# The Protective Role of Pericardial Macrophages and their Efferocytosis Potential During Experimental CVB3 Myocarditis

Paul A. Delgado, ScM; Graduate Student;
David M. Hughes, B.S.,
William Bracamonte-Baran, M.D., Ph.D.,
Taejoon Won, Ph.D.,
Daniela Čiháková, M.D., Ph.D.

Myocarditis is an inflammatory disease of the heart responsible for the development of acute and chronic heart failure. While the clinical manifestations of myocarditis vary, severe disease can cause arrhythmias, progression to dilated cardiomyopathy and sudden death. There are approximately 1.5 million cases of myocarditis annually, with an incidence of 22 out of 100,000 patients worldwide. Although different etiologies have been identified, in the United States, viral infections are a main cause of myocarditis development, mostly affecting children and young adults. The lack of biological therapies for the disease makes imperative the development of new strategies, which require deeper mechanistic understanding of the leukocyte subsets involved in the disease's immunopathogenesis.

This research attempts to advance the understanding of recently identified murine GATA6+ macrophages in the pericardial cavity and the role they play in limiting cardiac inflammation through myocardial migration and efferocytosis during CVB3 myocarditis. The first contribution is the description of the gene expression and physical characterization of GAT6+ macrophages. In the analysis, four main efferocytosis receptors were identified to be expressed among GATA6+ pericardial macrophages: Tyro3, Axl, MERTK, and TIM4. Second, we assessed the functional role of phagocytosis by GATA6+ pericardial macrophages in vitro. Compared to GATA6+ peritoneal macrophages and bone marrow-derived macrophages, GATA6+ pericardial macrophages appear to have an equal or slightly higher ability to phagocytose opsonized cargo.

Third, we investigated the role of GATA6+ pericardial macrophages in clearing damaged cells by efferocytosis during experimental CVB3-induced murine myocarditis. Altogether, our data suggest that GATA6+ pericardial macrophages are a unique tissue-resident population with efferocytosis potential that can regulate inflammation and possibly decrease fibrosis development during CVB3 induced myocarditis. Although the reparatory properties of GATA6+ peritoneal and myocardial macrophages have been previously described, there are multiple questions that remain unanswered for GATA6+ pericardial macrophage.

This research attempts to describe the efferocytosis properties of GATA6+ pericardial macrophages, something new in the cardiac immunology field. Finally, it is proposed that GATA6+ reparative macrophages could be manipulated as a potential cellular therapy to induce enhanced efferocytosis and prevent the development of cardiac fibrosis.

**Keywords:** immunology, heart disease, myocarditis, public health

**Manus biomechanics of a giant mastodon from the Gray Fossil Site suggest the ability to traverse uneven terrain in a karstic and mountainous refugium**

*Brenna Hart, M.S.,*
*Steven Wallace, PhD,*
*Eric Snively, PhD*

The largest terrestrial animals have adapted to supporting their body mass by walking on graviportal limbs. In sauropods and proboscideans, graviportal limbs are typically constrained to several structural features: columnar articulation, digitigrade stance with near vertically oriented metapodials, cushioned by fat pads, tightly and circularly arranged carpals and tarsals, and a greatly reduced distal phalangeal size. Variances in these characters can be adaptive for specific graviportal animals that faced challenges with their habitats, such as terrain navigation and the pursuit for food. A striking manual adaptation is present in the manus of a giant mastodon from the Gray Fossil Site (GFS; Gray, Tennessee, U.S.A.). GFS is a sinkhole-based, fossil-bearing deposit located in the Appalachians representing a C3 forest refugium present during the spread of the Miocene C4 dominant grasslands at the Hemphillian and Blancan transition 4.5 to 4.9 Ma. The discovery of a nearly complete, giant, and undescribed mastodon highlights variation in manus morphology and biomechanics in Proboscidea. The GFS mastodon had a highly splayed manus, unappressed first and second metacarpals, tripartite terminal phalanges, and a first digit that is oriented approximately 45° from the rest of the manus and is in full contact with the ground surface. Because the GFS mastodon was several tonnes larger than the common Mammut, approaching and even exceeding body masses calculated for some species of Mammuthus, and it lived in a karstic, mountain terrain, such unique manual characteristics could have been adaptations to navigating steep terrain, while supporting an enormous body mass.

From surface scans of its elements, we constructed finite element models of its manus in Amira to test stresses and strains under loads from different gaits. Mass was estimated from allometric methods and used to determine forces on the bones at various speeds. We applied distal forces, proximal constraints, and material properties for FEA in Strand7 and COMSOL Multiphysics. Maximum stresses of 8 Mpa at low speeds indicate that all elements had high safety factors, suggesting that the broad manus and divergent first digit enhanced potential capability to traverse high relief terrain. The unique manus features would have created a broader surface area, and the more mobile thumb might have had gripping or bracing capabilities, all of which would have made traversing the terrain easier.

**Keywords:** Proboscidean, Mastodon, Manus, Biomechanics, FEA

**Intraskeletal growth mark and tissue variation in the North Island Brown Kiwi (Apteryx mantelli)**

*Christian Heck, BS; Graduate Student;*
*Holly Ballard, PhD*

Osteohistology, the study of bone microstructure, provides an important avenue for assessing extinct and extant vertebrate growth and life history. Cortical vascularity and collagen fiber organization are direct reflections of growth rate, while bone growth marks are indicative of absolute age. However, each skeletal element has its own ontogenetic trajectory and microstructure of certain bones may not be a true representation of whole body growth. Additionally, bone remodeling varies intraskeletally and often obliterates or obscures bone growth marks, potentially altering interpretations of absolute age. Extensive comparative study of modern taxa is required to resolve intraskeletal discrepencies between age, vascularity, and tissue organization in extinct vertebrates. Despite their comparative utility, studies of bone microstructure in modern taxa are severely lacking. Here, we add to a growing comparative osteohistological database by describing the bone microstructure in a 14-year old male and 5-year old female North Island Brown Kiwi (Apteryx mantelli). Transverse and longitudinal histological thin-sections were processed and described for femora, tibiotarsi, tarsometatarsi, humeri, ulnae, and radii in both kiwi. Cortical bone can generally be described as cyclical parallel-fibered tissue with vascular canals oriented longitudinally within primary and secondary osteons. Tissue morphologically similar to medullary bone is present in the hindlimbs of the female, and coarse compacted cancellous bone (CCCB) is found sporadically in the male and female hindlimbs. Lines of arrested growth (LAGs) are present in all hindlimb bones of both kiwi, but remodeling has obliterated all LAGs in the male ulnae and radii. LAG count varies intraskeletally, but large weight bearing elements such as femora and tibiotarsi have less remodeling and, thus, higher number of LAGs. LAG count did not match absolute age in any skeletal element; a maximum of seven LAGs are present in the male kiwi and a maximum of six LAGs in the female kiwi. The tissue organization within the forelimbs and hindlimbs are reflective of the protracted growth strategy of the North Island Brown Kiwi and congruent with previous studies of the kiwi. LAGs were highly variable throughout the skeleton of the kiwi and a decoupling of age and LAG deposition is apparent from the male kiwi samples. Six LAGs in the 5-year old female kiwi may be a product of hatching, egg-laying, or captivity. Regardless, LAG count variation in the kiwi stresses the importance of intraskeletal sampling when assessing growth patterns of extinct taxa. Tissue organization did not appear to reflect sexual dimorphism aside from the presence of medullary tissue in the female hindlimbs. Our results reinforce a potential relationship between CCCB formation and fossorial behavior as described previously in mammals and non-avian dinosaurs. An extensive ontogenetic sampling of kiwi is necessary for future investigations of bone growth patterns, CCCB formation, medullary tissue, and LAG deposition and obliteration in these elusive birds.

**Keywords:** Osteohistology, Growth, Aves

**Developing the NeuroRelay App: A Neurology Atlas & Clinical Problem-Solving Tool**

*K. Elizabeth Johnson, BS & Haley Riley, BS;*
*Audrey Byrd, BS,*
*Alexander Eddy, MS,*
*Marah Smith, BS,*
*J. Tyler Todd, DO,*
*Paul Gignac, PhD,*
*Haley O'Brien, PhD*

Abstract: In medical education, the nervous system is often reported to be the most challenging subject by students and practitioners. This entrenched dislike and fear of neuroanatomy has led to a culture of "neurophobia," where a reciprocal cycle of learning-aversion leads to poor clinical understanding that ultimately impairs patient care. The primary source of neurophobia is high perceived difficulty, which precipitates low levels of interest and knowledge. Additional contributors include: 1) clinical translation of neuroanatomy, 2) visualization of structures, and 3) appreciation of 3D relationships. In response to these barriers, our medical-student-inclusive research team is developing "NeuroRelay": an app that combines a 3D neuroanatomy atlas with dynamic clinical problem-solving exercises. This descriptive study provides an overview of NeuroRelay development and the role of medical students in increasing the accessibility of medical education. NeuroRelay is made possible by recent OSU-CHS led efforts to capture some of the highest-resolution images of the human brain through tissue contrast staining and powerful microCT scanning. Using these techniques, an MRI-like image is produced every 40 to 90 microns (1 micron = 1 millionth of a meter), visualizing the central nervous system in unparalleled detail. From these high-resolution scans, medical students and principal investigators build interactive 3D digital models from microCT and MRI scans that showcase neuroanatomical systems (cortical regions, nuclei, tracts). These models can be viewed in augmented + virtual reality, and animated to demonstrate how signals are transmitted throughout the nervous system. NeuroRelay will also be programmed to identify sites of nervous system injury ("lesions") and engage learning and retention through rapid-recall quizzes. We anticipate that this student-inclusive initiative will enhance spatial anatomical knowledge and more directly target students' needs during learning. Ultimately, we hope that better and bespoke learning tools can address neurology learning aversion, empowering more students to consider neurology specializations.

**Keywords:** Medical education, 3D Imaging, Radiology

**Clinical perspectives on the cultural impact of family resilience among pediatric cancer families**

*Vivian Le, BS; DO; MPH;*

Background: Pediatric cancer diagnoses differ from their adult counterparts as their incidence defies environmental influence. Studies have shown that mortality rates among pediatric cancer patients disproportionately mirror the incidence rates when stratified by race. Although factors such as cancer type and treatment plans change outcomes, biological differences fail to explain this imbalance. Thus, the purpose of this study was to explore the role social and environmental factors play in the prognosis of pediatric cancer patients that may explain racial disparities between incidence and mortality rates.

Methods: This study used a qualitative research design with in-depth interviews conducted with clinical staff at a pediatric cancer clinic. A total of 12 interviews were conducted with interviews averaging at 37.5 minutes using a semi-structured interview outline. Interviews were transcribed and coded for emerging themes.

Results: Results showed four main themes in the role of culture on pediatric cancer resilience: social support, family composition, compliance, and individual coping. The significant role social support plays in a family's successful completion of treatment. However, it did reveal the importance of not just the support itself, but a family's willingness to ask and accept support. Family composition affected resilience in the presence of support within the immediate household and demographics of the parents, especially their educational background, language barriers, and socioeconomic status. Compliance variation correlated with access to resources, age of patient, and understanding of the diagnosis. Individual coping, primarily in each parent, was also a critical component to family resilience, as an innate ability to be adaptive and flexible improved the family experience as well as influenced patient coping skills.

Conclusions: Implications of this study can inform medical practice in assessing the psychosocial risk factors of a family prior to treatment initiation. Understanding the complexity of each family structure and their most influential factors of resilience can inform physician conversations with parents. Identifying the social and emotional strengths and weaknesses of a family can improve the role clinicians and support staff can play in providing families with resources. It can also hone in on strengths of the family to optimize their treatment experience. Recognizing the importance of individual parent and patient coping as well as willingness to accept the support that is available can be critical in promoting positive outcomes and outlooks during an arduous, straining, and labile treatment process.

**Keywords:** Social support, Resilience, Pediatric cancer, Coping

**Spironolactone Prevents High-Salt-Induced Increase in Blood Pressure in Male and Female Mice**

*Vina Nguyen, BS;*
*Liming Fan, MS,*
*Al Rouch, PhD*

Background: Mineralocorticoid receptor (MR) antagonism is a therapeutic approach that has beneficial effects for patients with heart failure and renal disease. Recent reports of sex differences with respect to MR antagonism could eventually lead to differential treatment of men and women with hypertension and cardiovascular disease. The purpose of this study was to investigate sex differences in blood pressure and sodium excretion in mice treated with the MR antagonist spironolactone.

Methods: Intact male and female CD-1 mice, 5 – 7 weeks old, were purchased from ENVIGO, Inc. Mice were placed in metabolic cages for a 5-day baseline (BL) period consuming normal food with water. After BL, either a placebo (P) or spironolactone (Sp) pellet (25mg, 21-day release, Innovative Research of America) was implanted sc and mice consumed a salt-deficient (SD) diet (Teklad, TD90228) with water for seven days. After the SD period, mice consumed a high-salt (HS) diet of 4% NaCl with 1% saline for seven days. Groups included male-P (MP), male-Sp (MSp), female-P (FP), and FSp (n=6/group). Systolic blood pressure (SBP, mmHg) was measured daily via the tail-cuff technique (CODA, Kent Scientific). Sodium balance was measured daily via sodium intake – sodium excretion, which was determined by urine volume x urine sodium concentration.

Results: In male mice, SBP decreased in the SD period in both MP & MSp mice: (BL vs SD: $105.0 \pm 1.1$ vs $100.8 \pm 1.2$ p<0.005; $108.7 \pm 2.0$ vs $102.5 \pm 1.8$, p<0.01 respectively). In MP mice, SBP increased in the HS period ($107.2\pm1.9$, p<0.02 compared to SD) whereas in MSp mice SBP did was not different ($98.3 \pm 3.7$, p<0.08 compared to SD). In female mice, SBP was not different between BL and SD periods in either FP or FSp mice: (BL vs SD: $97.5 \pm 1.7$ vs $96.2 \pm 1.1$; $98.8 \pm 1.8$ vs $100.6 \pm 1.4$, respectively). As in the males, SBP increased in FP mice in the HS period ($104.2 \pm 2.3$, p<0.02 vs SD), but did not change in FSp mice ($100.6 \pm 2.3$). Sodium excretion was significantly higher in FSp compared to FP mice in both the SD and HS periods whereas sodium excretion was not significantly different between MP and MSp mice in both SD and HS periods. In summary, consuming the SD diet for seven days lowered SBP in male mice but not in female mice. In transitioning from the SD to HS diets, SBP increased in the untreated male and female mice but remained stable in spironolactone-treated male and female mice.

Conclusions: MR antagonism prevents HS-induced elevation in blood pressure. MR is a ubiquitous transcription factor and thus potential sex differences regarding in not only renal sodium handling but also other physiological mechanisms related to blood pressure need further investigation.

**Novel Melanin-Inspired Compound that Exhibits Gram-Positive Antimicrobial Properties**

*Daniel Reed; Undergraduate Student; Daniel Reed, Toby Nelson, PhD, Gabriel Cook, PhD, Franklin R. Champlin, PhD*

The Melanin-inspired core represents a novel compound having the intrinsic ability to act as scaffolding for functional groups which may possess antibacterial properties. The purpose of this study was to investigate the antibacterial potential of Melanin-inspired compounds EIPE-1 and EIPE-HCl which are hydrophobic and hydrophilic, respectively. A standardized disk agar diffusion bioassay was employed to determine the susceptibility and resistance levels of twelve gram-positive and thirteen gram-negative bacteria to the EIPE derivatives. Turbidimetric growth curves were generated using batch culture growth kinetic analysis to provide preliminary mechanistic information. Five strains of Staphylococcus aureus, plus Bacillus subtilis and Staphylococcus epidermidis were found to be susceptible to the hydrophobic derivative EIPE-1, while other gram-positive and all gram-negative organisms exhibited resistant phenotypes at the potencies tested. Batch cultural growth kinetics revealed EIPE-1 to cause immediate bacteriolysis of B. subtilis and S. epidermidis at a concentration of 0.2 µg/mL. The more polar EIPE-HCl derivative failed to inhibit growth of any of the organisms examined. These data support the conclusion that the hydrophobic EIPE derivative EIPE-1 possesses a gram-positive antibacterial spectrum and likely acts in a cytoplasmic membrane-directed manner. The susceptibility of two methicillin-resistant S. aureus strains (MRSA) suggests that its mechanism of action does not involve the penicillin-binding proteins of peptidoglycan biosynthesis targeted by mainstream β-lactam antibiotics. The uniform resistance of thirteen phylogenetically disparate gram-negative pathogens supports the notion that intrinsic outer membrane exclusion properties may play a role in the mechanism underlying their intrinsic phenotypic resistance. Further experiments will involve determining EIPE-1 break points using a minimal inhibitory concentration bioassays and treating gram-negative organisms with an outer membrane permeabilizer in an attempt to increase the efficacy of EIPE-1 by outer cell envelope permeabilization. Determining the mechanism of gram-negative resistance will be valuable for expanding the EIPE-1 spectrum and the development of other Melanin-inspired derivatives.

**The Effectiveness of Functional Bracing in Athletes with Anterior Cruciate Ligament Reconstruction on Function, Stability, and Biomechanics: A Critically Appraised Topic**

*Kerlee Alberty, BS; Graduate Student; MAT;*
*Jonathan Herrick, BS,*
*Aric Warren, PhD*

Context: There are approximately 200,000 anterior cruciate ligament (ACL) injuries per year in the United States and about half of these injuries undergo ACL reconstruction (ACLR). Currently, the treatment for ACLs post reconstructive surgery often involves the use of a functional brace to aid in the rehabilitation process by providing stabilization and protection to the graft by reducing mechanical loads and supporting early motion. According to the American Orthopedic Society for Sports Medicine (AOSSM), postoperative braces are used in 85% of ACLR cases. While the effectiveness of the use of a functional brace post ACLR for return to sports, or high levels of physical activity, is still unclear, many physicians still opt to prescribe and recommend bracing for the first postoperative year. In conclusion, the most effective use of a functional brace post anterior cruciate ligament reconstruction still remains unclear.

Clinical Question: What is the efficacy of functional bracing on the function, stability, and biomechanics in athletes with reconstructed anterior cruciate ligaments?

Summary of Key Findings: A search of the following databases was conducted in November 2020 using the search terms: anterior cruciate ligament reconstruction; bracing; kinematic; knee instability, kinetics; ACL functional brace (PubMed, TRIP Medical Database, Journal of Athletic Training, PEDro Database, Google Scholar). Only peer-reviewed articles that were randomized control trials or systematic reviews were included in the analysis. Of the three included studies, all report significant results supporting the idea that bracing of the ACL post ACLR surgery does not improve long-term patient outcomes and clinical outcomes on the function and stability of ACL reconstructed knees.

 Clinical Bottom Line: There is moderate evidence to support the idea of discontinuing the use of ACL functional braces post ACLR surgery for function and stabilization of the ACL reconstructed knee. Currently, no existing functional brace has been successful to restore normal anterior stability to the ACL deficient knee and improve long term patient outcomes following ACLR.

 **Keywords:** Anterior cruciate ligament reconstruction, Bracing, Kinetics, Knee instability, ACL functional brace

**BDNF in heparin-plasma blood samples using a commercial ELISA: measuring and standardization**

*Samuel Alvarado, BS;*
*Dilani Herath Gunasena, PhD,*
*Dolores Vazquez-Sanroman, PhD*

Introduction: Brain-Derived Neurotrophic Factor (BDNF) is a neurotrophin that plays an essential role in neuronal development and synaptic plasticity. Enzyme-linked immunosorbent assay (ELISA) kits can be used to measure BDNF in blood serum. However, information about sample processing and appropriate standards when clotting factors are present in the sample remains scattered. We aim at validating and optimizing the BDNF ELISA kit with respect to measurements in heparin-plasma blood samples.

Methods: blood heparin-treated plasma from 28 adults were processed as the commercial kit Mature BDNF/proBDNF Combo Rapid ELISA Kit (BEK-2211/2237, Biosensis, Australia) suggested for human plasma. Results: we found that the pre-analytical conditions were critical for plasma samples. Determination of the intra assay variation and the accuracy and yield of the BDNF ELISA kit in heparinplasma samples were conducted with the optimal dilutions. A linear dilution curve determined the optimal dilutions of plasma extracts; we found that 1:2 dilution optimized the detection levels for proBDNF and 1:50 dilution for matureBDNF. The range of sensitivity for BDNF isoforms in heparinplasma samples was accurate to the manufacturer's descriptions. Furthermore, we established the coefficient of variation (CV%) between pro- and mature BDNF. The inter-assay variation showed a CV% of 5% for mature BDNF and 25% for proBDNF. We conclude that the BDNF ELISA kit determines heparinplasma BDNF accurately and with high reproducibility. Last, it can be used for the measurement of BDNF isoforms in samples with clotting agents. Comparisons between clotting-plasma and serum samples will be determined and presented as part of this pilot study.

**Keywords**: Brain derived neurotrophic factor (BDNF), Enzyme-linked immunosorbent assay (ELISA) kit, blood serum

**A Free Open-Source Method of Image Cytometry in Rat Dorsal Root Ganglia with Fluorescent Immunohistochemistry**

*Michael Anderson, BS;*
*Kenneth E. Miller, PhD,*
*Subhas Das, PhD*

Immunohistochemistry (IHC) is a valuable tool in clinical and biological research for evaluating proteins and other antigens in spatially bound tissue. In neuroinflammatory pain research, primary afferent neurons of the dorsal root ganglion (DRG) are studied to understand molecular signaling mechanisms involved in nociception (pain) and inflammation. Measuring IHC immunofluorescence in DRG neurons require manual hand tracing of nuclear and somatic boundaries, which is laborious, error-prone, and can require several weeks to collect the appropriate sample size with a mouse or pen-input display monitor. To overcome these limitations and increase standardization of sampling and measurement, we employed a reliable neuronal cytoplasmic reporter (NeuN), exclusive to DRG neuronal soma and nuclei, in a semi-automated algorithm-based approach of Image Cytometry in rat Dorsal Root Ganglion (ICDRGs).
**Keywords:** Image Cytometry, Primary Sensory Neurons, Automation Technique

# Cross-sectional Analysis of IRB Submission Prevalence Among Studies Using ClinicalTrials.gov

*Reece M. Anderson, MPH; Medical Student;*
*Philo Waters, BS,*
*Benjamin Heigle, BS, Ryan Ottwell, BS,*
*Micah Hartwell, PhD,*
*Matt Vassar, PhD,*
*Jason Beaman, DO*

Background: In 1974, the National Research Act established institutional review boards (IRBs) to cease and prevent the unethical treatment of humans within medical research. It is the duty of researchers and IRBs to determine what research should be reviewed for ethical violations. For example, research not involving human subjects does not often require IRB review. With fewer constraints, non-human subjects research — such as cross-sectional analyses of ClinicalTrials.gov (CT.gov) — can be conducted with fewer resources and provide insight into trial outcomes, outcome reporting, and resource allocation. Owing to the proximity of these analyses with human subject data we sought to determine: (1) the rates of IRB submission; (2) associations of IRB approval and additional data inquiries with trial investigators; and (3) associations between IRB submission and extracted study characteristics.

 Study Design: PubMed was queried for publications that included "ClinicalTrials.gov" in the title or abstract published after 2011. We randomized then screened the first 700 articles. In a masked, duplicate fashion, we extracted the article's title, whether it made correspondence for additional data, country of the primary author, IRB statement, and if the study was funded. Frequencies were calculated for all extracted characteristics and chi-square tests were conducted to measure associations between IRB submission and extracted study characteristics.

Results: Of 57 articles included, zero declared that they were submitted to an IRB or ethics review panel. Forty-two studies (of 57, 73.7%) did not include an IRB or ethical review statement while 16 (of 57, 28.1%) studies did include a statement of IRB exemption. Four (of 57, 7.0%) studies reported contacting the principal investigator to collect additional data. Two of these four studies included IRB statements. No significant associations were found between studies with IRB declarations and those with no mention of ethical approval among any study characteristics.

 Conclusions: Nearly three-quarters of meta-research examining data from CT.gov did not include a statement regarding IRB or ethical approval. These studies were likely determined exempt by the authors or the institutional IRBs under the Code of Federal Regulations — 45 CFR 46.101. The remaining quarter of studies in our sample explicitly declared exemption from the IRB. Four of the studies contacted trial investigators and under strict interpretation of regulation, these methods may constitute "interview" procedures involving human subjects research; however, current policy — 45 CFR 46.104(d)(2)(i) — states these studies are exempt if data do not include information that may identify subjects, and in these cases, are not the unit of analysis. Taken together, these findings suggest that ethical approval for meta-research of CT.gov data regularly meet federal exemption criteria.

**Keywords:** Cross-sectional Analysis, Human Ethics, IRB Submission

**Examination of hypertension, hypercholesterolemia, and diabetes among pregnant women in the United States: A cross-sectional analysis of BRFSS**

Jordyn Austin, BS;
Mariama Abramson, BS,
Vanessa Lin BA,
Benjamin Greiner, DO,
Marshan Marick, DrPH,
 Micah Wright, DO,
Micah Hartwell, PhD

Background: Chronic conditions including hypertension, hypercholesterolemia, and diabetes mellitus are known risk factors for severe complications during pregnancy and can lead to maternal death— a burgeoning health crisis that impacts hundreds of women in the United States each year. While studies have been completed to measure the rates of maternal mortality and hospitalization, there have been no recent ventures to quantify the presence of mortality risk factors in pregnant women. The primary objective of this study was to determine the prevalence of these chronic conditions among pregnant women and determine associated risk factors.

Study Design: A cross-sectional analysis of 2017, 2018, and 2019 Behavioral Risk Factor Surveillance System (BRFSS) surveys was completed. Inclusion of participants was dependent upon the respondents answering "Yes" to the question: "To your knowledge, are you now pregnant," which was asked of all women between 18 and 49 years of age. Data extracted included socio-demographic variables, lifestyle behaviors, and the presence of comorbid diagnoses. Population estimates, prevalence rates, and adjusted odds ratios (AORs) were calculated. A post hoc multinomial regression analysis was conducted to determine risk factors associated with race.

Results: This sample consisted of 7,101 pregnant women (N = 2,308,485). Of the pregnant respondents, 46.7% were over the age of 30; 19% over the age of 35. More than 1 in 10 women lacked healthcare coverage. Age was significantly associated with all three chronic conditions while having children in the household or a college degree were associated with lower odds of having hypertension (AOR: 0.79 95%CI: 0.65-0.96 and AOR: 0.31; 95%CI: 0.16-0.61, respectively). Being a current smoker was associated with an increased risk of hypertension (AOR: 2.35; 95%CI: 1.39-3.98). Diabetes among pregnant women was associated with having healthcare coverage (AOR: 1.84; 95%CI: 1.17-2.89), drinking alcohol within the past 30 days (AOR: 1.62; 95%CI: 1.02-2.60), and being Asian American (compared to white women; AOR: 2.32; 95%CI: 1.21-4.45). The post hoc analysis showed that race was significantly associated with risk factors associated with pregnancy complications.

Conclusions: Our findings add to existing literature and showed that risk factors for childbirth and maternal mortality were more prevalent among women bearing children later in life and that Black and Hispanic pregnant women were more likely to have risk factors associated with these conditions. Opportunities for improvements are contingent on understanding risk factors for cardiovascular disease and diabetes, monitoring the changing maternal population, and creating policy initiatives at the community, state, and national levels.

**Keywords:** Pregnancy, Chronic disease, Maternal Mortality

**Cervical cancer screening among women with comorbidities: A cross-sectional examination of disparities from the Behavioral Risk Factor Surveillance System**

*Jordyn Austin, BS;*
*Paul Delgado, ScM,*
*Ashton Gatewood, MPH,*
*Mackenzie Enmeier, BS,*
*Elise Stephenson, BS,*
*Benjamin Greiner, DO,*
*Micah Hartwell, PhD*

Background. In 2020, the American Cancer Society projected that 13,800 women would be diagnosed and nearly 4,300 would die from cervical cancer (CC). Human papillomavirus (HPV) infection is the leading cause of CC development. Implementation of prophylactic HPV vaccination and screening via Papanicolaou smear has reduced CC rates up to 80% over the last five decades, yet, disparities in screening usage continue to exist. Current research suggests adherence to CC screening is inversely related to patient body mass index, however, no study has assessed the impact of other comorbidities on screening use. Thus, our objective was to analyze screening rates among women with diabetes mellitus, hypertension, cardiovascular disease, chronic obstructive pulmonary disease (COPD), arthritis, kidney disease, depression, or skin cancer compared to healthy women.

Methods. We combined the 2018 and 2019 Behavioral Risk Factor Surveillance System datasets and then constructed multivariate logistic regression models to determine the adjusted risk ratios (ARR) of persons receiving CC with and without comorbidities as well as in those with multiple comorbidities (1, 2-4, 5+) compared to zero. Confidence intervals were reported at 95%.

 Results. Our study found that individuals who were obese (ARR: 0.96; CI: 0.95-0.98), had diabetes (ARR: 0.98; CI: 0.96-0.99), COPD (ARR: 0.92; CI: 0.90-0.94), arthritis (ARR: 0.96; CI: 0.95-0.97), depression (ARR: 0.97; CI: 0.95-0.98), or chronic kidney disease diagnoses (ARR: 0.94; CI: 0.91-0.98) were less likely to be screened, controlling for age, race, healthcare coverage, and education. Women with 2-4 or 5 or more diagnoses were significantly less likely to receive screening compared to those with zero diagnoses.

Conclusion. Women diagnosed with comorbidities including obesity, diabetes mellitus, COPD; arthritis; depression; and kidney disease were less likely to complete CC screenings. Additionally, the number of comorbidities was inversely related to completing screenings. These findings suggest physicians and patients are not following evidence-based guidelines regarding cervical cancer screening schedules in patients with comorbidities. Further efforts are warranted to reduce the disparities in cervical cancer screening among women with comorbidities.

**Keywords:** Cervical Cancer Screening, Pap smear, Human Papillomavirus (HPV), Comorbidities, Behavioral Risk Factor Surveillance System.

**A Statistical Analysis of Medical School Exam Score Distributions**

*Kaylea Bixler, BS;*
*Nicholas B. Sajjadi, BS,*
*Joseph A. Price III, PhD*

Mean, median, and standard deviation are integral components in basic statistical analysis. In the context of medical education, few have endeavored to statistically analyze large exam score data sets for these measures of central tendency and deviation. This study determines basic statistical measures of distribution among exams scores from first and second year medical students. Raw exam score data from the 2019-2020 academic year was collected from all exams given to first and second year medical students at Oklahoma State University College of Osteopathic Medicine. This data was deidentified and grouped according to Course Title and Course Exam in Microsoft Excel. This data was imported into the software suite R (version 4.0.2) for preliminary numerical and graphical analysis, with a distinction drawn between system and non-system courses. From these analyses it was concluded that Systems courses appeared to have more tightly clustered exam score means, medians, and standard deviations. This result lends itself to further exploration of a possible correlation between clustering of the calculated values and normality of exam score distribution curves. Additionally, Non-Systems exams showed a large degree of variability in measures of central tendency and dispersion. This observation, once assessed for statistical significance and skewness, may indicate a need to restructure non-systems courses in order to decrease the variance in exam performance. This study highlights the utility of simple statistical methodology in analyzing large scale data sets and will allow for future evidence-based curriculum decisions to be made.

# Gene expression profiling of the urease operon of a Lactobacillus strain isolated from the prairie vole gastrointestinal tract

*Kyrsten Bene, BS; Graduate Student*
*Senait Assefa, PhD,*
*Tom Curtis, PhD,*
*Gerwald Koehler, PhD*

Some bacteria such as Helicobacter pylori can sense their environment and use urease to produce ammonia and carbon dioxide when exposed to acidic conditions. This will neutralize the surrounding microenvironment and potentially promote survival in conditions such those in mammalian stomachs. Lactobacilli are common commensals in the gastrointestinal tract and some strains are associated with beneficial effects on the host. Whole genome sequencing revealed a urease operon in the prairie vole Lactobacillus strain PV034. In order to functionally characterize the urease operon, we analyzed the mRNA expression of the nine genes encoded in the operon when PV034 was grown in various conditions. The strain was cultured in de Man-Rugosa Sharpe (MRS) medium in different pH conditions (2, 4, 6, 8) with and without the presence of urea. Total RNAs were isolated from the bacterial cells and cDNAs were generated. The expression of the urease operon and several housekeeping genes were analyzed using reverse transcription-quantitative PCR. Statistical tests were performed to identify differential gene expression. A detailed mRNA expression profile of the PV034 urease operon will be presented. This study provides insights into the gene regulation of the urease operon, which is potentially a crucial colonization factor for some Lactobacillus strains in the mammalian gastrointestinal tract. Future studies will be directed towards characterization of the in vivo role of urease production by lactobacilli.

Keywords: Lactobacillus, urease, operon, Reverse transcriptase-quantitative PCR

**Evaluation of Predatory Journal Publication in Systematic Reviews in the Top Five Cardiology Journals: A Cross-Sectional Analysis**

*Dayna Brewer, BS;*
*Caleb Smith, B.S.,*
*Adam Corcoran, B.S.,*
*Ryan Ottwell, B.S.,*
*Micah Hartwell, Ph.D.,*
*Matt Vassar, Ph.D.*

Background: Predatory journals are those which take advantage of the open access model of peer reviewed research by implementing unethical submission practices. This includes publishing manuscripts without peer review in exchange for large publication fees, among other questionable conduct. These published articles may lack scientific merit and threaten the integrity of other medical research. Publications from predatory journals have the potential to be cited in systematic reviews; this can threaten clinical practice guidelines and clinical decision making. Thus, we investigated whether systematic reviews from the five most-cited cardiology journals included primary studies published in predatory journals.

Methods: In a cross-sectional design, we systematically identified five cardiology journals using Google Metrics based on their H-5 index. Using PubMed, we designed a search string to ensure we obtained the proper list of systematic reviews from each journal. The following search query was used for the top five cardiology journals: (("systematic review"[Publication Type]) OR ("meta analysis"[Publication Type])) AND ("journal name"[Journal]). The first ten qualifying systematic reviews were then analyzed, and the journals cited were obtained. An algorithm created by author A.C. was used to determine predatory journals categorized by Beall's list, an online public collection of journal titles which have demonstrated predatory submission tactics. Any matches were verified to be predatory by comparing it to the publication website listed on Beallslist.net. Systematic reviews that were deemed to include a predatory journal citation were further analyzed in a masked, duplicate fashion by C.S and D.B. After the extraction process, result differences were adjudicated by C.S. and D.B. with authors R.O. and A.C. available for consult.

Results: Of the 50 systematic reviews analyzed, we found one instance (1/50, 2%) where a primary study published in a predatory journal was included in a systematic review. This systematic review was published by Circulation Research, the fourth most cited journal in cardiology (Table 1). This systematic review dealt with a potential treatment strategy of myocardial infarctions; it has been cited by 80 other publications but was not included in a clinical practice guideline (Table 2). The primary study published in the predatory journal has been cited by 36 other publications. Of note, the predatory publication was referenced by a recommendation article from the American Heart Association.

Conclusions: We identified that systematic reviews published in the top cardiology journals do contain predatory publication. Including unscrupulous research as primary studies in systematic reviews or clinical practice guidelines threatens the integrity of the synthetic data, which may ultimately play a role in clinical decision making. More research needs to be done to investigate this issue in greater sample sizes across more journals. It is imperative that this problem is investigated to ensure the validity of medical literature.

**Keywords:** Cardiology, Predatory journals, Systematic review

# Methods to study the intestinal microbiome

*Victoria Burris, BS;*
*Senait Assefa, PhD,*
*Gerwald A. Koehler, PhD*

Recent technological advances have led to a revolution in microbiology: the detailed characterization of microbiomes in and on humans, animals, plants, in soil, and a myriad of other sites. Microbiomes are comprised of microbial communities (microbiota) and their associated genomes. Traditional low throughput methods to study complex microbial assemblages have been surpassed by high throughput technologies that can deliver information about microbiome compositions and functions in a much faster and more comprehensive way.

In this study, we have used low-throughput approaches such as traditional endpoint and quantitative PCR (qPCR) for molecular identification of microbes in fecal or intestinal material. As examples for modern high throughput analyses of microbiomes, massively parallel sequencing of 16S ribosomal RNA amplicons was employed (16S metagenomic sequencing). The latter methodology delivers immense amounts of sequence reads (amplicon sequence variants, ASVs) that require sophisticated bioinformatics for quality control and data analyses. Results from these approaches will be presented with a discussion of advantages and drawbacks of utilizing the methods for small (summer) research projects by undergraduate, graduate and medical students. Furthermore, the potential for implementation of other modern technologies such as whole genome shotgun metagenomics, transcriptomics, proteomics, and metabolomics for small or larger research projects will be discussed. In conclusion, microbiome research is not necessarily restricted to large and expensive research projects. Well planned, small projects are possible as part of larger studies or even as stand-alone studies that allow students to experience scientific research and discovery in this new and exciting field.

**Keywords:** Metagenomics, Intestinal microbiome

# Ethical approval among studies using the National Health and Nutrition and Examination Survey (NHANES): a cross-sectional analysis

Lydia Brock, BA; Medical Student;     Kirstien Lindley, BS,

Brayden Rucker, BS,     Arjun K. Reddy, BA,

Ryan Ottwell, BS,     Matt Vassar, PhD,

Jason Beaman, DO,     Micah Hartwell, PhD

Background: Institutional Review Boards (IRBs) were born out of the unethical treatment of individuals in several studies— the Tuskegee syphilis experiment, the Milgram experiment, and the Stanford prison study, among others. While IRBs are essential for protecting individuals and the integrity of research, local IRBs vary in what they perceive warrants ethical review which can lead to confusion among researchers— particularly about what constitutes human subjects research (HSR). The National Health and Nutritional Examination Survey (NHANES) provides a nationally representative dataset that includes many psychological and medical components used for public research. All components with any individually identifiable information have been removed, which classifies their use as NON-HSR. Given that IRB guidelines are not standardized across institutions and there is a lack of literature concerning ethics in the use of NHANES data, our objectives were to evaluate rates of IRB submissions among crosssectional studies of publicly available NHANES data and associations with other study characteristics.

Methods: PubMed was queried for cross-sectional studies of NHANES data published after 2011. Next, the articles were randomized and 500 articles were exported to an excel sheet. Data screening and extraction were performed simultaneously by two authors until they independently retained 200 articles. Extracted data included IRB statements, country of the primary author, and if the study was funded. Descriptive statistics were recorded for extracted characteristics and chi-square tests were used to measure associations between IBR submission, study characteristics, and publications occurring before and after the 2019 revisions to HHS45-CFR46, although no changes were made to the definition of non-HSR.

Results: Among 203 included studies, 22 (11.1%) had declared being submitted to an IRB, 26 (13.1%) reported not having undergone IRB review, and 150 (75.8%) studies made no mention of ethics review. Of the 22 studies submitted for review, 6 (27.3%) were published in journals requiring an ethics determination, 7 (31.8%) of the author's institutions required all studies to be submitted for review, and 6 (27.3%) studies were from universities which had exempted NHANES analysis from IRB submission. We found no significant associations between IRB submission and study funding, whether it originated within or outside the United States, nor among publications occurring before or after 2019.

Discussion: Our findings show the majority of studies using NHANES data did not include an ethics statement, and there was a nearly equal split among declarations of IRB submission and nonsubmission. Journal and institutional requirements were infrequent among studies that were submitted to an IRB, which may constitute the need for national standards for IRBs concerning federal datasets, such as NHANES. Accessibility to these datasets can provide researchers cost-effective avenues to test hypotheses which can provide critical preliminary data to support future clinical research and reduce research waste. Thus, public accessibility to NHANES, without unnecessary institutional or journal requirements is essential to maximize their benefit. Moreover, institutions must evaluate their policies that prove to be barriers to secondary data analysis.

Keywords: NHANES, IRB, Ethic, Cross-sectional

**Rural College Students' Amenability Towards Using At-Home HIV and STI Testing Kits**

Lynn Bui, BS;
Randolph D. Hubach, PhD,
Carlos Mahaffey, PharmD,
Kelley Rhoads, PhD,
Andrew M. O'Neil, BS,
Campbell Ernst, MAT,
Lynn X. Bui, BS,
Justin Hamrick, MPH,
Zachary Giano, PhD

Background: College students residing in rural areas of the United States have limited access to HIV and STI screening programs; yet, have increased rates of infection.

Methods: Students (N=326), attending a state university located within a rural community, completed an online survey containing open-ended questions that gauged their perceptions and experiences with HIV/STI testing, amenability to at-home testing technology, and preferences for obtaining at-home testing kits. Inductive coding was utilized to create themes for each open-ended question.

Results: Students encounter a number of perceived barriers to accessing clinical HIV/STI testing venues including cost, utilization of parents' medical insurance, and stigma. Students desired screening paradigms that allow for a greater sense of privacy and the ability to be empowered through selfsampling methods. This includes the use of at-home testing kits which could be accessed via mail, campus, or the local community. Although students were overwhelming amenable to using at-home testing, students discussed concerns with potential user error that could impact testing accuracy. Conclusions: Study findings suggest the importance of developing less clinically-oriented systems of HIV/STI screening, which allow students to choose from an array of screening options. Removing perceived barriers, notably access and privacy concerns, to HIV/STI testing by leveraging at-home testing is one potential method to increase screening uptake among this at-risk population.

**Keywords:** At-home testing, Rural health, Emergent adults, Testing preferences

**Effects of Ovariectomy on Body Weight, Metabolic Hormones and Neuroreceptors in Rats**

*Katie Burch, BS; Graduate Student;*
*Kathleen S. Curtis, PhD;*
*Kelly McCracken, MS;*
*Daniel J. Buck, BS;*
*Randall L. Davis, PhD*

Introduction: Obesity effects over 40% of American adults, and as of 2019, Oklahoma ranks 4th in the US in the incidence of obesity. Particularly concerning is the greater incidence of obesity in women, especially after menopause. This specific area of health issues has not been greatly studied. We model post-menopausal weight gain in ovariectomized (OVX) rats and recently reported that post-OVX weight gain is accompanied by changes in neuroimmune signaling in central nervous system (CNS) regions that respond to metabolic hormones including leptin, ghrelin and insulin.

Research Question: Our working hypothesis is that alterations in neuroimmune factors involved in postOVX weight gain are associated with changes in metabolic hormones and/or in their CNS receptors.

Study Design/Methods: In this study, 90 day old female Sprague-Dawley rats were divided into groups of OVX (n=24) or sham OVX (aka control, n=24). Rats were housed individually in plexiglass cages on a 12:12 dark:light cycle and given ad libitum access to standard laboratory chow and water throughout the experiment. After acclimation to the colony room, rats were bilaterally OVX or sham OVX and body weights were recorded daily for 5 days postoperatively. One subgroup of rats (OVX: n=8, sham: n=8), was sacrificed on day 5. Remaining subgroups of rats were weighed weekly thereafter and sacrificed at 33 (OVX: n=8, sham: n=8) or 54 (OVX: n=8, sham: n=8) days post-operatively. At termination, body weight was determined and brains and plasma were collected. Brain punches were obtained from the arcuate nucleus (ARC), dorsal vagal complex (DVC), and paraventricular nucleus (PVN) and then homogenized. ELISA kits were used to measure leptin, ghrelin and insulin receptor expression in these brain regions, in addition to circulating insulin, ghrelin and leptin levels.

Results: Body weight increased rapidly and progressively in OVX rats but not in sham OVX rats. Plasma leptin levels increased over time, especially in OVX rats, while plasma ghrelin and insulin levels were increased more transiently. Insulin, ghrelin and leptin receptor levels in the ARC did not differ between OVX and sham OVX rats after an initial increase in leptin receptor levels. In the DVC, insulin receptor levels decreased over time in OVX rats and were significantly less than those in sham OVX rats by day 54; however, neither ghrelin or leptin receptor levels differed. In the PVN, all receptor levels were reduced in OVX rats by day 54, with the leptin receptor levels also less at day 33.

Conclusions: These results do not demonstrate a clear relationship among body weight gain, circulating hormone levels, and hormone receptors in OVX rats. Nonetheless, an inverse relationship between circulating leptin and leptin receptor levels that occur with body weight gain in OVX rats was evident in the PVN. Moreover, the PVN showed the largest change in hormone receptor levels, suggesting it is an area of interest to understand hormone effects in the CNS and their role in body weight gain.

**Financial conflicts of interest in Achilles tendon rupture repair systematic reviews**

*W. Tanner Cole, BS;*
*Cody Hillman, B.S.,*
*Adam Corcoran, B.S.,*
*J. Michael Anderson, B.S.,*
*Michael Weaver M.S.,*
*Trevor Torgerson, B.S.,*
*Micah Hartwell PhD,*
*Matt Vassar, PhD*

Aims: The primary aim of our study was to evaluate the effects of undisclosed financial conflicts of interest in Achilles tendon rupture repair focused systematic reviews.

Methods and Results: Following a cross-sectional study design, we searched MEDLINE and Embase for Achilles tendon rupture repair systematic reviews. We performed screening and data extraction in a blind, triplicate fashion. Each systematic review was evaluated on the individual characteristics of the study, presence of undisclosed and disclosed conflicts of interest, favorability of results and conclusions, and the relationship between conflicts of interest and the favorability of results and conclusions. Our search produced 172 total systematic reviews pertaining to Achilles tendon rupture repair, of those, only 12 were included in our study. Undisclosed conflicts of interest were found in half (6/12, 50%) of the included reviews. No significant tie was found between conflict of interest and the favorability of results and conclusions, however.

Conclusion: Undisclosed conflicts of interests were discovered in a large percentage of our sample. This lack of disclosure did not appear to show a tie to favorability of the study, but all conflicts should be disclosed. Further research is needed to evaluate if there is a tie present.

Keywords: Achilles tendon rupture; Achilles tendon rupture repair; Orthopedics; Systematic Review; Meta Analysis

**Exploremos: supporting the advancement of minorities in stem**

*Celine Cortes, BS; Graduate Student;*
*Kent Smith, PhD,*
*Nicholas Czaplewski, PhD,*
*Reggie Whitten, JD,*
*Jeff Hargrave, JD*

Hispanics are highly under-represented minorities (URMs) in science in the U.S.A. In Oklahoma, Hispanics are the largest minority group, followed by American Indians. The student population at Oklahoma State University Center for Health Sciences (OSU-CHS) is very diverse and includes Hispanics and American Indians. In 2010, the Native Explorers Program (NEP) was created to increase the number of American Indians who pursue STEM careers. The program introduces participants to various scientific disciplines, with an emphasis on vertebrate paleontology. It has been incredibly successful, with most former participants earning science degrees. In spring 2020, a novel program called "Exploremos" was created as an opportunity for two Hispanic college students to participate in the 2020 NEP. The NEP and Exploremos were canceled due to COVID-19.

The targeted population for Exploremos is Hispanic college-age students with a high-school degree or equivalent and a desire to continue their education. Despite Hispanics representing 16% of the U.S. workforce, they hold only 8% of STEM jobs. Exploremos was created to address their paucity in STEM. In efforts to recruit participants, we contacted campus diversity officers and distributed program materials to Oklahoma colleges and universities. Despite our efforts, we received fewer applications than anticipated. We are evaluating recruiting methods to increase applications for 2021.

Studies on STEM workforce diversity have indicated Hispanics lack encouragement to pursue STEM early in life, as well as educational resources and opportunities in STEM. Exploremos participants will learn from URM and non-minority OSU-CHS faculty, graduate and medical students, and scientific professionals. They will engage in activities within anatomy and vertebrate paleontology labs, and prospect for and collect vertebrate fossils at multiple field sites in Oklahoma. Exploremos will allow Hispanic students, regardless of scientific background, to explore STEM fields with support from URM mentors and peers. We hope this enrichment program will empower participants to pursue STEM, and become the next generation Hispanic STEM educators, researchers, and leaders.

Keywords: Mentorship, Hispanic, STEM, Paleontology

**The effects of BAPS board proprioceptive training to improve balance and functional stability in young chronic ankle instability patients: A critically appraised topic**

*Michael Daniels, BS; Graduate Student; MAT;*
*Aric Warren, PhD, LAT, ATC, CSCS, CES*

Context: Chronic ankle instability (CAI) is a term used to describe patients with recurrent ankle injuries that stem from an increase in joint laxity and decreased muscular strength. These patients are the ones that are hypothesized to benefit from proprioceptive training the most; however, there are many therapeutic tools to increase neuromuscular control. There has been an increase in proprioceptive training research on CAI patients, but there are limited studies looking at the proprioceptive benefits of the biomechanical ankle platform system (BAPS) board. Therefore, there is potential for the BAPS board to show improvements in neuromuscular control, like balance and functional stability, in CAI patients.

Clinical Question: Can proprioceptive training on a BAPS board improve balance and functional stability in young CAI patients?

Summary of Key Findings: The literature searched for studies comparing the effects of BAPS balance training on balance and functional stability in the ankle (Pubmed, PEDro Database, Medline, EBSCO host). Three randomized controlled trials (RCTs) were found and compared. There was a significant difference found in balance and functional stability after BAPS board training in one of the RCTs; however, all three RCTs showed improvements before and after the training.

Clinical Bottom Line: There is moderate evidence to support the effects of proprioceptive training on functional stability in CAI patients; however, there is limited research to support BAPS board as a proprioceptive tool to increase functional stability in young CAI patients. Strength of Recommendation: Level 2 evidence does exist to show the effects of BAPS board training on balance and functional stability in young CAI patients.

 Keywords: Chronic ankle instability, Proprioceptive training, BAPS board, Ankle injury treatment

**Morphine-induced exacerbation of activated immune response is mediated by miR-155**

*Subbhas Das, PhD*
*Subhas Das, PhD,*
*Sabita Roy, PhD*

Abstract: According to data from 2018, 128 people died in United states after opioid overdose every day, while in Oklahoma, 43% of drug overdose deaths involved opioid abuse contributing to a major health problem of epidemic proportions. Among opioid use disorders, chronic morphine use and abuse has been documented to severely compromise the immune system and hence, increase the risk of opportunistic infections like tuberculosis, HIV infections and pneumonia in opioid addicts. Morphineinduced immune modulation has been shown to be either indirect (ultimately affecting CNS) or direct through opioid receptor on immune cells. Also, many studies have also identified changes in expression profiles of specific miRNAs after chronic morphine abuse. In the current study, we are targeting regulation of OPRM1 gene encoding mu opioid receptor by miR-155 through transcription factor PU.1 binding to distal promoter of OPRM1 in morphine-induced immunosuppression.

 Aim: We are establishing miR-155 mediated regulation of transcription factor PU.1 ultimately regulating OPRM1 gene expression in LPS-induced immune cells activation.

Method: We used WT and mu opioid receptor knockout (MORKO) mice and splenic macrophage cell line J774.1 to study morphine-induced immunosuppression. Blood samples from mice were used for miRNA array study to select miR-155 as a target miRNA. J774.1 cells were activated by LPS treatment (100ng/ml) and morphine sulfate (1uM) was used to suppress LPS-induced activation. RNA and proteins were extracted from these cells to evaluate the expression of mu opioid receptor and miR-155 expression. We used techniques like PCR, quantitative PCR, western blotting in this study.

Results and Discussion: miRNA-155 was confirmed as a target microRNA from miRNA array. This was further confirmed in splenic macrophages rather than T cells, thymus cells or bone marrow cells in mice tissues. For in vitro studies, we selected splenic macrophage cell line J774.1 and it showed the similar results compared to splenic macrophages. We further confirmed that miR-155 targets transcription factors PU.1 and C/EBPb. Distal promoter of OPRM1 has PU.1 binding site which is involved in negative regulation of OPRM1 gene expression. For future directions, we are targeting miR-155 overexpression, antagomir assay against miR-155, luciferase assay and chromatin immunoprecipitation experiments to further confirm LPS-induced, PU.1-mediated regulation of OPRM1 gene.

Keywords: Opioid abuse, Morphine, OPRM1, miR-155

**Education, perceptions, and delivery: Factors shaping the perceived role in the pre-exposure prophylaxis (PrEP) care continuum among a sample of osteopathic medical students**

Kyle Deboy, BS, DO/MPH,
Andrew O'Neil, BA, BS,
Hunter Meyers, BS,
Mollie Stowe, MA,
Justin Hamrick, MPH,
 Zachary Giano, PhD,
Randolph D. Hubach, PhD, MPH

Background: Pre-exposure prophylaxis (PrEP) uptake has been suboptimal despite its demonstrated efficacy in reducing the risk of contracting HIV. This threatens to hinder efforts to suppress the HIV epidemic in the seven states with a disproportionate disease burden in the rural population. Medical education a determinant of PrEP access in the PrEP care continuum. However, information about osteopathic medical students', especially those looking to serve a rural population, perceptions of what their part is in the is the PrEP care continuum is limited.

 Objectives: The current study seeks to identify factors that shape osteopathic medical students' perceived role in the PrEP care continuum at the patient-provider level, especially among those that wish to practice in rural communities.

 Methods: Twenty-one semi-structured interviews were conducted (March 2019 – April 2020) to determine what influences osteopathic medical students' perceived role in the PrEP care continuum at the level of patient-provider interactions. A grounded theory approach was used to identify emergent themes.

Results: Three main themes emerged when considering patient-provider interactions in our exploration of medical students' perceived roles in the PrEP care continuum: (1) lack of adequate sexual health training in medical school, (2) students' personal perceptions of who should be on PrEP and the consequences of PrEP use, and (3) ambiguity concerning which medical specialty should prescribe and manage PrEP.

Conclusion: Osteopathic medical schools should work to incorporate more inclusive and holistic sexual health and PrEP into standing curricula to address these barriers and better prepare osteopathic medical students for their future role in the PrEP care continuum.

 Keywords: HIV care continuum, sexual health, medical education

**Characterization of a lactic acid bacteria strain showing antimicrobial activity against food pathogens**

*Ratnakar Deole, PhD;*
*Chelsea Truitt, BS, GRCT*

A search for alternative intervention strategies for fighting bacterial infections is extremely important due to the rise of multidrug resistant forms of microbial pathogens imposing a serious problem to public health worldwide. The rapid spread of antimicrobial resistance is associated with misuse of antibiotics. This may also impose a range of side/toxic effects on the host. In addition, conventional antibiotics eliminate natural (beneficial) microflora, thus leading to various complications. One popular approach to mitigate the aforementioned problem is the use of beneficial microorganisms or probiotics. Most probiotic microorganisms are bacteria belonging to the order of lactic acid bacteria. Health benefits imparted by probiotic bacteria are strain specific, and not species- or genus specific. These health benefits include antibacterial activity against pathogens, causing improvement in lactose metabolism, anti-mutagenic properties, anti-carcinogenic properties, reduction in serum cholesterol, anti-diarrheal properties, immune system stimulation, improvement in inflammatory bowel disease and suppression of Helicobacter pylori infection. Food and Beverage market research reports estimate probiotic market size by revenue to reach 69 billion USD by 2023. The objective of this project was to analyze a candidate probiotic lactic acid bacteria strain (identified as Lactococcus lactis) for the factors that dictate survival, colonization, and beneficial interactions with the host which will facilitate substantiation of the probiotic characteristics.

**Keywords:** Probiotics, Lactic acid bacteria, Beneficial microorganisms

# The Effect of Image Stack Resampling on Manual Segmentation of the Putamen from Magnetic Resonance Imaging

Thomas W. Duffy, BS;
Zachary Fowler, BS,
 Caleb Hill, BS, Ali Sharp, BS,
Skylar Turner, BS,
Jamison Williams, MS,
J. Tyler Todd, DO,
Paul Gignac, PhD,
Haley O'Brien, PhD

In neurology, brain region surface areas and volumes are often utilized to confirm diagnosis. These metrics are calculated from three-dimensional (3D), digital models sculpted from magnetic resonance imaging (MRI) stacks via a process called segmentation. Manual and automated segmentation highlights and in-fills 3D pixels ("voxels"), with length, height, and width dimensions dependent on the spatial increment of scan image capture. The capture of diagnostic images in clinical settings is necessarily lowresolution due to patient safety, time, and costs of equipment operation, yielding 3D surface areas and volumes contingent on a variable degree of missing anatomical information. The degree to which scan resolution affects 3D volumetric and diagnostic potential is poorly documented. We therefore investigate whether an image stack pre-processing technique known as "resampling" may improve volumetric precision in manual segmentation. Resampling is a common data-handling technique that increases the resolution of 3D digital images by inserting new planes of voxels with grayscale values interpolated from existing neighboring values. To form preliminary recommendations regarding the efficacy of resampling procedures for ameliorating low scan resolutions, we quantify inter- and intrauser variation in manual segmentation of the putamen from an MRI study of a healthy individual, using two protocols: 1) original scan resolution, and 2) up-sampled by 100% in all three dimensions, in a repeated-measures experimental design. Six participants (three per test group) segmented the left and right putamina five successive times using a standardized segmentation protocol. For each model surface area and volume data were collected. Results indicate that volume is significantly less variable for putamina that were segmented from the resampled dataset when compared to those segmented from the original dataset. The inverse result was found for surface area: variation was significantly lower for the original dataset. Intra- and inter-user replicability did not differ between methods. Overall, these results support the utilization of up-sampling to increase the accuracy of repeated volume measurements.

**Keywords:** MRI, Radiology, 3D imaging

**Evaluation of Predatory Journal Publication in Systematic Reviews in the Top Five Orthopedic Journals: A Cross-Sectional Analysis**

*Bryan Dunford, BS;*
*David Tanner, MS,*
*Ryan Ottwell, BS,*
*Micah Hartwell, PhD,*
*Matt Vassar, PhD*

Background: What started out as a noble goal to make the world of research more accessible to the public through open access, journals were quickly adulterated by predatory journals who looked to use researchers for personal financial gain. The real problem with predatory journals goes far beyond their unethical entrepreneurial business practices. Predatory journals lack many of the foundational elements of scholarly writing, like peer review and editing, which is a crucial component of authentic scientific literature. As the medical profession continues to move towards evidence based medicine in clinical decision making, it is imperative to maintain quality research. The purpose of this study is to determine the prevalence of predatory journals within systematic reviews published in the top five orthopedic journals.

 Methods: In a cross-sectional design, we systematically identified five orthopedic journals using Google Metrics based on their H-5 index. Using PubMed, we designed a search string to ensure we obtained the proper list of systematic reviews from each journal. The following search query was used for the top five orthopedic journals: (("systematic review"[Publication Type]) OR ("meta analysis"[Publication Type])) AND ("journal name"[Journal]). The first ten qualifying systematic reviews were then analyzed, and the journals cited were obtained. An algorithm created by author A.C. was used to determine predatory journals categorized by Beall's list, an online public collection of journal titles which have demonstrated predatory submission tactics. Any matches were verified to be predatory by comparing it to the publication website listed on Beallslist.net. Systematic reviews that were deemed to include a predatory journal citation were further analyzed in a masked, duplicate fashion by D.T. and B.D.. After the extraction process, result differences were adjudicated by D.T. and B.D.. with authors R.O. available for consult.

Results: Of the 50 systematic reviews examined, three systematic reviews included primary studies that were published in predatory journals (3/50, 6%). The systematic reviews that cited primary studies published in predatory journals were identified in The Journal of Bone & Joint Surgery, one systematic review (1/10, 10%), and Clinical Orthopaedics and Related Research, two systematic reviews (2/10, 20%) (Table 1). None of the identified systematic reviews that included studies published in these predatory journals comprised clinical practice guidelines. In total, the primary studies that were published in a predatory journal were referenced 53 times (Table 2).

Conclusion: Our study shows that systematic reviews from the top orthopedic journals contain primary studies published in predatory journals. Since systematic reviews are an important factor in determining clinical practice guidelines, and ultimately patient care, it is important to ensure the information supporting these guidelines comes from reputable, peer-reviewed sources. The purpose of this study was not to determine the effect predatory journals have on systematic reviews and further research is warranted.

Keywords: Predatory Journal, Systematic Reviews, Orthopedics, Open Access

**Time to resolution of ketoacidosis comparing weight based and non-weight-based insulin dosing for diabetic ketoacidosis**

*Zach Dunn, PharmD;*
*Ben Jacobs, PharmD,*
*Josh Burton, DO,*
*John Bury, PharmD, BCPS, MBA,*
*Kelly Murray, PharmD BCACP*

Purpose: Diabetic ketoacidosis (DKA) is a hyperglycemic emergency characterized by uncontrolled hyperglycemia,metabolic acidosis, and ketonemia. Insulin in the treatment of DKA is crucial to help the body stop theproduction of ketones, ultimately resolving acidosis. Some patients diagnosed with DKA may present withmild hyperglycemia, which if treated with weight-based dosing could potentially increase the risk forhypoglycemia. Current guidelines from the American Diabetes Association (ADA), recommend two differentweight-based dosing regimens for insulin for DKA. The purpose of this study is to assess between the ADA'sweight-based insulin regimen versus non-weight based regimen insulin in the treatment of DKA.

Methods: We aim to assess if there is a difference in time to resolution of ketoacidosis in patients diagnosed with diabetic ketoacidosis based on their initial insulin dosing regimen. This institutional review board approved, retrospective cohort chart analysis will identify patients with a diagnosis code for diabetic ketoacidosis between January 1, 2018 and December 31, 2019. Patient will be included if they have a diagnosis (ICD-10code) for diabetic ketoacidosis. Patients will be excluded if they left against medical advice, direct admits from another hospital, not admitted to the hospital, or did not receive an insulin drip as initial treatment of diabetic ketoacidosis. Using data from Oklahoma State University Medical Center, patients will be separated into two groups based on their initial insulin drip regimens: weight-based dosing and non-weight-based. Primary endpoint is time to resolution of ketoacidosis as defined by the American Diabetes Association's guidelines. Descriptive statistics, two-sample t-test, and chi-square tests will be utilized to address baseline demographics. For contentious variables, parametric tests to examine differences between subjects will be used. Alpha will be set at 0.05 and beta will be set at 0.20.

Keywords: Diabetic ketoacidosis, Insulin drip, Emergency medicine

**Behavioral and Hormonal Changes in Estrogen-Treated Rats after Repeated Episodes of Dietary Sodium Deficiency**

*Emily Ehresman, BS; Graduate Student;*
*Kath Curtis, PhD*

The incidence of hypertension in America is increasing, especially in women. After menopause, women's blood pressure increases, indicating a possible role of estrogen in the control of blood pressure. Hypertensive patients typically are advised to maintain a low salt diet. However, this diet is difficult to maintain, and many patients exhibit "yo-yo" dieting, in which they alternate between low and higher salt intakes. The impact of alternating dietary sodium remains unclear. Therefore, the aim of this research was to determine the behavioral and hormonal effects of multiple dietary sodium deprivations on female rats with and without estrogen. We removed the ovaries of female rats, then gave estradiol benzoate (EB) injections or OIL injections twice a week for the remainder of the study. Some rats were maintained on regular sodium diet throughout; others were given one or two alternating 10-day periods of regular and sodium deficient diets. At the end of each 10-day period, rats were given a bottle of water and a bottle of 0.5M NaCl for two hours, and intakes were recorded. On the final day, rats were sacrificed, and ELISAs were used to measure the levels of norepinephrine, epinephrine, vasopressin, and aldosterone in trunk blood. We found that while NaCl intake did not differ between the first and second deprivations, rats drank less water after their second deprivation, and, therefore, a more concentrated solution. However, EB-treated rats drank more water than OIL-treated rats after both deprivations. EBtreated rats had lower norepinephrine, vasopressin, and aldosterone levels than OIL-treated rats, but there was no difference in norepinephrine, epinephrine, or aldosterone between the first and second deprivations. Vasopressin was increased after the second deprivation in both groups, but this did not appear to be specific to diet. We conclude that there are persistent behavioral changes after repeated episodes of dietary sodium deficiency that are affected by estrogen treatment, but are not likely to be explained by the hormones we measured. In contrast, the observed differences in regulatory hormones may impact blood pressure under baseline conditions, as well as during single or repeated episodes of dietary sodium deficiency, particularly in females with estrogen.

Keywords: Estrogen, Repeated sodium deficiency, Salt intake

# Outreach with Embedded Asynchronous Care Improves Smokers' Engagement in Physician-Assisted Quit Attempts

*Marjorie Erdmann, MS;*
*William Paiva, PhD,*
*Brian Maves, PharmD,*
*Cari Marshall, Ipe Paramel, MHA*

Abstract: As portal messaging grows, we need to understand the value of coupling patient outreach with asynchronous care (AC) to better activate patient-physician collaboration. In a field experiment targeting smoking quit attempts, we demonstrate the value of outreach and the supplemental value of embedding a link to AC to activate physician-assisted quit attempts (PAQA). We found outreach coupled with AC efficiently found smokers interested in physician assistance and engaged them in evidencebased quit attempts at significantly higher rates than treatment as usual or outreach alone. Current EMR and portal functionality were applied.

Background: Over forty million smokers reside in the United States[1]. Smoking cessation is better accomplished with physician assistance yet overwhelmingly smokers try to quit on their own[1]. Smoking decline has stalled in the US[1]. Rural and younger patients face greater barriers to PAQA because it currently occurs in face-to face visits. The potential benefit of offering these populations access to AC is tremendous. Smokers are concentrated in difficult to reach, rural populations[1] and younger patients make more quit attempts but visit the doctor less. Moreover, if smokers quit by 35-44 years of age they avoid most of the mortality risk of smoking[1].

Methods: In a 2x2 experimental design, 250 patients were randomly assigned to one of four test conditions or control group. We tested if sender (physician or health system) and message type (outreach alone or outreach with AC) affected PAQA rates. EMR documented physician-assisted quit attempts were tracked 30 days after outreach. Salient patient traits were collected.

Results: Digital outreach alone generated a 4% quit attempt rate. Using T-tests, outreach with a link to asynchronous care generated a significantly higher rate, 9.5% (p=0.020). 56% of patients opened the message. Among openers, outreach alone generated a 7% rate and outreach with asynchronous care link generated a significantly higher rate (p=0.014), 18%. Control group had 0 PAQAs. All patients with PAQAs opened the message. Surprisingly, physician as sender did not significantly increase open rates (p= 0.225) or quit attempt rates (p=0.827). Among openers, only age significantly predicted asynchronous care PAQA's (p=0.0095).

Conclusion: Outreach coupled with AC significantly improved patient-physician collaboration. Digital messaging activated difficult to reach patients (rural) and AC activated patients who arguably have the greatest benefit of quitting (younger). The program efficiently found patients interested in PAQA and delivered it outside of the clinic setting. Unlike other telemedicine innovations, AC is billable. Physicians were comfortable with the program and found it valuable. Additionally, the results suggest patients are engaged at the health system level, a positive sign indicating systems can target population health goals with AC. The effectiveness of asynchronous care is particularly impactful now during COVID-19 when need for high quality, remote care is growing.

Keywords: Smoking Cessation, Asynchronous Care, Innovation

**Rural Patients Outpaced Urban in Opening Patient Portal Communication Initiated by Health Providers**

*Marjorie Erdmann, MS; Staff;*
*William Paiva, PhD,*
*Brian Maves, PharmD,*
*Cari Marshall, Ipe Paramel, MHA*

Background: Technology is often touted as what will help overcome health disparities like those that plague rural America. However, the findings are mixed on rural technology adoption, most often casting rural populations as poor adopters. This bias is challenged by research that establishes rural populations' strong adoption of Health Information Technologies and Telehealth. This research aims to contribute to understanding rural population usage of and response to electronic health outreach via Patient Portal messaging, a growing tool in reaching and activating patients.

Methods: In a hospital system in south region of the US, 200 smokers were randomly selected to receive invitation to a QI program which invited patients to smoking cessation treatment via patient portal messaging. 54 of the 200 patients were rurally located. Rural location of patients was binary (rural or urban) and was determined by their home address on file in the EMR and it's CMS qualification for "Rural Clinic" which was acquired through "Am I Rural?" website provided by Rural Health Information Hub. The patient portal tracked if the message was opened or not. Rural-urban odds ratio testing was conducted. Patient traits (including rural/urban) predicting opening the message were analyzed by logistic regression.

 Results: The odds of rural patients opening the message was ~2 times greater than patient living in an urban area (OR = 2.4 = (37/17) (71/75) (Fischer's exact test p = .037). Rural was the only patient trait that predicted opening of the message (p=0.041) compared to age (p=0.995), gender (p=0.628), distance in miles to PCP (p=0.501), number of chronic diseases (p=0.403), and payer (0.493).

Conclusion: Rural patients significantly outpaced urban patients in opening of patient portal outreach messages. Rurality was the only patient trait that significantly predicted opening. These findings support that rural patients use health information technology at a higher rate than urban counterparts and are promising to electronic communication's future role in reaching rural populations to overcome health disparities.

Keywords: Rural, Patient Portal, Outreach

**Innovation of Rurally Sustainable Integrated Care Management Model: Innovation Process and Model**

*Marjorie Erdmann, MS;*
*Ipe Paramel, MHA,*
*Cari Marshall, William Paiva, PhD*

Background: There are increasing calls for integration of mental health and physical health care in a marketplace where the two primarily remain siloed. Across the US, Medicaid programs have attempted to bridge this gap through care management with focus on improving patient outcomes. There is little attention paid to the workflow, processes and models that efficiently address this gap, especially important factors in rural areas that suffer from workforce and healthcare shortages.

Methods: OSU Center for Health Systems Innovation's consultants (ROK-Net) partnered with 6 healthcare agencies (7 sites) in Oklahoma, (4 rural, 3 urban). ROK-Net conducted three assessment stages (direct observation, formal assessment, and visualizations of barriers) and one innovation stage (model development), resulting in a new integrated care management model. ROK-Net reviewed program handbook, conducted interviews and attended team meetings. These informed the development of a 30-item assessment tool (Cronbach alpha = 0.89) measuring 6 program components: administrative technology, case management workload, medical team integration, population health (assessed at county level), ability to meet state requirements, and efficiency of delivery design. In addition to statistical analysis, scores were transformed into radar graphs to convey program dynamics and customize targets for individual agencies. Workflow analysis of patient journey, data, and care models identified additional inefficiencies. The new model was innovated by reorganizing staff, recombining resources, and simplifying patient journey.

Results: Statistical analysis demonstrated benefit of medical expertise and workflow analysis demonstrated a need to minimize patient burden. Efficiencies in care management were significantly correlated to the involvement level of the medical consultants (r= 0.85, p= 0.015); overall program efficiency was highly and significantly correlated with the accessibility of medical expertise (r=0.84, p=0.018). Workflow maps identified bottlenecks and duties transferred to patients. Program visualizations identified data gaps, mis-ordered tasks, and unreasonable expectations of workforce. (Visualizations will be included on poster.)

Conclusions: Innovation provides promising solutions for rural health. Workforces attempting to integrate health care face many barriers and the inclination is to resolve these by increasing care manager workload and push responsibilities to patients. Creating models that can overcome these while controlling workload inflation and patient burden is important. Through model innovation clear organizational and operational targets were created to improve medical quality, reduce workforce burden, and simplify patient experience - all without increasing cost. In short, the model maximized available medical expertise and reinvented patient journey. Tremendous amount of downstream efficiencies are created by addressing upstream sources, primarily access and use of medical expertise, medically "tightening" the delivery of care management. Future work could benefit from reassessment of tracked measures and more robust state HIE.

Keywords: Rural Health, Innovation, Care Management, Integrated Care

**Challenges for optimizing chromatin immunoprecipitations studies**

*Christy Eslinger, BS;*
*Kenneth E. Miller, PhD,*
*Subhas Das, PhD*

Inflammatory bowel disease, including ulcerative colitis, affects millions of Americans with recurring visceral pain and inflammation. Also, with this number increasing drastically each year, it makes it a necessary area of research. The most widely used animal model to mimic colitis is TNBS-induced colitis model where the chemical 2,4,6-trinitrobenzenesulfonic acid (TNBS) in ethanol is intrarectally infused in rat colon. Ethanol degrades the mucosal epithelial barrier allowing entry for TNBS to mount a localized immune response in the colon. The TNBS-induced colitis peaks on day three and appears to subside within a week. Twenty-four hours post-treatment, TNBS-induced colitis results in DNA hypermethylation of CpG dinucleotides in the promoter region of glutaminase (GLS1) gene. GLS1 catalyzes the production of glutamate, an excitatory neurotransmitter that plays a crucial role in neuro-immune pathway. This hypermethylation results in recruitment of methyl CpG binding protein 2 (MeCP2) to hypermethylated CpG dinucleotides. MeCP2 protein has been shown to interact with corepressors to suppress or turn off gene transcription, however, in TNBS-induced colitis recruitment of MeCP2 to GLS1 promoter results in increased gene expression indicating interaction with coactivators rather than corepressors. For this study, we are discussing new challenges in using chromatin immunoprecipitation (ChIP) assay to confirm protein - DNA interactions and identifying interacting proteins by mass spectrometry.

Aim: In this current study, we are identifying the challenges in optimizing chromatin immunoprecipitation and proteomics/mass spectrometry.

Method: The key component of the chromatin immunoprecipitation assay is the size of the DNA, which needs to be fragmented in a reliable consistent and repeatable manner. The collected tissue from treated rats were first crosslinked followed by lysing the cells to release the cellular component. We then used benchtop sonicator to fragment the genomic DNA. We also used commercially available enzymes for DNA fragmentation, like MNase and Fragmentase (both from New England Biolabs). These enzymes were used according to manufacturer's methods. After fragmentation, genomic DNA was extracted and analyzed on 2% agarose gel electrophoresis. Further, we performed the ChIP assay followed by bisulfite conversion and methylation specific PCR to confirm protein-DNA interaction. For MS, we extracted proteins from ChIP assay using either MeCP2 or IgG antibodies. For some samples, we performed PAGE and confirmed the protein bands after pulldown. We are planning to send these samples for MS analysis.

**The Effect of the COVID-19 Pandemic on Child Abuse and Neglect Reports in Oklahoma**

Sheridan Evans, BS
Ashton Gatewood MPH,
John Whelan, BS,
Tessa Chesher, DO,
Sara Coffey, DO,
Amy D. Hendrix, MA,
Sarah J. Passmore, DO,
Michael A. Baxter, DO,
Micah Hartwell, PhD

Background: The COVID-19 pandemic has had an unprecedented impact on the health of pediatric populations, including concerns of malnutrition, anxiety and depression, and child abuse and neglect. The majority of child abuse reports in Oklahoma in 2017 were made by law enforcement, child welfare staff, relatives, schools, and hospitals. Given that COVID-19 has resulted in less interaction with many of these professionals, there is concern for decreased rates of reporting child abuse and neglect. Our objective is to determine if there has been any change in surveillance reports of alleged physical and sexual child abuse and neglect in Oklahoma between 2017 and 2020.

Methods: Oklahoma Department of Human Services, Child Welfare Services (CWS) provided surveillance data for each county from July 2017 through June 2020 of alleged physical and sexual child abuse and neglect. Using economic forecasting models via autoregressive integrated moving average algorithms (ARIMA), we predicted the values for the months of February through June of 2019 as if COVID-19 pandemic and Stay-at-Home orders had not occurred. We then assessed the difference between surveilled cases reported to CWS and the predicted values. Lastly, we applied risk ratios and percent relative effect calculations to county level data.

Results: Although the trend of child abuse and neglect has been increasing over the past 3 years, our results show that as of May 2020, there was a significant difference between the expected number of reports (1699, 95%CI: 1393-2005) and the actual number of all surveilled allegations reported to CWS (1254), a deviation of 26.2%. Reports of physical abuse were 38.3% lower and reports of neglect were 24.7% lower than predicted values for May— both of which remained significantly lower than expected in June. Overall, rural counties were less likely to have decreased reporting of child abuse (Risk Ratio: 0.83); however, were more likely to have larger decreases where lower reporting occurred.

Conclusion: Despite the 3-year trend of increasing child abuse and neglect reports in Oklahoma, the results of this study show a significant decrease in total reports and allegations from the predicted numbers in May 2020 along with significant decreases in reports of physical abuse and neglect in June 2020. The COVID-19 pandemic has resulted in increased risk factors for abuse including increasing rates of mental health issues, social isolation, and familial stress. There are also decreased protective factors such as having social networks, a caring adult outside the home to serve as a mentor, and community support. Additionally, the pandemic has resulted in less interaction with those who most commonly report abuse and neglect in Oklahoma, including school staff and medical personnel. Considering these factors and the predicted number of reports for May and June 2020, the significant decrease in reports and allegations is cause for concern of underreporting. Without new policy and increased funding for appropriate services and resources, children will continue to suffer the ramifications for the foreseeable future.

Keywords: Child Abuse, Child Neglect, COVID-19, Coronavirus, Pandemic

**Association between industry sponsorship and author conflicts of interest with outcomes of systematic review and meta-analyses investigating interventions for opioid use disorder**

*Sydney Ferrell, BS;*
*Simran Demla, BS,*
*J. Michael Anderson, BS,*
*Michael Weaver MS,*
*Trevor Torgerson, BS,*
*Micah Hartwell PhD,*
*Matt Vassar, PhD*

Background: Conflicts of interest (COI) among studies, through sponsorship or various associations with authors, can lead to biased results and conclusions. The effects of affiliations between industries and systematic reviews warrant the need for further exploration, specifically for common addiction disorders such as opioid use disorder. This study aims to explore the relationship between conflicts of interest and industry-author associations in systematic reviews on opioid use disorder.

Methods: We searched MEDLINE and Embase for systematic reviews and meta-analysis related to opioid use disorder treatment. All data extraction was performed in a masked duplicate fashion. Fifteen study characteristics were extracted for each systematic review. We searched for undisclosed conflicts of interest for each systematic review author in 3 databases — the CMS Open Payments database, Dollars for Profs, and the United States Patent and Trademark Office (USPTO).[1,2,3] A subgroup analysis was performed to determine additional industry connections within systematic reviews sponsored by industry.

Results: Our study consisted of 17 systematic reviews and meta-analyses with 81 authors. We found that 25 (of 81, 30.9%) authors had some form of COI, and 22 (of 25, 88.0%) authors had an undisclosed COI. However, there was no significant association between COI and favorability of results and conclusions. There was additionally no significant association between sponsorship and favorability of results and conclusions. Notably, two systematic reviews (of 17; 11.76%) were industry-sponsored. Within the two industry-sponsored reviews, our subgroup analysis determined additional industry affiliations among primary studies.

Conclusion: Despite non-significant results, our study emphasizes the influence and relationships between conflicts of interest and industry sponsorship in systematic reviews and meta-analyses. Further, we provided an expansion on the subject and recommendations for improving reporting.

Keywords: Opioids, Opioid use disorder, Conflicts of interests, Funding Bias, Industry Sponsorship

**Breast cancer screening among women with comorbidities: A cross-sectional study of disparities**

Ashton Gatewood, MPH;
Mackenzie Enmeier, BS,
Elise Stephenson, BS,
Jordyn Austin, BS,
Benjamin Greiner, DO, MPH,
Micah Hartwell, PhD

Background: Breast cancer (BRCA) is the leading cause of cancer death among women worldwide. Fortunately, frequent mammography among 50 to 69 year-old women decreases BRCA mortality between 20% to 35%; however, comorbidities, existing in the presence of a BRCA diagnosis, significantly lower rates of survival. Given the importance of BRCA screening, our primary objective was to determine if screening rates differed among individuals with and without diagnoses of any of the following: diabetes, hypertension (HTN), cardiovascular disease (CVD), skin cancer, chronic obstructive pulmonary disease (COPD), arthritis, kidney disease, or depression compared to healthy patients. Secondarily, we will assess whether multiple comorbidities have an increasing effect on BRCA screening rates.

Methods: Using the 2018 and 2019 Behavioral Risk Factor Surveillance System (BRFSS) datasets we constructed multivariate logistic regression models to determine the adjusted risk ratios (ARR) of persons receiving BRCA screening with and without comorbidities. To assess our secondary objective, we constructed a regression model to determine the likelihood of individuals with multiple comorbidities (1, 2-4, 5+) having a breast cancer screening. Regression models were adjusted for race, age, healthcare coverage, and education level. A post hoc regression model was conducted to assess the impact of health insurance on breast cancer screening, accounting for all co-occurring diagnoses and sociodemographic variables.

Results: Our models showed statistically significant associations among BRCA screening and all chronic conditions except for kidney disease. Individuals who were obese (ARR: 1.03, 95%CI:1.01-1.04), had diabetes (ARR: 1.02, 95%CI: 1.00-1.04), HTN (ARR: 1.11, 95%CI: 1.03-1.19), a skin cancer diagnosis (ARR: 1.05, 95%CI: 1.03-1.07), or arthritis (ARR: 1.05, 95%CI: 1.03-1.07) were more likely to have completed a BRCA screening, while individuals with CVD (ARR: 0.89, 95%CI: 0.83-0.96), COPD (ARR: 0.95, 95%CI: 0.92-0.97), and depression (ARR: 0.98, 95%CI: 0.96-0.99) were less likely to be screened, controlling for age, race, healthcare coverage, and education. The post hoc analysis showed that the odds of women without healthcare coverage were 62% less likely (OR: .38; 95%CI: 0.34-0.43) to have a breast cancer screening than women with coverage, and also indicated that the odds of having a screening increased with increased education.
Conclusion: We found that people with co-occurring diagnoses including obesity, diabetes, HTN, skin cancer, and arthritis completed BRCA screening more often than those with no comorbidities. Conversely, individuals living with CVD, COPD, and depression were less likely to receive potentially lifesaving BRCA screening. Our findings are supported by previous studies that BRCA screening rates are inversely proportional to healthcare coverage and educational attainment. The critical nature of BRCA screening's effectiveness in reducing mortality through early detection highlights the need for greater multidisciplinary care integration to increase preventive health measures in the primary care setting where most chronic conditions are managed, including CVD and depression.

Keywords: Breast Cancer, Health Disparities, Comorbidities, Behavioral Risk Factor Surveillance System, Multidisciplinary Care Coordination

**What can we see with diceCT? Comparison of iodine-enhanced brains and histological atlases in a rat model**

*Jacob George, BS.,*
*Todd Green, PhD.,*
*Haley O'Brien, PhD.,*
*Dolores Vasquez-Sanroman, PhD.,*
*Paul Gignac, PhD.,*

Major advancement and refinement of neurological imaging modalities have the potential to enable new understanding in nervous system organization. One recent example, diffusible iodine-based contrast-enhanced computed tomography (diceCT), is an iodine staining and X-ray μCT-imaging technique that allows for the differentiation of myelinated from unmyelinated nervous tissues at finer scales of spatial resolution than standard 3D brain-imaging tools allow. DiceCT is versatile, capable of imaging specimens across several orders of magnitude in size and enabling large and complex structures such as human brains to be studied alongside those of much smaller organisms like fish, frogs, and birds. The staining agent can also be removed, allowing the subsequent application of acetate, fluorescent, and immunofluorescent histology following diceCT imaging. However, because of its relative newness, ground-truthing diceCT by determining its reliably for distinguishing precise boundaries between neuroanatomical structures is critical for its potential broad application by anatomists, neuroscientists, and organismal biologists. For example, some tissue-level neuroanatomical features are poorly differentiated due to similar make-up of adjacent structures or obscure boundaries (such as the thalamus, which houses many small white-matter tracts). To address this, we compare 3D orientationmatched image stacks of diceCT juvenile Sprague Dawley rat brains to well-established, standard 2D brain atlases. We score the consistency, repeatability, and error associated with documenting atlasneuroanatomical features in diceCT images. Visual identification of brain structures was attempted for all brain regions, structure grayscales were documented, and results were exclusively categorized as: (i) visibly distinct and replicable, (ii) visible but with ambiguous boundaries; (iii) visibly distinct and replicable after image enhancement, (iv) visibly distinct but non-replicable (e.g., right/left staining asymmetry), or (v) visibly non-distinct and non-replicable. We used this scheme to evaluate which neuroanatomical structures are distinguishable using diceCT and what proportion of all Paxinos and Watson atlas structures they make up. Preliminary results show that diceCT rat brain sections align well with standard cresyl violet histological sections, and visibility of neuroanatomical features is similar to tissue-based, 3D magnetic resonance imaging atlases of comparable resolution. We examine the potential future for diceCT as a powerful neuroanatomical imaging standard.

Keywords: Neuroanatomy; Bio-imaging; Sprague Dawley Rat

**Spin the abstracts of systematic reviews and meta-analyses regarding the treatment of Ménière's disease**

Benjamin Heigle, BS;
Micah Kee, BS.,
Ryan Ottwell, BS.,
Wade Arthur, BS.,
Lacy Brame, DO.,
Drew N. Wright, MLS.,
Micah Hartwell, PhD.,
Jam Khojasteh, PhD.,
Matt Vassar, PhD.,

Background: To identify, quantify, and characterize the presence of spin – specific strategies leading to misrepresentation of study results – in the abstracts of systematic reviews and meta-analyses of Ménière's disease treatment.

Study Design: Using a cross-sectional design, we searched MEDLINE and Embase on May 28, 2020, for systematic reviews and meta-analyses focused on Ménière's disease treatment. Returned searches were screened, and data were extracted in a masked, duplicate fashion.

Results: Our sample included 36 systematic reviews and meta-analyses. Of the 36 included studies, 22 (61.1%) abstracts contained spin while 14 (38.9%) did not. The most common spin types were selective reporting of benefit (10/36, 27.8%) or harm (8/36, 22.2%). Other types of spin occurred when findings were extrapolated to the global improvement of the disease (5/36, 13.9%), beneficial effects were reported with high risk of bias in primary studies (3/36, 8.3%), and when beneficial effects were extrapolated to an entire class of interventions (1/36, 2.8%). No instances of other spin types occurred. Abstracts containing spin were substantively associated with studies of critically low methodological quality compared with studies with low and moderate quality. No studies had a methodological rating of high quality. No associations were observed between spin and intervention types, journal recommendation of adhering to Preferred Reporting Items for Systematic Reviews and Meta-Analyses, or funding. We found a negative correlation (r = -.31) between abstract word limit and presence of spin.

Conclusions: Our study highlights that spin in the abstracts of systematic reviews of Ménière's disease is common, and it further enhances the discussion surrounding spin in abstracts of scientific research. Spin in an abstract does not discredit a study's findings; however, its occurrence should be eliminated.

Keywords: Ménière's disease, Vestibular diseases, Evidence-based medicine

**Effectiveness of Early Therapeutic Exercise Versus Rest, Ice, Compression, and Elevation in Treatment of Acute Lateral Ankle Sprains: A Critically Appraised Topic**

*Jonathan Herrick; Graduate Student; MAT*
*Karlee Alberty MAT-II,*
*Jennifer L. Volberding PhD, LAT, ATC*

Clinical scenario: Lateral ankle sprains are one of the most common musculoskeletal injuries and are associated with a high rate of visits to the emergency department. Ankle sprains have been reported to be 7-10% of all admissions to emergency departments, and are occurring at a rate of 2.15 ankle sprains per 1000 person/year in the United states. Clinical Question: Does the inclusion of therapeutic exercises early in the rehabilitation process of a lateral ankle sprain return patients to normal activities of daily living earlier than the RICE therapy? Summary of Key Findings: There were significant effects between the therapeutic exercise (strengthening and range of motion) group and the RICE group after week 1 and 2 for ankle function. However, there was not a significant clinical difference between the two groups after month 1, 3, and 6.[1,3] In the systematic review it suggests that an initial immobilization period with rest, ice, compression, and elevation (RICE) during the first 4-5 days is beneficial for the inflammatory phase of healing. Clinical Bottom Line: There is moderate evidence to support using a more active treatment consisting of therapeutic exercises to increase ankle range of motion (ROM) and ankle strength in patients that suffer from grade I and II ankle sprains during the first few weeks after injury. Strength of Recommendation: There is a grade B evidence for using therapeutic exercises during the first two weeks after an ankle sprain improves ankle range of motion and ankle strength compared to the RICE protocol, but does not have a significant difference at month 1, 3, or 6. The recommendation of a grade B was given to the consistency of conclusions of the level 1 evidence included in this CAT.

Keywords: Lateral ankle sprains, Therapeutic exercises, RICE

**Evaluation of spin in the abstracts of systematic reviews and meta-analyses focused on the treatment of psoriasis**

*Cody Hillman, BS;*
*Alyssa Lindsey, BS,*
*Ryan Ottwell, BS,*
*Wade Arthur, BS,*
*Courtney Cook, DO,*
*Hannah Howard, MD,*
*Drew N. Wright, MLS,*
*Micah Hartwell, PhD,*
*Suhao Chen, MS,*
*Zhuqi Miao, PhD,*
*Matt Vassar, PhD*

Background: Spin -- a way of reporting that distorts the true findings – has not been investigated in systematic review abstracts on psoriasis treatments.

Objective: To investigate the prevalence of spin in systematic review abstracts and whether study characteristics were associated with spin. Methods: We searched MEDLINE and Embase to obtain our sample. Screening and data extraction were performed in a masked duplicate fashion. Each included study was evaluated for the 9 most severe types of spin and other study characteristics. The methodological quality was assessed to explore potential relationships between spin and study quality.

Results: Search queries returned 3200 articles, which included 173 systematic reviews. Spin was present in the abstract of 37 (21.4%) of these reviews. We identified 8 of the 9 spin types in our sample, and spin type 6 was the most frequently identified (19/173, 11%). The presence of spin in the abstract was not associated with methodological quality or any study characteristic.

Limitations: Evaluation of spin is subjective. We were further limited by sample size and the nature of our study design. Conclusions: Spin was present in systematic review abstracts. Preventing spin is essential for improving future systematic reviews.

Keywords: Psoriasis, Spin, Systematic Review, Psoriasis Treatment

# A Retrospective Analysis of Suburban Fire Department Call Volume Data

W. Connor Howard;
Ryan McIntyre MS-I, J. Jay Dawes PhD, CSCS, NSCA-CPT, TSAC-F, FNSCA,
Jennifer. L. Volberding PhD, LAT, ATC

Firefighting is a unique profession where individuals must be prepared to respond to a call at any time, with most firefighters rotating 24 hour shifts every three days. Firefighters are tasked with performing life and property saving procedures at any time of day. The success of these procedures depends on the attention and alertness of those responding. PURPOSE: To determine call patterns of suburban fire departments. METHODS: Call data (day of week and time of day) from two suburban fire departments over a four-year span (2014-2019) were provided through the Fire Chiefs. The first community has a population of 23,216 (2 fire stations, 20 full-time firefighters). The department is responsible to respond to all fire and medical calls. However, the response to medical calls is immediate care, with patients provided advanced medical care and transportation by a secondary service. The second community has a population of 36,173 (4 fire stations, 50 full-time firefighters). This department differs from the first as it has its own ambulance service and is responsible for all medical calls, advanced medical care, and transport. Means and standard deviations were performed, and a one-way ANOVA was conducted to determine analyze time of day. RESULTS: For the smaller community, Tuesdays experienced the highest number of calls while in the larger community Fridays had the highest volume. The one-way ANOVA determined statistically significant differences over the course of the day ($F_{(23,216)} = 4.06$, $p < 0.00$), with the 2-3PM hour the busiest time of day in both communities. CONCLUSION: Firefighters are expected to be able to respond with attention and alertness at any point in time while on call. Understanding when the highest volume of calls occur can assist the department in properly preparing the firefighters to respond.

Keywords: Tactical health, Occupational preparedness, First responders

**Characterization of a recombinant bacteriocin with potent activities against Clostridioides difficile**

George (I-Hsiu) Huang, PhD;
Hsiang-Ning Chang, MS,
Yu-Jen Jiang, MS,
Yuan-Pin Hung, MD, PhD,
Jenn-Wei Chen, PhD,
 Joseph McCreary, BS

Clostridioides difficile is a spore-forming gram-positive bacteria and is the leading cause of antibioticassociated dirrhea in hospitals worldwide. Immunocompromised conditions and disruptions of gut microbiota are risk factors for C. difficile infections (CDI). Currently no vaccines are available for the prevention of CDI and there are concerns for development of additional antibiotic resistance. In this study, we identified and characterized a bacteriocin from the probiotic Clostridium butyricum Miyari. Recombinant bacteriocin displayed a narrow spectrum of activity against only genus Clostridium and Clostridioides . Importantly, the recombinant bacteriocin displayed potent activity against C. difficile both in vitro and ex vivo. This study demonstrate the potential of developing alternative treatment strategies against CDI.

Keywords: C. Difficile, Bacteriocin, Probiotic

**Isolation and characterization of Clostridioides difficile from wastewater and seafood in Tainan, Taiwan**

*George (I-Hsiu) Huang, PhD;*
*Ya-Ru Li, B.S.,*
*Jenn-Wei Chen, PhD,*
*Jason Tsai, PhD*

Clostridiodes difficile (C. difficile) is a gram-positive, spore-forming anaerobic bacillus. C. difficile infections (CDI) can cause antibiotic-associated diarrhea (AAD), toxic megacolon, colonic perforation, and even death. The major virulence factors of C. difficile are three toxins, TcdA (toxin A) and TcdB (toxin B), and the binary toxin CD. In addition, C. difficile spores are highly resistant to environmental stress and is responsible for transmission to human via fecal-oral, food source, and potentially zoonotic routes. Past studies in other nations have indicated that C. difficile can be isolated from various environmental samples as well as from both wild and domesticated animals which might serve as potential reservoirs for human infection. Wastewater treatment plant (WWTP) is considered as an important source of water contamination by multiple intestinal pathogens. Hospital wastewater is also a potential reservoir for infectious pathogens as well. In Taiwan, wastewater is discharged into rivers or recovered by sewage treatment plants after treatment with chloride. Therefore, it is possible that hardy pathogens within wastewater might contaminate seafood that are raised near estuaries. In this study, we were able to isolate C. difficile from multiple water samples from multiple WWTPs, National Cheng Kung University Hospital, and seafood near the Tainan coast. A total of 124 C. difficile isolates were identified in this study. 5 isolates were from WWTPs, 103 from NCKUH, and 16 from seafood source. We performed genotypic analysis, which included multiplex PCR for toxin genes, ribotyping, and MLVA. We also performed phenotypic analysis which included antibiotic susceptibility assays, motility assay, and biofilm formation assay. Interestingly, 49% (61/124)of all total isolates belonged to either the hypervirulent ribotype 027 or 078 lineage which are known to be resistant to fluoroquinolone antibiotics. 53% (55/103) of NCKUH isolates belonged to the hypervirulent RT127 ribotype. Phenotypic analysis suggested that isolates belonging to RT078 lineage exhibited significant lower swimming motility when compared to other toxigenic and non-toxigenic isolates. No significant differences however were observed among all isolates in terms of biofilm formation ability. In the near future, additional water samples from WWTPs and other hospitals in southern Taiwan will be collected for analysis. In summary, for the first time ever in Taiwan, toxigenic C. difficile were isolated from various water source as well as from seafood, indicating that C. difficile is able to persist even after wastewater treatment.

Keywords: Clostridioides Difficile, Wastewater Contamination, Ribotyping

**Evaluation of Predatory Journal Publication in Systematic Reviews in the Top Five General Medicine Journals: A Cross-Sectional Analysis**

*Griffin Hughes, BS;*
*Ty Moore, MS,*
*Ryan Ottwell, BS,*
*Micah Hartwell, PhD,*
*Matt Vassar, PhD*

Background: Since the early 2000s, the "open access" digital space of published science has become popular for new and established journals alike. However, because of the open access business scheme, pernicious predatory publishers are looking to profit off of charging exorbitant publication fees to would-be published researchers. These journals offer a "rapid turnover" of "a few days or, sometimes, even within hours." With such rapid review and publication time, these journals' publishers are suspected to forgo a proper peer review or decline one altogether. The goal of our research here is to determine if these predatory journals have been cited in systematic reviews or meta-analyses - the gold standard of evidence-based medicine - coming out of the top five journals of general medical sciences. Another goal of this research is to determine if the data cited from these journals are used in clinical practice guidelines.

Methods: Using a cross-sectional design, we selected the top five general medicine journals (based on H-5 index) using Google Scholar Metrics: The New England Journal of Medicine (NEJM), The Lancet, Proceedings of the National Academy of Sciences (PNAS), The Journal of the American Medical Association (JAMA), and PLoS One. To filter for the most recent systematic reviews and meta-analyses, we applied this PubMed search string: (("systematic review"[Publication Type]) OR ("meta analysis"[Publication Type])) AND ("journal name"[Journal]). We analyzed the first 10 systematic reviews or meta-analyses from each journal and extracted each citation of every included primary study. A pilot tested Google Sheets script was used to compare and match the journals of publication of the primary studies with the listed journals of Beall's List: a compendium of potential predatory journals. Exact matches of primary study journals and those from Beall's List were analyzed in masked, duplicate fashion. After data analysis and extraction, we mediated and resolved our findings.

Results: We identified three systematic reviews containing predatory publications (3/50, 6%). One systematic review published in PLoS One contained two primary studies that had been published in predatory journals; thus, a total of four predatory publications were identified. One systematic review published in The Lancet and one systematic review published in the Proceedings of the National Academy of Sciences each contained a primary study published in a predatory journal (Table 1). The systematic review that was published in The Lancet was included in clinical practice guidelines. The systematic reviews which contained a predatory publication were cited a total of 208 times (Table 2).

Conclusion: We found that predatory publications occur in some of the most highly recognized journals in general medicine and these systematic reviews containing predatory publication can be referenced in clinical practice guidelines. Predatory journals are then a significant concern as they could directly influence patient care. Further research needs to be performed to better understand predatory journals as a whole and how to best keep them out of science and research.

Keywords: Systematic reviews, Predatory journals, General medicine

# Gender Differences in Serial Homicide

*Nikki Igo, BS; Medical Student;*
*Jason Beaman D.O., M.S., M.P.H., FAPA*

Background: Serial homicide is a topic of great interest both in popular culture and academics. There has been an abundance of research conducted on the matter from a plethora of perspectives all of which have provided valuable data for progress in the fields of Psychiatry and Forensics. However, there has been limited study on the differences between male and female serial killers. The purpose of this study is to identify variable trends between male and female serial homicide offenders. Data used for this study was extracted from the Radford/Florida Gulf Coast University Serial Killer Database. The database has a total of 2,870 serial killer entries with victim entries totaling 9,064.

Methods: Data extraction was conducted using Microsoft Excel and included information related to serial killer individuals and teams, name, date of birth, sex, sexual preference, number of victims, and race. For every serial killer, the corresponding victim profiles were entered, in chronological order, by date of attack. The following information was extracted from victim profiles: Name, Date of Attack, Age, Sex, Race, Target, Weapon, Method of Kill, and Treatment. With the data properly filtered and sorted based on timeline, we created separate data sets for male (1,044) and female (71) subjects who committed their murders individually. For each set, we calculated the percentage of subjects within each race (White, Black, Hispanic) and sexual preference (Heterosexual, Homosexual, Bisexual). For the victims of each subject, we calculated the percentages of all first victims, second victims, and so on, based on the following demographics: Age, Sex, Race, Target, Weapon, Method of Kill, and Treatment. Once these percentages were calculated for each victim, the average was calculated across all victims.

Results: Both male and female serial killers show steady escalation with victims 1-4 and then de-escalate between 4 and 5 with escalation returning between victims 5-7 and de-escalating again between 7 and 8. Differences were identified in male and female serial killers in victim selection, weapon of choice, method of kill and treatment of victims.

Conclusion: Our study was successful in identifying areas of notable similarity and difference in male and female offenders. However, even with access to the RFGCU Database, there is still a great deal of data to be gathered and analyzed on the subject of serial homicide, specifically in gender comparison. The identified trends provide a basis for potential areas of in-depth Psychiatric and Forensic research on gender differences in serial homicide offenders.

Keywords: Serial homicide, Gender, RFGCU database

**Research committee approval for use of the Behavioral Risk Factor Surveillance System data: a crosssectional study**

Samuel Jacobsen, BS.,  Chase Ladd, BS,
Samuel Streck, BS.,  Samuel Shepard, BS,
 Ryan Ottwell, BS.,  Matt Vassar, PhD,
Jason Beaman, DO., Micah Hartwell, PhD

Background: Research involving medical diagnoses, comorbidities, drugs and alcohol use, and physical activity often requires ethical approval from institutional review boards (IRBs) prior to initiation, with good reason. Historically, there have been many experimental studies that have unethically treated human research participants—several that have performed extreme atrocities. However, the US government national survey data, such as the Behavioral Risk Factors Surveillance System (BRFSS); which is often used for public health research. Funded by the Center for Disease Control (CDC), data from BRFSS has no individually identifiable information, and does not meet the requirements of human subjects research as defined by the Department of Health and Human Services. However; there is no standardization of IRB guidelines regarding ethical review of non-HSR, and universities and journals vary on what is perceived to warrant ethics review. As no study has investigated the use of BFSS and rates of IRB submission, the primary aim was to evaluate the frequency of ethics review among cross-sectional studies of BRFSS and their associated study characteristics.

Methods: A systematic search of PubMed was conducted for publications that included 'BRFSS' or 'Behavior and Risk Factor Surveillance System' in the title or abstract published after 2011. Studies were eligible for inclusion if they include a cross-sectional examination of the specified dataset. Editorials, comments, or methodological examination of the survey design, sampling methods, missing data, etc., including data simulation studies, will be excluded. Data extraction was conducted by two authors in masked, duplicate fashion, in accordance with best practices as noted in the Cochrane Handbook. Results: Of 154 included studies, 34 stated it was submitted to an IRB, 38 reported not having submitted the study for ethical review, and 54 studies included no mention of ethics review. Only 2 of the 34 studies submitted for review were published in journals that require an ethics determination, and none of the universities or institutions that approved the studies had such a requirement in their research guidelines. We found a statistically significant association between study funding and IRB submission ($X2 = 16.5443$, $P = 0.002$). Among the 60 funded studies, 22 (36.7%) reported being submitted to an IRB, while only 2 (5.0%) of the 40 studies reporting no funding and 10 (18.5%) of the 54 that did not include a funding statement were submitted to an IRB. We found no significant differences among studies and ethical approval from before and after 2019 ($X2 = 0.0264$, $P = 0.871$), with approximately 30% of the studies having declared they were submitted to an IRB.

Conclusions: BRFSS is not categorized as human subjects research. Yet, despite this information, 32 of 34 (94.1%) cross-sectional studies of secondary BRFSS data were submitted for IRB approval, with little discernible reason as to why. Submission of non-HSR can be burdensome to universities, and varied guidelines may cause confusion among ethics in research among junior researchers. Public availability of large datasets provides many advantages including cost-effective, preliminary studies, that can lead to clinical research investigations that require substantially more resources.

 Keywords: Behavioral Risk Factor Surveillance System, Institutional review board, Cross-sectional analysis, Research Policy, Human Subject Research

**An Analysis of the Rates of Discontinuation and Non-publication of Chronic Pain Clinical Trials**

*Samuel Jacobsen, BS; Medical Student;*
*Drew Lester, BS,*
*Samuel M. Jacobsen, BS,*
*Austin L. Johnson, BS,*
*Matt Vassar, PhD*

Introduction: It is well documented that aggressive disinformation marketing by the pharmaceutical industry contributed to the opioid epidemic, but another factor that is often overlooked, is the nonpublication and discontinuation of randomized clinical trials (RCTs). All publications, with or without statistical significance, yield beneficial insight and prevent research waste. The primary objective of this cross-sectional analysis is to evaluate the rate of discontinuation or nonpublication of RCTs involving patients with chronic pain.

Methods: Using ClinicalTrials.gov, a sample was derived on October 5th, 2020, which included clinical trials pertaining to chronic pain. Trials were analyzed for publication status and completion status of each trial. If information was unavailable on the trial registry database, or could not be allocated through a systematic search, the corresponding trialist was contacted and data points were gathered.

Results: In our final analysis of the 408 RCTs, we found that 281 (68.9%) were published in a peerreviewed journal and 127 (31.1%) were unpublished trials. Of 112 discontinued trials, 59 (52.7%) reached publication. In addition, 221 of 296 completed trials (74.7%) were published, and 75 (25.3%) remained unpublished after trial completion. Clinical trials funded by non-industry sponsors were more likely to reach publication than industry-funded clinical trials ((unadjusted odds ratio (uOR) 1.86 [95% CI, 1.18-2.95]; adjusted odds ratio (aOR) 3.01 [95% CI, 1.76-5.14]). Pharmaceutical intervention clinical trials were more likely to be completed and more likely to reach publication, than medical device intervention clinical trials (uOR 3.46 [95% CI, 1.74-6.87]; aOR 2.12 [95% CI, 1.05-4.33], and uOR 3.22 [95% CI, 1.62-6.40]; aOR 2.55 [95% CI, 1.23-5.29] respectively).

Conclusion: Chronic pain clinical trials that are funded by industry sources are more likely to be completed than trials funded by all other sources; however, industry funded chronic pain clinical trials are far less likely to be published than chronic pain clinical trials funded by non-industry sources. This data is indicative of the overarching narrative of the pharmaceutical pain industry over the last two decades; namely, that this industry repeatedly suppressed information that was not conducive to their bottom line while promoting disinformation that was beneficial to them. In order to regain the trust of the public, it is imperative that the pharmaceutical pain industry increases transparency in reporting their research.

Keywords: Pain, Chronic, Opioid, Non-publication, Discontinuation, Clinical trials

**The Effectiveness of a Proprioceptive Training Program in Reducing the Incidence of Ankle Sprains in Athletes: A Critically Appraised Topic**

Tomas Jimenez, BS,
Tyrus Schmalz, BS,
 Matthew O'Brien, PhD

INTRODUCTION: A variety of sport associations have found that ankle sprains have the highest injury incidence rate as compared to all other injuries.[1] Not only are ankle sprain rates high, but also ankle sprain reinjury rates (70-80%).[1] This alludes to the possibility of an anatomical or biomechanical cause. Regardless of the reason for such high incidence rates, as with any injury, this often results in athletes being limited or fully restricted from activity due to such injuries. Preventing ankle sprains is then of utmost importance for the proper continuation of athletes in a variety of sports. Another important aspect to consider is that ankle sprains, and the costs associated with such injuries, may be financial burdens on lower income families or smaller sport teams; therefore, preventing ankle sprains not only benefits the physical well-being of the athletes, but also decreases the financial burden on lower income families or smaller sport teams. Prevention is also beneficial in the long term since multiple injuries to the same structures can damage those structures permanently, leading to chronic conditions such as chronic ankle instability.[2] Chronic ankle instability can then hinder an athlete's ability to participate in physical activity in the future or can lead to disability.[2] PURPOSE: To investigate if a proprioceptive training program decreases the incidence of ankle sprains in athletes.

 METHODS: A computer-based search of the literature was completed on November 2020. The search was completed through PubMed Central, Medicine and Science in Sports and Exercise Journal, Journal of Athletic Training, and the Journal of Science and Medicine in Sport with the search phrases "proprioceptive training to prevent ankle injuries" and "proprioceptive program prevents ankle injuries."

RESULTS: Three studies were included in this critically appraised topic. All were published between 2010-2020 and were in the English language. Two of the studies were systematic reviews and one was a randomized controlled trial (RCT). Both systematic reviews reported evidence that a proprioceptive training program can decrease the rate of ankle sprain in athletes.[3,4] The RCT found evidence that a proprioceptive training program decreases the rate of ankle injuries in basketball players and that there is an associated neuromuscular effect.[5]

CONCLUSIONS: A proprioceptive training program is an effective way to decrease the incidence of ankle sprains in athletes. There is a greater reduction in the incidence of ankle sprains in athletes with a past medical history of ankle sprains than in patients with no past medical history of ankle sprains; however, the effects are significant with both populations.[3,4] Future research should focus on standardizing the parameters for a proprioceptive training program.

Keywords: Proprioception, Sprains, Prevention, Athletes

**Finite Element Analysis Indicates Juvenile Tyrannosaurus rex Crania Experienced High Strain Under Normalized High Forces, in Contrast to the Adult Condition**

*Evan Johnson-Ransom, BS.,*
*Paul Gignac, PhD,*
 *Gregory M. Erickson, PhD,*
*Eric Snively, PhD*

Background: Considerable focus has been directed at understanding the feeding anatomy of adult Tyrannosaurus rex, but rarely have the biomechanics of juveniles been appraised. For example, rapid growth in T. rex is thought to enable ontogenetic dietary transitions in which small gracile-snouted juveniles with narrow teeth developed into large adults with a deep snout and reinforced teeth that facilitated osteophagy. Morphology-driven exclusion and opportunity, as is observed in modern crocodylians, supports the stratification of juvenile and adult Tyrannosaurus niches through the partitioning of prey resources based on differences in feeding capacities. How the demands of prey acquisition and processing are reflected in the skull morphology and jaw mechanics of juvenile T. rex as compared to their adult counterparts is not well understood quantitively. Gaining this insight would help address the functional morphology that contributed to developmental niche partitioning in this apex predator.

Methods: Here we use finite element analysis (FEA) to quantify how the crania of a juvenile T. rex (BMRP 2002.4) responded to high forces, in comparison to a large adult individual (MOR 555).

 Results: Analogous to the American alligator (Alligator mississippiensis), modeling results indicate that T. rex underwent dramatic transformations in morphology that manifested substantial differences in cranial stresses and strains. Specifically, the juvenile specimen showed high strain under high forces because of its relatively gracile cranium in contrast to the adult, which was capable of handling disproportionately high forces for its size. Although our results indicate that juvenile T. rex had the adaptations to bite into bone, it appears that only adults were able to wedge bone apart, requisite for extreme osteophagy. These morpho-adaptive results resonate with trace evidence from tyrannosaurinflicted bite marks.

Conclusion: Our findings reveal how dietary trends may have been dynamic for large-bodied tyrannosaur species and point towards important understanding that can be gained through interrogation of their ecological roles throughout life.

 Keywords: Tyrannosaurus, Biomechanics, Feeding Behavior, Vertebrate Paleontology

**Evaluation of Spin in the Abstracts of Systematic Reviews and Meta-Analyses of Atopic Dermatitis Treatments and Interventions**

*Vanessa Lin, BA;  Raahi Patel, MS,*
*Alexis Wirtz, BS,  Deepika Mannem, MS,*
*Ryan Ottwell, B.S., Wade Arthur, BS,*
 *Courtney Cook, DO, Hannah Howard, MD,*
*Drew N. Wright, MLS, Micah Hartwell, PhD,*
*Matt Vassar, PhD*

Background: Spin -- the misrepresentation of a study's actual findings -- has the potential to misguide a clinician's understanding of a therapy's efficacy or harm outcome. Spin has been previously demonstrated in randomized controlled trials from multiple fields of medicine and is in some ways incentivized due to certain results being more publishable. More recently, studies have demonstrated that spin exists in abstracts of systematic reviews, including dermatology.

Objectives: This study's primary objective was to evaluate the presence of spin in abstracts of systematic reviews and meta-analyses focused on the treatment of atopic dermatitis.

Methods: We systematically searched Embase and MEDLINE for systematic reviews of atopic dermatitis therapies. Screening and data extraction occurred in a masked, duplicate fashion. Each included study was evaluated for the nine most severe types of spin, AMSTAR-2 quality appraisal and other study characteristics.

Results: Our searches retrieved 2,456 studies, of which 113 were included for data extraction. Spin was found in 74.3% of our included studies (84/113). Spin type 6 — "selective reporting of or overemphasis on harm outcomes or analysis favoring the safety of the experimental intervention"— occurred most frequently (68/113, 60.2%). Six of the nine spin types were identified in our sample. The presence of spin was not associated with any specific study characteristics, including the methodological quality of the study.

 Conclusions: Spin was found in the majority (over 70%) of abstracts for systematic reviews of atopic dermatitis treatments. Steps should be taken to prevent spin to improve the quality of reporting in abstracts.

Keywords: Atopic Dermatitis, Eczema, Spin, Treatment

**Prevalence of Institutional Review Board Ethical Oversight Among Google Trends Studies: A Cross-sectional Analysis**

*Mitchell Love, BS;*
*Taimoor Khan, BS,*
*Nicholas B. Sajjadi, BS,*
*Micah Hartwell, PhD,*
*Jason Beaman, DO,*
*Ryan Ottwell, BS,*
*Matt Vassar, PhD*

Background: Ethical considerations are necessary when conducting Human Subjects Research (HSR) to ensure participant's rights are preserved. Previous ethical breaches have led to establishing Institutional Review Boards (IRBs) to ensure ethical conduct in HSR. However, the extent of IRB oversight among nonHSR, such as internet studies involving publicly available databases, remains largely unknown. This study focuses on the emerging subset of internet research utilizing Google Trends (GT) data, which analyzes user search query volumes for a given topic over time and across locations. GT studies in medical research have provided a deeper understanding of the public interest in key medical issues, which may lead to positive health outcomes. It is important to ensure ethical standards are being met for these studies to help to secure their place in the scientific literature. Thus, IRB submission rates of GT studies are ascertained and characterized in this study, furthering what is known about the current state of ethical oversight of GT studies.

Study Design: A systematic search of PubMed was conducted for observational studies using GT data published after 2012. We randomized and screened 563 articles in a masked, duplicate fashion. Each study's title, PMID, publishing journal, publishing date, primary author credentials and country, potential correspondence for outside data, IRB statement, IRB sponsor, and funding statement was extracted. Frequencies were calculated for all extracted characteristics and chi-square tests were conducted to measure associations between IRB submission and extracted study characteristics.

Results: 76 studies were retained for extraction. Of these articles, 3 (3.95%) declared submission to an IRB for ethics review, 11 (14.47%) declared no submission, and 62 (81.58%) made no declaration of submission. The 3 articles declaring IRB submission were published in journals with requirements for an IRB statement and from universities that required all studies be submitted for review. Of the 76 articles evaluated, 30 (39.47%) reported a funding source, 11 (14.47%) reported no funding source, and 35 (46.05%) did not mention funding. Three studies disclosed the collection of additional supporting information and data from principal sources. There was a correlation between study funding and likelihood of reporting ethical oversight ($X2=9.9$, $P= 0.043$).

Conclusions: Our principal findings demonstrate that most GT studies did not apply for IRB approval nor was this designation required by their institution or publishing journal. This may be the result of consistently poor methodological documentation known to occur in GT studies. Additionally, unfunded studies were less likely to submit to an IRB for non-HSR designations possibly due to deterrents such as monetary limitations and temporal constraints. The aforementioned limitations may hinder project initiation and also contribute to research waste. We recommend the use of stratified ethical review boards that may alleviate such hindrances by permitting research to undergo limited review or to forego review entirely, due to the nature of some studies, particularly those utilizing GT data. Preserving the advantages of IRBs while avoiding the disadvantages of potential for harm may afford ethical research conduct without slowing progress or wasting resources.

**Gender Differences in Body Measurement Index in Athletic Trainers**

*Emily Madrak, MS;*
*Jennifer L. Volberding, PhD, LAT, ATC,*
*Ki L. Cole, PhD,*
*Bridget M. Miller, PhD,*
*Kathleen S. Curtis, PhD*

Background: Athletic Trainers are healthcare workers that care for a niche population, the physically active. It could be hypothesized that since these sports medicine professionals work with the physically active, the provider is more likely to be physically healthy due to the population they work with. Though it is ideal to maintain a healthy weight, many factors can influence these variables, including athletic trainers. Innate factors involve genetics, gender, age, or developmental and lack voluntary control. Behavioral factors such as activity level, stress, medication, and diet can significantly impact weight and adipose tissue mass as well, but unlike the innate factors, can potentially be altered. Additionally, any of these behavioral factors can cause fluctuations in weight. Body Mass Index (BMI) is the most common and easiest objective form of measurement for determining obesity levels. Increased BMI can lead to morbidities such as type 2 diabetes, hypertension, heart disease, etc. The effects of obesity do not discriminate. Though there is considerable research on gender and BMI, and BMI in general, but there are few studies relating athletic trainer gender and BMI.

Methods: Cross-sectional design with certified athletic trainers (ATs). (males=96, females=165). An "eblast" email was sent to 2500 members of the National Athletic Training Association (NATA) across the US. This study was part of a larger study identifying health behaviors in ATs. The survey included multiple sections: nutrition, eating disorder, physical activity assessment, and a demographics section that contained questions on height (ft) and weight (lbs) to calculate BMI. A one-way ANOVA was calculated for gender and BMI with an alpha of 0.05.

Results: The ANOVA demonstrated significant results. Because normality and homogeneity of variance were violated for all ANOVAs, most likely due to unequal sample sizes, Kruskal-Wallis tests, represented by a chi-square statistic ($X2$), were used as modifications. $X2(3) = 12.06$, $p < 0.05$. A Games-Howell post hoc test demonstrated males were more likely to have a greater BMI, MD = 1.64, $p < 0.05$.

Conclusions: Our data suggests that males ATs are more likely to have a greater BMI than female ATs. This may be a result of male stereotypes such as having a well-built and muscular physique. Additionally, males lack the negative views that females have toward obesity. Because of this negative view, females will spend more time, effort, and money on the becoming or staying thin, and therefore having a lower BMI.

Keywords: Athletic Trainers, Body Mass Index, Gender

**Rural EMS Post-Hospital Closure Perceptions and Impact: Telemedicine Readiness**

Courtney Mapes, BS;
Mark Woodring, DrPH, FACHE,
Courtney Mapes, BS,
 Hunter Meyers, BS

Rural hospitals and health care systems continue to close across the nation. However, only 4% of reported rural closures had a next nearest hospital emergency room greater than thirty miles. The purpose of this study was to examine the perceived impact emergency medicine telehealth interventions have on EMTs serving Tillman County, Oklahoma, a USDA persistently impoverished county post-hospital closure where the next nearest hospital was 31 miles away. Through our qualitative study, Oklahoma State University Medical Center emergency physicians served to provide virtual consultation services to assist in appropriate care and advice in indicated medical crises as requested by EMT personnel. Key informant interviews were designed to analyze the paramedics' perspective pre and post-telemedicine installment assessing their comfort level, role change posthospital closure, and preference of previous rural hospital ER service pre-closure versus telemedicine post-closure regarding the pilot project. At the conclusion of the study, we intend to lead communitybased focus group to receive feedback from Tillman County regarding their satisfaction, personal experiences, and willingness to continue utilizing the service in rural Oklahoma. Both are being conducted to explore alternative care rural emergency models that will serve to be the most beneficial and effective in satisfying rural areas with quality health care.

**Histological Insights into the Neomorphic Preparietal of Dicynodont Therapsids**

*Lianna Marilao, BS; Graduate Student;*
*Lianna M. Marilao, BS,*
*Zoe T. Kulik, BS,*
*Christian A. Sidor, PhD*

Neomorphic skull bones are rare among tetrapods, appearing only a handful of times. One notable example is the preparietal, which is thought to have evolved three times in therapids within dicynodonts, biarmosuchians, and gorgonopsians. Here, we will be histologically describing the preparietal in dicynodonts, a non-mammalian synapsid from about 260 million years ago. We'll be looking at the preparietal in specimens of two dicynodonts: Diictodon feliceps and an indeterminate species of Lystrosaurus. For both, we made coronal thin sections through the skull roof in the region containing the frontal, the preparietal, and the parietal foramen. It has been noted that the preparietal shape varies substantially in dorsal view, and we found a similar pattern in thin-section. In the Diictodon specimen, which likely represents a mature individual, the anterior thin-sections show that the preparietal forms fan-like prongs that embed themselves entirely within the frontal bone. Additionally, there is evidence of an anterior midline suture. In the Lystrosaurus specimen, which shows evidence of being a juvenile, there is a well-defined midline suture in the posterior section of the preparietal, but the prongs and midline suture were not present anteriorly. In both taxa, there is an interdigitated suture that is formed between the anterior portion of the preparietal and the underlying frontal and parietal bones. We also found highly vascularized fibrolamellar bone in the posterior sections of the preparietal in both taxa, suggesting rapid growth in the posteroventral direction. Because our data shows these two features present in both taxa, we believe that these are characteristics of the dicynodont preparietal. More histological work will need to be done on gorgonopsians and biarmosuchians to determine if the histological features characterizing dicynodonts are also found in the other groups of therapsids that evolved a preparietal. This future histological work will hopefully be able to test whether these neomorphic ossifications are homologous. The therapsid preparietal can help shed light on the development and evolution of a neomorphic cranial element in the vertebrate fossil record.

Keywords: Histology, Paleontology, Evolution, Skulls, Synapsids

**PAM-2 downregulates activated human microglia and astrocytes by modulating α7 nicotinic acetylcholine receptors**

*Ilias Marmouzi, PhD;*
*Randall L Davis, PhD,*
*Daniel J Buck, Hugo R Arias, PhD*

Chronic pain (e.g., neuropathic pain) is a major health problem with high economic burden. Add to that the widespread opioid epidemic crisis consuming lives and devastating the health system. In that focus, developing an effective and adequate medication that acts on central and peripheral pain targets without inducing tolerance or addictive behaviors is an urgent need. Glial cells are viable targets for pain therapy; considering their contribution to sensory and/or non-sensory aspects of neuropathic pain. In fact, targeting glial cells may attenuate upregulation of inflammatory mediators in the spinal cord and brain, and reverse nociceptive behaviors. α7 nicotinic acetylcholine receptors (AChRs) are expressed in glial cells, and α7-selective positive allosteric modulators (α7-PAMs) decrease pain in animal models. Our group is particularly interested in identifying novel agents that target the cholinergic inflammatory pathway, particularly in microglia and astrocytes, as a potential therapeutic strategy.

To assess whether the anti-nociceptive activity elicited by PAM-2, an α7-PAM, is related to an antiinflammatory effect, the levels of inflammatory chemokine/cytokines (e.g., IL-6, CCL2, CXCL10) were measured in activated human microglia (C20) and astrocytes (NHA) using the enzyme-linked immunosorbent assay (ELISA). The modulating activity of PAM-2 (0-2.5 µM) was determined in the absence and presence of (-)-nicotine (5 µM). C20 or NHA cells were exposed to interleukin-1β (IL-1β; 25 pg/µL or 1 ng/µL, respectively), to stimulate the release of inflammatory mediators. IL-1β-induced expression of inflammatory mediators was minimally inhibited by (-)–nicotine (0-100 µM) or PAM-2 (0-5 µM), whereas PAM-2 potentiated the inhibitory effect of (-)-nicotine. The most pronounced effect was on CCL2 and IL-6 in microglia and on IL-6 in astrocytes. Interestingly, methyllycaconitine (MLA; α7-selective antagonist) inhibited the observed activity of PAM-2/(-)-nicotine, supporting a mechanism involving α7 AChRs. The current work supports a role for α7 AChRs in the regulation of glial cells as a therapeutic strategy for alleviating neuropathic pain.

Keywords: Astrocytes; Microglia; PAMs; Nicotine; Pain; Human

**Effects of β-Funaltrexamine on lipopolysaccharide-induced chemokine expression and sickness behavior in mice**

*Stephanie Myers, BS*
*Daniel J. Buck, BS,*
*Kelly McCracken, MS,*
*J. Thomas Curtis, PhD,*
*Randall L. Davis, PhD*

Background: Neurological conditions including infection, neurodegeneration, and psychiatric disorders, involve neuroinflammation. Yet, most of the medications used to treat these disorders are not considered potently anti-inflammatory. We previously discovered that beta-funaltrexamine (β-FNA), a selective mu-opioid receptor (MOR) antagonist, inhibits inflammatory signaling in vitro in human astroglial cells. Notably, the mechanism of action does not seem to involve actions at the MOR. We also determined that β-FNA inhibited bacterial lipopolysaccharide (LPS)-induced sickness behavior and neuroinflammation in mice. In these initial in vivo experiments, mice were administered β-FNA, immediately followed by LPS administration, then assessed 24 h later. In the present study, we examined the extent to which β-FNA is protective when treatment occurs several hours after LPS administration. Also, we investigated the protective effects at an earlier time point (8 h) after LPS administration, when sickness behavior is more pronounced. Lastly, previous in vitro findings indicated that naltrexone (a non-selective opioid receptor antagonist from which β-FNA is derived) does not inhibit inflammatory signaling in astrocytes; thus, we questioned if it would also be ineffective in vivo.

Methods: In the current study, male C57BL/6J mice were administered LPS (0.83 mg/kg, i.p.) followed by treatment with β-FNA (50 mg/kg, i.p.) at 4 and/or 10 h post-LPS, depending on the experiment. At 8 or 24 h post-LPS, sickness behavior was assessed using a 10-min open-field test, followed by termination and collection of plasma and brain. Levels of inflammatory chemokines (interferon γ-induced protein, CXCL10; and monocyte chemotactic protein 1, CCL2) in tissues were measured using an enzyme-linked immunosorbent assay.

Results: Two-way analysis of variance revealed that at 24 and 8 hours, LPS increased CCL2 and CXCL10 in the brain and plasma. β-FNA treatment was protective depending on the dosing schedule, and Naltrexone did not significantly reduce inflammation.

Conclusions: β-FNA treatment 4 or 10 h after LPS administration inhibited CCL2 levels in plasma and brain (but did not significantly affect CXCL10 levels), and it failed to reduce sickness behavior. Conversely, β-FNA treatment within minutes of LPS treatment resulted in attenuation of both sickness behavior and chemokine expression. Delayed β-FNA treatment was not protective against LPS-induced behavioral deficits or inflammation 8 h post-LPS. Interestingly, naltrexone did not significantly reduce LPS-induced CCL2 and CXCL10 levels or sickness behavior. These results suggest that the timing of β-FNA treatment is critical for neuroprotection and supports earlier findings that the protective effects of βFNA likely involve mechanisms beyond actions at MOR. However, further examination of the antiinflammatory and neuroprotective effects of β-FNA is necessary.

Keywords: Neuroinflammation, Chemokine, LPS, Opioid, Anti-inflammatory

**Evaluation of Predatory Journal Publication in Systematic Reviews in the Top Five Emergency Medicine Journals: A Cross-Sectional Analysis**

*Tiffany Nguyen, BS.,*
*Ryan McIntire, BS,*
*Ryan Ottwell, BS,*
*Micah Hartwell, PhD,*
*Matt Vassar, PhD.,*

Background: Predatory journals are publishers that mislead many academic scholars into publishing their work without any peer-review, allowing these unrefined studies to enter and damage the scientific archive. These groundless publications by predatory journals contain data and information that are unvalidated, yet because they are published, they are able to circulate and can be cited by other articles that may later be published by a reputable journal. Systematic reviews — the gold standard of evidence based medicine — may create clinical practice guidelines based off of inaccurate studies or second-rate work published in predatory journals, dangering the public health. Thus, the primary objective of this study was to explore whether systematic reviews and meta-analyses within the top 5 emergency medicine journals contained predatory journal publications in their included primary studies.

Methods: Using a cross-sectional design we systematically searched PubMed for systematic reviews and meta-analyses published in the top 5 emergency medicine journals based upon h-5 indices. H-indices were obtained using Google Scholar Metrics. The first ten systematic reviews were included from the following journals, Resuscitation, The Journal of Trauma and Acute Care Surgery, Annals of Emergency Medicine, Academic Emergency Medicine, and The American Journal of Emergency Medicine, so that a final sample size of 50 systematic reviews were obtained. A study was excluded for the following reasons: 1) the study was not a systematic review, 2) the study was not available in English, or 3) the study was not accessible. Each systematic review was independently screened by authors TN and RM, and the primary studies included in each review were extracted. These primary studies were then examined using Beall's List of Predatory Journals to determine if they were published in a predatory journal. If a systematic review included a primary study published in a primary journal, then additional data were extracted from both the systematic review and the predatory publication using a pilot-tested Google Form. Data were extracted in masked, duplicate fashion by authors TN and RM, and disagreements were resolved by group discussion. When an agreement could not be resolved author RO was available for adjudication.

Results: Two systematic reviews included primary studies that were published by predatory journals (2/50; 4%). Both the systematic reviews were published in the journal, Resuscitation. Neither of the systematic reviews have been included in clinical practice guidelines nor have they been referenced by other articles. One of the primary studies published by a predatory journal has been cited five times, while the other has not been referenced. The predatory journals that published these primary studies are Signa Vitae and International Journal of Nursing Education Scholarship. Conclusions: We found the top emergency medicine journal, Resuscitation, to include systematic reviews containing predatory publications. Our findings reveal that predatory journals may contaminate even the most reputable medical literature in emergency medicine. This is a growing concern as it corrodes the integrity of science and may also directly influence patient care. Further research is necessary to explore the effects of predatory publications in systematic reviews.

Keywords: Emergency medicine, Predatory journal, Systematic review

**The Use of Sensational Language in News Articles about Anti-diabetic therapies**

*Savannah Nicks, BS;*
*Corbin Walters, MS-III, Ryan Ottwell, MS-IV,*
*Savannah Nicks, MS-111, Madison Slawson, MS-III, Stacy Chronister, DO, Matt Vassar, PhD*

Background: Diabetes affects approximately 24.7 million people in the United States with an estimated cost of $327 billion annually; of which, $102 billion is medication cost1. News outlets often publish stories about diabetic therapies — and since these stories may play a significant role in educating healthcare providers, patients, and the public — their accuracy and use of accurate language is critical. In 2011, Diabetes Australia published a statement that outlined terms to use when communicating about diabetes. They emphasized the role of the media and its influence on public views of health topics. Studies2,3 have found that the use of superlatives — exaggerated language intended to capture interest —- have been used to describe "breakthrough" or "miracle" drugs, but lack supporting clinical data. We evaluated the frequency of superlative use in articles of diabetic agents as a measure of the claims presented by news articles using Health on the Net Code of Conduct (HONCode)4.

Methods: We performed a cross-sectional study based on methods developed by Abola and Prasad.3 We searched articles from 6/16/2019 to 12/16/2019 for the keyword "diabetes drug" using Google News for 11 superlatives: "breakthrough," "cure," "game changer," "groundbreaking," "home run," "life-changing," "life-saving," "marvel," "miracle," "revolutionary," and "transformative." Two investigators (S.N. and M.S.) performed article screening and data extraction in a duplicate, blinded fashion. Disagreements were resolved by consensus. The following data was extracted using a Google form: article URL, news outlet, frequency of superlative(s), therapy or medical device, drug classification, phase of development, FDA status, drug novelty, presence of clinical data, and the author's background . To validate claims made by articles, we searched for the HONCode logo and cross-referenced the HONCode search engine for the websites of every article.

Results: 62 news articles met inclusion criteria from 32 news outlets. We found 120 superlatives describing 31 diabetic therapies. Teplizumab had the highest frequency of superlative instances (18/120, 15.0%) and news articles (11/62, 17.7%) (Table 1). The majority of articles were written by journalists (44/62, 72.0%). Therapies in clinical trials had the highest superlative frequency (56/120, 46.7%) and were featured in the most news articles (24/62, 38.7%) (Table 2). One (of 39, 2.6%) news outlet was HONCode registered.

Discussion: We found that superlatives were used in articles for FDA approved and non-approved therapies. Almost three-quarters of the articles were authored by journalists, who made unsupported claims. The unsubstantiated superlatives "cure" and "miracle" were troublesome. This hyperbolic verbiage may not be scientifically substantiated; yet, this form of advertising captures reader interest leading to increased drug prices, medication overutilization, and inappropriate prescribing.6 Studies have shown that superlative language in press releases from pharmaceutical companies leads to a surge in news containing the same or similar claims7. The Association of Health Care Journalists provides principles for journalists to follow when publishing medical articles, which includes omitting sensational language and quantifying the benefit and risk of therapies. We recommend that these principles be adopted by both health news and press release writers.

Keywords: Diabetes, Superlatives, News, Cross-sectional

# Complement Regulatory Proteins and Their Role in HCV-Related Pathogenesis

Batuel Okda, GCRT, BS;
Anna Platt, BS,
Magdalene Quintero, GCRT, BS,
Sarah Groover, PhD,
Anil Kaul, MD, DDS, MPH,
Rashmi Kaul, PhD

Hepatitis C virus (HCV) liver infection will result in chronic inflammation of the liver in 80% of untreated cases. About 20% of the individuals with chronic inflammation develop the scarring of the liver called cirrhosis and about 5% of the individuals with cirrhosis will develop hepatocellular carcinoma (HCC). The complement system, a crucial component of the innate immune system serves as an important antimicrobial defense. HCV proteins inhibit the complement component thus inhibiting the cytolytic action resulting in increased viral persistence. Additionally, the viral proteins have been shown to modulate the expression of complement regulatory proteins' (CRPs) CD55 and CD59 on hepatocytes. However, the role of CRPs in the development of HCV cirrhosis and the transition to HCC is poorly understood. In the current study, mRNA expression of CRPs CD46, CD55, and CD59 was analyzed in normal liver tissues and liver tissues of subjects with HCV-mediated cirrhosis and HCC. mRNA expression analysis of CRPs was conducted by qRT-PCR. The results indicated a differential mRNA expression of CRPs among the two diseased groups when compared to normal. There was an increasing trend in CD55 and CD59 mRNA expression in HCV cirrhosis and HCC liver tissues compared to normal, however these differences did not reach significance. No differences were detected in CD46 mRNA expression among the groups. Further studies with increased sample size will be useful to confirm these observations and involvement if any of CRPs in the process of HCV viral protein- mediated pathogenesis. Cancer Sucks, Inc. (Bixby, OK) funded this study.

Keywords: Hepatitis C Virus, Liver Cirrhosis, Hepatocellular Carcinoma (HCC), Complement Regulatory Proteins

**Understanding epigenetic mechanism: a novel way to approach therapeutic targets for the treatment of colitis**

*Radhika D. Pande, MS;*
*Kenneth E. Miller, PhD,*
*Subhas Das, PhD*

Background: Chronic inflammatory bowel disease such as colitis is characterized by abdominal pain, for which pharmacological therapies are very limited. In addition, the excessive and exacerbated immune response within the gastrointestinal tract makes the underlying mechanisms of colitis more complex to understand. Numerous studies have shown that epigenetic regulation, especially DNA methylation, plays an important role in inflammatory modulation. Epigenetics is the study of changes in gene expression, which occurs without any changes in the DNA sequence. Previous studies have linked the Nerve growth factor (NGF), which plays an important role in inflammation and immune response, expression with neurogenic inflammation in various inflammatory animal models. Yet, the epigenetic mechanism for this NGF regulation is unexplored. Aim: In this study, we evaluated the epigenetic mechanisms which regulate the gene expression of NGF during TNBS induced colitis in rats.

Method: Colitis was induced in 8-10 weeks old female Sprague-Dawley rats by infusing TNBS into the colon. The colon was collected after 24 hours of inflammation. Azacitidine (Aza) was pre- and coadministered to/with TNBS in the colon. Bisulfite converted DNA was used for Methylation-specific PCR (MSP) to analyze the DNA methylation patterns in the NGF promoter's CpG islands. RNA and protein expression of NGF was determined by qualitative, quantitative PCR, and immunoblot techniques.

 Results & Conclusion: Our findings show altered NGF expression in the colon during TNBS induced colitis due to hypermethylation of CpG dinucleotides in the NGF promoter. Aza treatment mitigated this hypermethylation and reduced neurogenic inflammation in these animals suggesting NGF expression can be epigenetically regulated in neuroinflammation.

 Keywords: Inflammation, Chronic inflammatory bowel disease, Colitis, Nerve growth factor, Epigenetic regulation

**Farming and the Hygiene Hypothesis**

*Gunner Parent, BS;*
*Joe T. Landrum, DO,*
*N.C. Jacob, PhD*

Background: The increased prevalence of allergic disease over the past decade, and the claims of the hygiene hypothesis, has led to increased allergy research in relation to different environments. Objective: We aimed to statistically determine whether growing up on a farm provides a protective effect against allergies based on the hygiene hypothesis.

Methods: Data collection consisted of an SQL query. All patients from a single rural ENT Allergist in Southern Oklahoma from 2012-2018 are included in the study. Patient data was de-identified and formatted in excel for statistical analysis. Python software was utilized to determine the significance between patients who grew up on a farm and patients who did not grow up on a farm in relation to having allergies.

Results: We determined a statistical difference between the prevalence of allergic rhinitis in patients who grew up on a farm and patients who did not grow up on a farm (P < .001). Our results revealed that patients who grew up on a farm were more likely to have allergies compared to patients who did not grow up on a farm. Conclusion: In our patient population, those who did not grow up on a farm were statistically less likely to have allergic rhinitis compared to patients who grew up on a farm. A possible confounding variable for our findings may be incidental exposures to farming environments due to living near local farms.

Keywords: Hygiene Hypothesis; Farming; Allergic Rhinitis; Allergic Disease; Allergy

**Person-Centered Language in Scholarly Writing May Mitigate Stigma Among Patients with Obesity**

Andriana Peña, BS; Medical Student;
Zachary Griffin, BS,
Piper Long, MS,
Trevor Torgerson, BS,
 Austin Johnson, BS,
Ryan Ottwell, BS,
Andriana Peña, BS,
Samuel Jacobsen, BS,
 Micah Hartwell, PhD

Background: Language has the ability to influence societal perceptions of medical conditions. The movement to employ person-centered language (PCL) in healthcare is reflected in many scientific publications, however, the extent of this adaptation in reference to obesity is unknown.

Methods: This cross-sectional analysis included a systematic search of PubMed obesity-related articles across four cohorts spanning January 2004 – December 2006, January 2008 – December 2010, January 2015 – December 2018, and January 2019 – May 2020 respectively. All journals with 20 or more obesityrelated, PubMed indexed items with human subjects available in English were included, resulting in 2627 from 17 journals. A random sample of 1971 publications were screened and examined for prespecified, non-PCL terminology.

Results: After excluding editorials and commentaries, 991 were retained. We found 238 (24.02 %) publications adhered to PCL. It was also found that PCL adherence increased over time within cohorts 2-4, with cohort 2 being 1.75 times more likely and cohort 4 being 2.27 times more likely to adhere. Among the articles with non-PCL, "obese" was the most common label, occurring in 748 (75.48 %) articles, and "suffers from" was included in 158 (15.94 %). We found similar proportions of PCL adherence among obesity-specific journals, general medicine articles, and nutrition journals.

 Conclusion: Our investigation showed that PCL in reference to obesity is evident in weight-focused journals with PCL guidelines. However, many major medical journals lack specific PCL guidelines and continue to permit the use of non-PCL. Continued use of non-PCL in reference to obesity could inadvertently perpetuate weight-based stigma and health disparities in future generations.

Keywords: Obesity, Stigma, Person-centered language, Patient care

**A cross-sectional analysis of ethical approval among studies using the Youth Risk Behavior Surveillance System (YRBSS)**

Andriana Peña, BS; Mackenzie Moody, MS,
Kelsi Emmons, BS., Audrey Wise, BS,
Ryan Ottwell, BS.,  Matt Vassar, PhD,
 Jason Beaman, DO., Micah Hartwell, PhD

Background: Atrocious violations of human rights have been committed in the name of research, specifically among children, which include the Willowbrook Hepatitis Studies— where children with mental disabilities were purposely infected with hepatitis A and B, and another study in which children were fed radioactive milk or iron supplements. These studies demonstrate the need for Institutional Review Boards (IRBs) and federal regulations to define human subjects research (HSR) and their rights. The Youth Risk Behavior Surveillance System (YRBSS) captures multiple behaviors of youth including physical and sexual violence, bullying, and illicit drug use; yet, data from these surveys is publicly available and is often used in public health research. However, since individually identifiable information is removed from the dataset, a requirement to be considered non-HSR, many universities have listed YRBSS datasets as approved and not requiring IRB submission. As IRBs vary on what is perceived to warrant ethics review, and to our knowledge, no study has investigated the use of YRBSS and IRB submission, our primary aim was to evaluate rates of IRB submission among cross-sectional studies of YRBSS and association among study characteristics.

 Study Design: We searched PubMed for cross-sectional studies using YRBSS data published after 2012. Articles were then randomized and two authors screened articles until they independently retained 200 articles. Extracted data included IRB statements, the country of the primary author, and if the study was funded. Descriptive statistics were recorded and chi-square tests were used to measure associations between IBR submission, study characteristics, and publications occuring before and after the 2019 revisions to HHS45-CFR46, although no changes were made to the definition of non-HSR.

 Results: Of the 203 studies, 67 (67/203; 33.0%) reported submission to an IRB or ethical review and 46 (46/203; 22.7%) declared the study was not submitted to an IRB or ethical review. Ninety (90/203; 44.3%) did not mention if the study was submitted for IRB or ethical approval. Of the 67 studies that were submitted for IRB approval, 45 (45/67; 67.2%) of the articles were published in journals that required a declaration of ethical determination from a review board. Statistically significant associations were found between IRB statements and studies originating within and outside of the US ($X2= 9.3435$, $P = 0.009$), and whether a study received funding ($X2=22.8819$, $P = 0.000$), but not among studies published before or after 2019 ($X2= 2.39$, $P = .12$).

 Conclusions: Two-thirds of the studies in our sample declared that they were submitted to an IRB despite cross-sectional studies of YRBSS data being recognized as non-HSR by many federal institutions, likely to fulfill a journal requirement. Studies with funding and those originating in the US were more frequently submitted for an ethics determination. Standardized guidelines among journals and institutions regarding the secondary analysis of publicly available, federal datasets, would likely ease the burden of IRBs to oversee HSR studies as they were intended.

Keywords: Youth Behavior Risk Surveillance Survey (YRBSS), Institutional Review Board, Non-human subject research, Public availability, Secondary analyses

**Opioid induced changes in gut microbiota**

*Brenda Perez, BS;*
*Senait Assefa, PhD,*
*Alejandro Torres BS,*
*Zinar Simsek, MS,*
*Dolores Vazquez Sanroman, PhD,*
*Gerwald A. Koehler, PhD*

Background: The human gut microbiome is comprised of trillions of microbes (gut microbiota) and their genomes. Recent research has shown that the gut microbiome has important functions for human health and disease. Opioid use and misuse can be associated with gastrointestinal side effects such as chronic constipation; however, the effects of opioid exposure on the gut microbiome are not well understood.

Methods: We have started to use a pre-clinical model of opioid dependence to investigate the impact of oxycodone on the gut microbiome. Opioid induced changes in the fecal microbiota composition in adolescent rats were assessed using fecal samples collected over a 5-day time course of oxycodone administration and subsequent compositional analyses by 16S ribosomal RNA amplicon high-throughput sequencing on an Illumina MiSeq system. The resulting amplicon sequence variant (ASV) data were used for alpha and beta diversity analyses and microbial taxa classification to genus level. Differential abundance analyses of the ASV datasets from control and oxycodone-treated samples revealed specific changes in the fecal microbiota composition after opioid administration. The details and potential implications of these microbial community alterations for the host will be presented.

Conclusions: This study is a first assessment of the impact of opioids on the intestinal microbiome in adolescent rats. It will serve as a foundation for future, more detailed studies on the consequences of opioid use/misuse on intestinal homeostasis, the gut microbiome, and the microbiome-gut-brain axis.

Keywords: Microbiome, Opioids, Gastrointestinal

**Conflict of interest's influence on systematic reviews of chronic pain management with opioids**

Connor Polson, BS;
Parker Siex, B.S.,
J. Michael Anderson, B.S.,
Michael Weaver, M.S.,
Will Roberts, B.S.,
Micah Hartwell, PhD,
Matt Vassar, PhD

Background: Chronic pain is an increasing cause of distress and disability in the general population. Treatment of chronic pain is based on clinical guidelines, many of which are derived from systematic reviews. One treatment of note -the use of opioid analgesics to treat chronic pain- has become increasingly controversial due to the risk: benefit ratio. Therefore, it is imperative that systematic reviews regarding the treatment of chronic pain with opioids are accurate and without significant bias. Previous research suggests that industry bias, in the form of author conflicts of interest (COI) and industry sponsorship, may influence the direction of reported results and conclusions of medical research. We sought to determine whether author COI (disclosed or undisclosed) influenced the favorability of reporting of systematic reviews and meta-analyses investigating the use of opioid analgesics for the management of chronic non-cancer pain.

Methods: MEDLINE (Ovid) and Embase (Ovid) were searched to find systematic reviews and metaanalyses pertaining to the management of chronic non-cancer pain with analgesic opioids. Study sponsorship was determined using the funding statement provided in each systematic review. Similarly, author COI information was extracted from the COI disclosure statement. This information was crossreferenced with information available on the CMS Open Payments Database, Dollars for Profs, Google Patents, the United States Patent and Trademark Office (USPTO), and previously published COI disclosures. Initial results were screened and data extraction was performed by C.P. and P.S. in a masked, duplicate fashion. All discrepancies were resolved by group consensus with third-party adjudication available, if necessary. For reproducibility, our study materials and protocol have been made available on the Open Science Framework.

Results: Following title and abstract screening and full-text review, eight systematic reviews authored by 83 authors met our eligibility criteria and were included in our study. Of these authors, 19 (23.0%) were found to have a COI, of which the majority (17/19; 89.5%) had at least one undisclosed COI. Despite nearly one-quarter of authors having a COI, we found no statistically significant association between the presence of a COI and the favorability of results (p = 0.64) or conclusions (p = 0.07).

Conclusion: COI are common and frequently undisclosed among systematic review authors investigating opioid analgesics for the management of chronic non-cancer pain, although we did not find that these author-industry relationships had a significant influence on the favorability of results and conclusions. We recommend that future studies expand their eligibility criteria in an effort to increase the sample size.

Keywords: Conflicts of Interest; Industry Sponsorship; Industry Bias; Systematic Review

**Status of Estrogen Receptors & Inflammatory Markers in Hepatitis C Virus Related Liver Pathogenesis**

*Magdalene Quintero, GCRT, BS;*
*Anna Platt, BS,*
*Batuel Okda, GCRT, BS,*
*Sarah Groover, PhD,*
*Anil Kaul, MD, DDS, MPH,*
*Rashmi Kaul, PhD*

Background: Hepatitis C virus (HCV) is a viral infection that can lead to damage of the liver. Pathogenesis of HCV depends on the presence of chronic inflammation which can develop into cirrhosis (scarring) of the liver which further leads to hepatocellular carcinoma (HCC). Chronic HCV infection has worse disease outcome for males compared to females. There is a gap in knowledge about the inflammatory process in HCV related pathogenesis. The goal of this study was to determine mRNA expression of estrogen receptors and inflammatory proteins in HCV cirrhosis and HCV related HCC.

Methods: Diseased and normal liver tissues were obtained from NIH liver tissue bank. TNFα, ESR1, ESR2, and IL-10 mRNA expression in the selected liver tissues was analyzed using RT-qPCR in HCV related cirrhosis and HCV related HCC, compared to healthy controls. Housekeeping genes included GUSB and SRSF4 and data were analyzed using the ΔΔCt method.

Results: The mRNA expression differed between TNFα, ESR1, and ESR2 for HCV cirrhosis and HCV related HCC. TNFα mRNA expression increased with HCV associated diseases, specifically HCV cirrhosis. ESR1 mRNA expression was highest for HCV related HCC. ESR2 mRNA expression was downregulated for both HCV associated diseases. IL-10 mRNA expression will be studied in the future.

Conclusions: TNFα maybe an important player in driving chronic inflammation in liver cirrhosis and may have a contributory role in driving cellular transformation to HCC. The association of estrogen receptors to inflammatory markers TNFα will be further investigated in detail. The study was funded by Cancer Sucks, Inc. (Bixby, OK).

Keywords: Hepatitis C Virus, Liver Cirrhosis, Hepatocellular Carcinoma (HCC)

**Completeness of intervention reporting of clinical trials published in highly ranked obesity journals**

*Shelby L. Rauh, M.S. CCC-SLP, HCA, OMS-III;*
*D'Arcy Turner, M.S.,*
*Sam Jellison, B.S.,*
*David B. Allison Ph.D.,*
*Colony Fugate, D.O.,*
*Greyson Foote, B.S.,*
*Matt Vassar, Ph.D*

Background: Randomized controlled trials (RCTs) play a crucial role in the research and advancement of medical treatment. A cross-sectional study design was utilized to analyze the completeness of intervention reporting using the TIDieR checklist and to evaluate factors associated with intervention reporting. We sought to compare the completeness of intervention reporting before and after the publication of TIDieR.

Methods: PubMed was searched for RCTs in the top 10 obesity journals per the Google h5-index. After excluding non-RCTs, 300 articles were randomly sampled. After assessing each publication for eligibility, 2 authors (SR & DT) extracted data related to intervention reporting from records in an independent, masked fashion. Data was then verified and analyzed. Results: Our analysis revealed that the quality of intervention reporting is quite variable. Overall, we found no statistically significant difference in the quality of intervention reporting before and after the release of TIDieR guidelines. In general, obesity research has good intervention reporting in areas such as the mode of delivery, material lists for intervention, and procedure lists. However, we determined 4 main areas where obesity researchers can improve reporting quality. This included providing the expertise and background of intervention providers, providing statements regarding the assessment of fidelity of the intervention, and others.

Conclusion: Urgent intervention is warranted to improve the quality of research reporting in obesity research, which is a fundamental component of obesity management. This will likely take a unified approach from researchers, journals, and funding sources.

Keywords: Research Integrity, Transparency, Reproducibility, Quality

# Clinical Trial Registry Use in Orthopaedic Surgery Systematic Reviews

*Arjun K. Reddy, BA;*
*J. Michael Anderson, B.S.,*
*Harrison Gray, B.S.,*
*Keith Fishbeck, D.O.,*
*Matt Vassar, Ph.D*

Background: Results from systematic reviews and meta-analyses—the highest level of evidence—often drive clinical decision-making and health policy. Often, unpublished trial data are omitted from systematic reviews, raising concerns about the extent of reliability and validity of results drawn from systematic reviews. We aimed to determine the extent to which systematic review authors include searches of clinical trial registries for unpublished data when conducting systematic reviews in orthopaedic surgery.

Methods: Systematic reviews were gathered from the top 5 orthopaedic surgery journals based on the h5-index from Google Scholar Metrics. Systematic reviews published in the Cochrane Database of Systematic Reviews, which requires inclusion of a clinical trial registry search, served as controls. For the primary outcome, each systematic review from the top 5 orthopaedic journals was screened to determine whether the authors for each study searched for unpublished data in clinical trial registries. We then compared the rate of registry searches with the control. For the secondary analysis, a search of ClincalTrials.gov was performed for unpublished trial data for 100 randomized systematic reviews.

Results: All Cochrane systematic reviews (100%, 38/38) included clinical trial registry searches , while the top 5 orthopaedic journals had 31 studies that looked at clinical trial registries (6.5%, 31/480). The secondary analysis yielded 59 systematic review articles that could have included unpublished clinical trial data from one or more studies to their sample (59.0%, 59/100).

Conclusion: Systematic reviews published in the top orthopaedic surgery journals seldomly included a search for unpublished clinical trial data. The exclusion of clinical trial registry searches potentially contributes to publication bias within the orthopaedic literature. Moving forward, review authors should include clinical trial registry searches for unpublished clinical trial data to provide the most accurate representation of the available evidence for systematic reviews and meta-analyses.

 Keywords: Grey Literature; Systematic Reviews; General Orthopaedics; Trial Registry Use; Cochrane Collaboration

**Complication and Revision Rates After Reverse Total Shoulder Revision from Hemiarthroplasty: A Systematic Review**

*Arjun K. Reddy, BA;*
*Jake X. Checketts, DO,*
*B. Joshua Stephens BS,*
*J. Michael Anderson BS,*
*Craig Cooper BS,*
*Tyler Hunt BS,*
*Keith Fishbeck DO,*
*Marshall Boose DO,*
*Byron Detweiler DO,*
*Brian Chalkin DO,*
*Brent Norris MD*

Background: Thus, the purpose of the present study was to (1) characterize common postoperative complications (e.g., neurologic injury, deep surgical site infections (SSI), hardware loosening/prosthetic instability, postoperative fractures), and (2) quantify the rates of revision in patients undergoing HA to RTSA revisional surgery. We hypothesize that hardware loosenings will be the most common complication to occur in the sample, with the humeral component being the most common loosening. We also hypothesize that revision rates of RTSA following failed HA will be higher than primary RTSA.

Methods: This systematic review and meta-analysis adhered to PRISMA reporting guideline. For our inclusion criteria, we included any study that contained intraoperative and/or postoperative complication data, and reintervention rates on patients who had undergone revision RTSA due to a failed hemiarthroplasty of the shoulder. Our primary outcome for the study was to quantify the complication and re-operation rates for patients after having gone revision RTSA due to failed hemiarthroplasty. Complications include, neurologic injury, deep surgical site infections (SSI), hardware loosening/prosthetic instability, postoperative fractures (acromion, glenoid, and humeral fractures).

Results: The study contained 22 studies that assessed complications from shoulders that had revision RTSA from a hemiarthroplasty, with a total sample of 925 shoulders. As a result, we found the most common complication to occur was hardware loosenings (5.3%), and of the hardware loosenings, humeral loosenings (3.8%) were the most common compared to baseplate loosenings (1.5%). The revision rate was found to be 10.7%. Conclusion: This systematic review found that revision RTSA for failed hemiarthroplasty has a high overall complication and re-intervention rates, specifically for hardware loosening and revision rates.

Keywords: Revision, Reverse Total Shoulder Arthroplasty, Complication Rates, Hemiarthroplasty

**Over 30% of systematic reviews and meta-analyses focused on rotator cuff tear treatments contained spin in the abstract**

*Arjun K. Reddy, BA., Samuel Shepard, BS,*
*Ryan Ottwell, BS., Jay Thompson, DO,*
*Chris Price, DO., Wade Arthur, BS,*
*Chad Hanson, DO., Andrew Ebert, MD,*
*Drew N. Wright, MLS, Micah Hartwell, PhD,*
*Matt Vassar, PhD*

Purpose: The purpose of this study is to determine the prevalence of spin in the abstracts of systematic reviews and meta-analyses on treatments for rotator cuff tears and whether various study and publishing journal characteristics were associated with the presence of spin.

Methods: A search strategy was developed for Ovid MEDLINE and Ovid Embase to retrieve systematic reviews focused on rotator cuff tears treatments. For an article to be included, it must meet the following criteria: (1) the article must be a systematic review with or without a meta-analysis; (2) the article must pertain to the treatment of rotator cuff tears; (3) the article must only contain human subjects; and (4) the article must be accessible in English. Systematic reviews were analyzed for spin using a previously developed classification scheme in a masked, duplicate manner. Binary logistic regression was used to examine independent associations, via unadjusted odds ratios and 95% confidence intervals (95%CI), between the presence of spin and study characteristics.

 Results: Search queries returned 932 articles, of which 121 systematic reviews and meta-analyses were eligible. A total of 36.4% (44/121) of systematic reviews contained spin. Among the general characteristics evaluated, there were no correlations with spin.

 Conclusion: Spin was present in more than one-third of systematic reviews and meta-analyses covering rotator cuff tear treatments. Spin was not associated with any general study or journal characteristics, which indicates that clinicians must be aware of the potential presence of spin in all such abstracts. Clinical Relevance: Clinicians rely on systematic reviews and meta-analyses, especially abstracts of these articles, to provide succinct guidance on best practices in patient care. The presence of spin could adversely affect patient care; thus, steps should be taken to improve the reporting quality of abstracts on rotator cuff tear treatment.

Keywords: Spin, Rotator Cuff Treatment, Systematic Reviews

**Conflicts of Interest Among Systematic Review Authors for Cannabis Use Disorder Treatments**

Vaishnavi Reddy, B.S., Marvin Carr, BS,
Vaishnavi Reddy, J. Michael Anderson, BS,
Michael Weaver, M.S, Micah Hartwell, PhD,
Matt Vassar, PhD

Importance: Cannabis is the most commonly used illicit drug worldwide. In addition to potential adverse effects, those who use cannabis recreationally may develop a cannabis use disorder (CUD).

Objective: To evaluate disclosed and undisclosed conflicts of interest (COIs) and industry sponsorship's influence on CUD treatment within systematic reviews.

Design, Setting, Participants: This cross-sectional developed a search strategy using Ovid, MEDLINE, and Ovid Embase for systematic reviews and meta-analyses focused on CUD treatment in June 2020. Following title and abstract screening, these reviews were evaluated for COIs per previously developed classification scheme. Study characteristics reviews were performed in duplicate fashion.

Interventions: Pharmacologic and nonpharmacologic

Main outcome and measure: Our primary objectives were to (1) evaluate the presence of disclosed or undisclosed COI of systematic review authors, regarding treatment of CUD; and (2) determine whether overall summary effect estimates, narrative results and conclusions were influenced by the presence of disclosed or undisclosed COI(s) among systematic review authors. Our hypothesis was developed before data collection.

Results: Our systematic search returned 560 articles which 9 systematic reviews were eligible for data extraction. We found 77.8% (7/9) contained at least one author with a COI. From the 51 authors included, 29.4% (15/51) were found to have a COI. Forty-four percent (4/9) were funded, 22.2% (2/9) were not funded, and 33.3% (3/9) had no funding statements. Out of the 7 systematic reviews with one or more authors containing COI, 14.2% (1/7) included results favoring the treatment group and 28.6% (2/7) included conclusions favoring the treatment group. Our results showed no significance between funding source and results (p = 0.429) or conclusions. Additionally, we found no significance between the presence of COIs with the favorability of results (p = 0.56) or conclusions.

Conclusion and relevance: Multiple studies favored treatment of cannabis-containing products, even though COIs were found in majority of the systematic reviews. COIs have the ability to sway results of a study, which can affect clinical decision-making. Stricter guidelines should be enforced among authors displaying COIs in systematic reviews studying CUD treatment.

Keywords: Industry Sponsorship, Conflict of Interest, Cannabis Use Disorder, Cannabis, System

**Evaluation of Predatory Journal Publication in Systematic Reviews in the Top Five Oncology Journals: A Cross-Sectional Analysis**

*Abbey Renner, BS;*
*Alexander Douglas, B.S.,*
*Ryan Ottwell, B.S.,*
*Adam Corcoran, B.S.,*
*Micah Hartwell, Ph.D.,*
*Matt Vassar, Ph.D.*

Introduction: In 2012, Jeffrey Beall coined the term "predatory journal" to describe journals that used the open access model to exploit inexperienced researchers. Predatory journals are problematic as many lack the formal peer-review processes found within their scientific counterparts. This may result in the publication of faulty data and potentially influence patient care by misleading clinician readers. Through this problem, the journals are profiting from charging fees for publications that lack any merit. This method prevents potential publications from reaching reputable sources. Even more dangerous is that predatory publications could be unknowingly cited in other medical literature, such as systematic reviews and clinical practice guidelines (creating faulty resources for clinicians). Thus, our goal was to identify the use of predatory journals in systematic reviews published in the top five high impact oncology journals. We sought to study the characteristics of any predatory published studies in order to recognize associations between systematic reviews containing predatory journals.

Methods: Using a cross-sectional design, we searched PubMed using search-strings for systematic reviews published in the top five oncology journals based on Google Scholar Metrics' five-year h-index — Journal of Clinical Oncology, The Lancet. Oncology, Clinical Cancer Research, Annals of Oncology, and Cancer Research. We included the 10 most recent systematic reviews from each journal. Studies met inclusion criteria if they were a systematic review/meta analysis and published in English. The extracted primary study's publishing journals were then compared to a list of known or suspected predatory journals, Beall's List. If a study was determined to be published by a predatory journal, additional items were extracted from both the systematic review and the predatory study in a masked duplicate fashion using a pilot-tested Google Form by investigators A.R. and A.D.

Results: Four out of five of the top oncology journals published a systematic review with a primary study published in a predatory journal. In total, 8 systematic reviews (8/50, 16%) contained 18 primary studies published within one of two predatory journals — Genetics and Molecular Research and Oncotarget. Three systematic reviews included more than one predatory publication. One systematic review published by Budach, et al. contained seven predatory publications in their included studies sample. Annals of Oncology included no systematic reviews with a predatory publication. One systematic review by Konstantinopoulos et al., which also served as a clinical practice guideline, included two primary studies that were published in a predatory journal. Collectively, the 18 predatory publications have been cited 670 times.

Conclusion: In conclusion, we found predatory publications to be present in a number of oncology systematic reviews, as well as, in a clinical practice guideline. The purpose of this study was not to explore the accuracy of predatory publications nor the influence they may have on clinical decision making; however, future research is warranted to determine their impact on appropriate healthcare treatment plans. In the future, researchers and clinicians alike should beware of the effect predatory journals have on those individuals who click "submit."

Keywords: Oncology, Predatory Journals, Systematic Review, Cross-Sectional Analysis

**Common respitory findings seen in follow-up chest imaging of patients who were hospitalized and diagnosed with COVID-19**

Ben Rossavik, DO;
Zain Iftikhar, MBBS,
Weyman Lam, MD,
 Iftikhar Hussain, MD

Background: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is responsible for the coronavirus disease 2019 (COVID-19) pandemic. It is an airborne, respiratory infection with multisystemic involvement, notably in the upper and lower airways. Clinical manifestations range from asymptomatic to respiratory failure requiring advanced airway placement with mechanical ventilation, and mortality risk is significant. Although this is a multisystemic disease process, chest imaging has been used to assess patients during and after hospitalization. The objective of this study was to assess common findings seen in follow-up chest imaging studies of patients who were diagnosed and treated with COVID-19 at our local tertiary center.

Methods: We performed an institutional review board (IRB) approved retrospective chart review of patients who were hospitalized and discharged with COVID-19 from our local tertiary center. Our institution's electronic medical record (EMR) was accessed, and a list was generated in Microsoft Excel of COVID-19 patients diagnosed by reverse transcriptase polymerase chain reaction (RT-PCR). Patient data was collected for those who were admitted from March to August 2020. Chest X-ray and chest computed tomography (CT) findings were reviewed anywhere up to >200 days after initial admission. Imaging studies were obtained during initial hospitalization, subsequent hospitalization, or emergency room (ER) visits within the health system that occurred after discharge. The imaging studies were reviewed, specifically those pertaining to respiratory status, and the findings were compared. Commonly reported imaging findings obtained from chest X-ray and chest CT from the chart review included coarsening pulmonary vasculature, cardiomegaly, focal consolidations, atelectasis, effusions, and low lung volume.

 Results: Average age at diagnosis of the patients from the generated list was 74.8 years. Of the list of 232 individuals generated from our health system's EMR, 48 patients had follow-up imaging reviewed, including chest X-ray or chest CT. The majority of studies were obtained within 150 days after initial hospitalization. Of those 48 patients for which follow-up imaging had been obtained, 39 had chest X-ray findings available, and 9 had chest CT findings available for review. As for the more common findings seen in the follow-up chest X-ray or chest CT studies, coarsening pulmonary vasculature was seen most commonly (52.1%), followed by atelectasis (27.1%), and then cardiomegaly (22.9%).

Conclusion: This study demonstrates the more common chest X-ray and chest CT findings obtained in follow-up assessments of COVID-19 patients who were hospitalized at our tertiary center. Chest imaging studies are one of the available ways to assess follow-up in patients hospitalized with a diagnosis of COVID-19. Following chest imaging studies provides one way to assess recovery and complications from COVID-19, although the disease includes multisystemic involvement. Coarsening pulmonary vasculature was most commonly seen in the follow-up imaging studies' results that were available in our patient population. Although studies are needed to assess lasting effect on pulmonary function, follow-up chest imaging studies may provide prognostic value in assessing disease outcomes in COVID-19 patients.

**Implementation of a Pilot Pharmacist-Led Post-Discharge Transitions of Care Service**

*Lyndsay Ryan, PharmD;*
*Crystal David, PharmD, BCPS,*
*Anjly Kunapuli, PharmD,*
*John Bury, PharmD, BCPS, MBA,*
*Leah Rappsilber, PharmD*

Background: With the increase in prevalence of many chronic disease states requiring ambulatory care management and the complicated medication regimens that follow suit, there has become a pressing need for improved healthcare collaboration with medication reconciliation in an effort to ensure positive patient outcomes and safety. We implemented a quality improvement initiative involving recently discharged patients from the Family Medicine Service from OSU Medical Center, utilizing a pilot telephonic pharmacist-led transitions of care program to assess the feasibility and impact of the program.

Methods: This is an IRB approved, quasi-experimental quality improvement initiative. Patients were included in the study if they were documented English-speaking adults at least 18 years of age or older at the time of admission, who were discharged from inpatient Family Medicine Services at OSUMC, had an available discharge summary including a medication list(s), and received outpatient primary care from any provider at any of the three OSU FM Clinics. Patients were excluded from this study if pregnancy was documented during their admission or any time during the study period, or were discharged to a nursing home, psychiatric facility, prison or jail facility, skilled nursing facility (SNF), or long-term acute care (LTAC) facility. Charts for patients who met inclusion criteria for this study were reviewed within both the clinic and hospital EHR to identify and document baseline demographic information and medication discrepancies that occurred since the time of hospital discharge. These patients then received pharmacist-led transitions of care services, which consisted of a detailed medication reconciliation, and a telephone interview within 72 business hours of discharge from OSUMC. Telephone interviews were attempted a maximum of three times. A telephone note was documented for each call within the Family Medicine Clinic's EHR system to describe the encounter and include any potential recommendations or considerations to address at the patient's follow-up visit with their physician.

Results: There were 189 patient discharges identified, 13 of these discharges met exclusion criteria, and 87 discharges did not answer. There were 9 readmissions in the 89 patient discharges. A total of 17 and 13 errors were identified upon discharge and during the patient phone call, respectively. The top three categories of errors identified upon discharge included incorrect duration, dose, or drug selection. The missed doses/barrier to access made up half of the errors identified during the patient phone calls.

Conclusion: During this project, we identified and corrected errors using medication reconciliation, clinical interventions, and patient education. Implementing this pharmacist-led transitions of care program allowed for improved healthcare collaboration with patients and primary care providers to ensure optimal medication-related patient outcomes, safety and adherence, with the goal of preventing hospital readmissions.

Keywords: Transitions of Care, Pharmacist-Led Clinic, Hospital Readmission

**Medical Student Academic Performance Is Not Normally Distributed**

*Nicholas B. Sajjadi, BS.,*
*Kaylea M. Bixler, BS,*
*Joseph Price III, PhD*

Exam score distributions are classically used to introduce students and novice statisticians to the normal distribution. Basing academic assessment on normality in medical education influences tracking student progress and determining curricular efficacy. This study sought to determine whether exam scores of medical students at the Oklahoma State University College of Osteopathic Medicine were normally distributed and to quantify deviations from normality. Exam distribution data for 58 exams from the Class of 2022 and the Class of 2023 were assessed for normality graphically using Q-Q plots and numerically using the Shapiro-Wilk Test for Normality. The resulting p-values from the Shapiro-Wilk test were controlled for the false discovery rate using the Benjamini-Hochberg procedure. Skewness and kurtosis were then determined using the SAS method to minimize bias. 91.37% of exams had statistically significant deviations from normality evidenced graphically and numerically. The average skewness was -0.9484 and the average excess kurtosis was -0.6543. 74.14% of the exams were moderately-to-highly skewed and 89.66% were platykurtotic. All statistical analyses were performed using R (version 4.0.2). The results indicate a curve slumped heavily to the right containing a long, thin left-tail. These findings suggest that there are many high scores on average or that there is a subset of exam scores consistently far below the class average. Characterizing exam performance will enable more robust evaluations of student progress and course efficacy, permitting future investigations exploring causes and implications of non-normal exam score distributions regarding educational outcomes for medical students.

Keywords: Medical Education, Exam, Normal Distribution

**Association of Adverse Childhood Experiences and HIV Testing: A Cross-Sectional Analysis of the Behavioral Risk Factor Surveillance System**

*Nicholas B. Sajjadi, BS;*
*Kristen McPherson, MPH,*
*Bailey Wiggins, BS,*
*Jonas Weygandt, BS,*
*Liza-Ann Whitaker, BS,*
*Madhuri Lad, DO,*
*Micah Hartwell, PhD*

Background: It is estimated that nearly 15% of US adults and adolescents living with HIV are unaware of their seropositivity status and account for approximately 40% of HIV transmission in the US, presenting a major public health concern and stressing the importance of enhanced HIV screening. Adverse Childhood Experiences (ACEs) have been shown to be risk factors for HIV transmission in the US, but the relationship of ACEs and the likelihood of HIV screening in the US has yet to be elucidated.

Methods: Using data from the 2019 Behavioral Risk Factor Surveillance System (BRFSS) dataset, we constructed logistic regression models to determine the likelihood of men and women receiving HIV testing and their past history of ACEs, adjusting for age, sex, sexual orientation, HIV risk, race, education, and healthcare coverage.

Results: The binary logistic regression showed that women were more likely to be tested than men (OR: 1.16; 95%CI: 1.13-1.19) Compared to individuals reporting no ACES, individuals reporting 1 to 3 ACES were significantly more likely to be tested for HIV— the adjusted odds for women being 1.72 (95%CI: 1.63-1.83) and for men being 1.52 (95%CI: 1.35-1.71) controlling for sexual orientation, HIV risk, healthcare coverage, age, race, and education. The odds increased by nearly 100% among both sexes for those reporting 4 or more ACES. Compared to White individuals, Black, Hispanic, and 'other' of both sexes, and Native American women, were more likely to have been tested for HIV.

Conclusions: Our study suggests that US individuals with ACEs are more likely to report being screened for HIV, which may reflect clinical detection of ACEs as risk factors for HIV transmission precipitating enhanced screening. Black Americans were the most likely to report being screened by race, emphasizing the need to continue pursuing this population due to its disproportionate prevalence within the community. Understanding how ACEs relate to HIV screening behavior in the US is vital for increasing seropositivity awareness leading to positive HIV outcomes.

Keywords: HIV, Adverse Childhood Experiences, BRFSS, Preventive Medicine, Public Health

**The Effectiveness of Thoracic Manipulations in Addition to Therapeutic Exercise in Treating Shoulder Impingement Pathologies: A Critically Appraised Topic**

*Tyrus Schmalz, Bachelors; MAT;*
*Tyrus Schmalz, ATS,*
*Tomas Jimenez, ATS,*
*Matthew O'Brien PhD, ATC, LAT, PES, CES*

Clinical Scenario: Shoulder pain is a common complaint in the general population and the most prevalent cause is due to an impingement-related injury. There are many treatment options available for patients with shoulder impingement pathology including dry needling, myofascial release, joint mobilizations, and thoracic manipulations in combination with therapeutic exercise. Clinical Question: In adults ranging from ages 18-60 with shoulder impingement pathologies, does the use of thoracic manipulations in addition to therapeutic exercises reduce shoulder pain and improve shoulder function and range of motion? Summary of Key Findings: Two of the four studies identified the combination of thoracic manipulative therapy and adjunct exercise was more effective for treating patients with shoulder impingement-related injuries than exercise alone. Clinical Bottom Line: Based on the results of the studies included in this critically appraised topic there is moderate evidence to support the use of thoracic manipulations in the treatment of shoulder impingement pathologies in adults. Strength of Recommendation: Grade B evidence exists for the combined use of thoracic manipulations and exercise therapy when treating adults with shoulder impingement related injuries.

**Use of systematic reviews to justify the conduct of urology clinical trials**

*Samuel Shepard, BS; Medical Student;*
*Audrey Wise, BS,*
*Bradley S. Johnson, MA,*
*Micah Hartwell, PhD,*
*Matt Vassar PhD*

Background: Some have estimated billions of dollars each year are lost to health research worldwide. Given the increased amount of research being funded in the field of urology, reducing the amount of research waste is vital. Systematic reviews (SRs) are an essential tool in aiding in reducing waste in research; they are a comprehensive summary of the current data on a clinical question. Given the significant costs and time-intensive nature of randomized controlled trials (RCTs), it is critical that the research questions be carefully selected and prioritized to avoid unnecessary duplication of effort. In this study, we performed a review of urology RCTs to determine whether the trial authors reported having first consulted available SRs to establish the need for conducting their trial. Secondarily we evaluated the ways in which SRs were incorporated into clinical trial reports.

Methods: On December 13, 2019, one of us (BJ) conducted a PubMed search for RCTs published from 2014 to 2019 in the top four urology journals according to their Google Scholar h5-index. These journals were European Urology, BJU international, The Journal of Urology, and Urology. Two of us (SS and AW) underwent training prior to screening and extraction from authors MV and BJ. RCTs were screened, and data was extracted in masked and duplicated fashion as recommended by the Cochrane Handbook. Then each cited SR was evaluated for if it was justification for conducting the trial based on the context the SR was used.

Results: The search returned 566 articles, 276 were included. Overall 61.2% (169/276) the included trials cited a SR though 46.0% (127/276) of the included studies did not cite a SR as justification for conducting the trial. The 403 citations most commonly were found in the discussion 50.8% (205/403) while very few SRs were cited in the methods of trials 3.7% (15/403) A significant association between verbatim justification and type of intervention ($x2=20.23$, $p=0.017$) with 58.1% of 'other' having a SRs verbatim justification, but only 33.1% (39/118) of drug trials having SRs verbatim justification was noted. Trials published in the journal of European Urology were found to contain the most citations of SR's for verbatim justification 36.1% (87/241).

Conclusion: Less than half of the included RCTs cited a SR as justification for conducting the trial. These findings show that even with the increasing number of SRs available and more than a hundred Cochrane urology reviews published there is a disconnect between trialist and use of the existing evidence in trials conducted in the field of urology. If new trials were required to support their studies with SRs we believe this would greatly reduce the amount of research waste within clinical research.

 Keywords: Evidence-based medicine, Randomized controlled trials, Urology, Health Policy, Methodology

**Evaluation of Predatory Journal Publications in Systematic Reviews in the Top Five Otolaryngology Journals: A Cross-Sectional Analysis**

*Bilal Siddiqui, BS; Medical Student;*
*Cole Williams, BS,*
*Ryan Ottwell, BS,*
*Micah Hartwell, PhD,*
*Matt Vassar, PhD*

Introduction: Predatory journals are a form of deceptive publishing that allow authors to pay a fee to bypass quality and legitimacy checks. They are created by for-profit entities that falsely report to publish high quality academic research, but do not follow accepted scholarly publishing guidelines. Thus, authors can easily publish their work without the need for editorial services or peer-review. This deceptive publishing diminishes the credibility of the findings and puts uninformed readers at risk of accepting biased information. The aim of this study was to examine the prevalence of predatory journals within systematic reviews and meta-analysis published in the top 5 otolaryngology journals.

Methods: Using a cross-sectional design the authors systematically searched PubMed for systematic reviews and meta-analyses published in the top 5 otolaryngology journals based upon h-5 indices. Hindices were obtained using Google Scholar Metrics. The first ten systematic reviews were included from the following journals: The Laryngoscope, Head & Neck, Hearing Research, Otolaryngology--Head and Neck Surgery, and Ear and Hearing, so that a final sample size of 50 systematic reviews were obtained. A study was excluded for the following reasons: 1) the study was not a systematic review, 2) the study was not available in English, or 3) the study was not accessible. Ultimately, 45 systematic reviews met the criteria for inclusion and were independently screened by the authors. The primary studies included in each review were extracted and were then examined using Beall's List of Predatory Journals to determine if they were published in a predatory journal. If a systematic review included a primary study was published in a primary journal, then additional data were extracted from both the systematic review and the predatory publication using a pilot-tested Google Form. Data were extracted in masked, duplicate fashion by investigators B.S. and C.W. Disagreements between data sets were resolved by group discussion.

Results: A total of two systematic reviews were found to contain a predatory publication (2/45). Two journals, The Laryngoscope and Otolaryngology--Head and Neck Surgery, both contained a single systematic review which included a predatory journal. The systematic review published in The Laryngoscope had an influence on clinical practice guidelines (Table 1). The predatory journal publication referenced in a systematic review published by Otolaryngology--Head and Neck Surgery was referenced six times (Table 2).

Conclusion: Evidence of predatory publications has been discovered within the top otolaryngology medical journals. Further research must be done to examine the accuracy of these predatory publications and their implications on clinical practice guidelines.

Keywords: Otolaryngology, Predatory Journals, Systematic Review, Cross-Sectional Analysis

### Presence of Selective Brain Cooling in Carnivorans

Katherine Slenker, BA; Graduate Student;

As the world's climate becomes increasingly arid due to anthropogenic climate change, it becomes more pertinent to understand how species will respond to these changes on a physiological level. One of the most endangered mammalian groups is Carnivora, with as high as 25% of species in danger of extinction (IUCN Red List). With numerous mammalian carnivores serving as keystone species, the result of this biodiversity loss would send devastating cascades throughout global ecosystems (Maehr et al 2001). Previous studies have found that members of Artiodactyla utilize a meshwork of cranial vasculature known as the carotid rete to generate a counter-current heat exchange between blood travelling to the brain from the heart via the central arteries and cooler blood returning from the nasal and oral mucosa in a process known as selective brain cooling (SBC) to reduce thermal stress on the brain (O'Brien 2018). This makes them well-adapted to living in arid environments. Concurrently, carnivorans often occupy the same ecological communities as artiodactyls, and therefore need to be able to withstand the same environmental conditions. However, previous studies of the carnivoran rete have focused solely on anatomical mapping in domestic animals, like cats and dogs (Baker & Hayward 1967; Baker 1972; Kier et al 2019), and have ignored wild carnivores. The taxonomic distribution of the carotid rete in carnivorans remains largely unknown. In this study, I outline how I will take the first steps in finding answers to questions about the carnivoran rete: 1) identify the rete's structure and osteological correlates within these species; 2) use this survey to identify which carnivorans even possess a carotid rete. This can be accomplished by computationally isolating cranial vasculature in injected CT scans, and aggregating features into a character matrix to distinguish similarities and variations across Carnivora. Only once this is complete can further investigations into more nuanced inquiries, like the dependence of environmental and habitat parameters on the presence or absence of SBC or the breadth of SBC in paleontological specimens, be made.

Keywords: Carotid rete, Selective brain cooling, Carnivorans, Climate change

**The Effectiveness of Whole-Body Vibration on Improving Neuromuscular Performance After ACL Reconstruction: A Critically Appraised Topic**

*Caitlyn Smit, BS; Graduate Student; MAT;*
*Aric J. Warren, PhD, ATC, LAT, CSCS, CE*

Context: The anterior cruciate ligament (ACL) is located within the knee and is essential in knee kinematics. The rupture of the ACL is a common injury in sports. The rupture can be caused by landing position, sudden stops, planting maneuvers and high velocity contact to a planted foot. There is no set rehabilitation protocol for ACL reconstruction, but many programs focus on regaining strength rather than neuromuscular control or proprioception. Whole Body Vibration (WBV) treatment aims to increase one's ability to activate knee stabilizing muscles, by increasing neuromuscular control. By increasing neuromuscular control, the patient is better able to activate the muscles necessary to stabilize the knee and protect the ACL.

Clinical Question: Is WBV treatment effective in increasing neuromuscular performance after undergoing ACL reconstruction in both males and females?

Summary of Key Findings: The following data bases were used to search terms of anterior cruciate ligament, anterior cruciate ligament reconstruction, whole body vibration treatment (PubMed, EBSCOHost, and SPORTSDiscus.) Only peer reviewed studies that were randomized control trials that were published within the last 7 years were included. Of the three studies included, all found that whole body vibration treatment improved neuromuscular performance when compared to traditional rehabilitation programs.

Clinical Bottom Line: There is recent evidence that identifies positive increases of neuromuscular control after whole body vibration treatment in male and female patients who have had ACL reconstruction. Strength of recommendation: 2

Keywords: Anterior cruciate ligament, Anterior cruciate ligament reconstruction, Whole body vibration treatment

**Analyzing Consistency Among Various Resources Utilized by Medical Students**

*Snighda Smriti, MPH;*
*Joseph A. Price III, PhD*

Medical students are faced with not only a myriad of material they are expected to learn but also a wide range of resources that they can utilize to obtain their necessary information. With a wide selection of resources, it is important to gauge the extent of uniformity that may or may not be present amongst these resources often used by the medical students and faculty alike. In this study, network analysis has been used in order to assess the consistency amongst the topics that are found in course materials, reference materials, and review books. All analyses and visualizations in this study are conducted using R programming software. The various resources have been assessed using multiple similarity indices, and a novel use of network data visualization tools and multiple network analytic variables in order to obtain a comprehensive interpretation.

 The appearance of these graphs, homophily, and other network metrics using similarity indices reveals consistency amongst these various study tools which topics they discuss. Topics do not segregate by type. Results are similar with all four similarity indices. There is a predictable trend for board review books to have fewer topics. This study provides an insight into the evaluation of educational resources by network and statistical methods, and the consensus by experts on the choice of important topics for medical students.

 Keywords: Network, Consensus, Overlap, Academic Resources

**Domain Specific Adverse Childhood Experiences and Depression Diagnoses in Adulthood**

*Kelsey Snider, MM;*
*Abby Davis, BS,*
*Andrew O'Neil, BS,*
*Campbell Ernst, MAT,*
*Zachary Giano, PhD,*
*Randolph D. Hubach, PhD, MPH*

Background: Adverse childhood experiences (ACEs) are associated with increased incidence of poor mental health outcomes and depression diagnoses, yet little is known about the increased risk of depression among specific ACE domains. This study investigates the frequencies of those with a depression diagnosis across each ACE domain and which specific ACE domains are linked to a higher likelihood of receiving a depression diagnosis.

Methods: ACEs data were collected via the CDC's BRFSS (Behavioral Risk Factor Surveillance System). Eight domains are included in the ACEs survey: sexual abuse, emotional abuse, physical abuse, interparental violence, incarcerated household member, household mental illness, household substance use, and parental separation/divorce. After excluding those with an ACE score of 0 and 8, a sample size of 52,971 adults was analyzed. The frequency of a depression diagnosis was analyzed within each ACE score as well as across each ACE domain. A series of logistic regressions within each ACE score determined the odds of a depression diagnosis from each ACE domain.

Results: Incidence of depression diagnoses was higher in individuals in each ACE group (e.g., those with exactly three ACEs) who had sexual abuse or family mental illness. For example, in those with one ACE, 23% of those with sexual abuse had depression diagnoses and 30% of those with familial mental illness had depression diagnoses, compared to 14-16% with depression diagnoses of all other ACE domains (e.g., physical abuse) within those with an ACE score of one. When comparing all individuals aggregately with ACEs between 1 and 7, sexual abuse (39%) and family mental illness (42%) constituted the highest percentage of depression diagnosis compared to all other domains (29-34%). Family history of mental illness had the highest odds ratio of depression diagnosis, as individuals with an ACE score of 1 were 3.5 times more likely than those with an ACE score of 1 without family history of mental illness (OR=3.508, 95% CI 2.866-4.295). Among those with 1 ACE, the second highest odds ratio are those who experienced sexual abuse who are two times more likely to receive a depression diagnosis when compared to those with no history of childhood sexual abuse (OR=1.770, 95% CI 1.427-2.194). When comparing individuals with ACE score ranging from 1-7, those with a familial history of mental illness were 2.8 times more likely than those without a familial history of mental illness to receive a depression diagnosis (OR=2.841, 95% CI 2.732-2.955) and individuals with a history of sexual abuse were 1.7 times more likely than those who did not experience sexual abuse to be diagnosed with depression (OR=1.692, 95% CI 1.621-1.766).

Conclusion: Though each ACE domain is scored equally, sexual abuse and family mental illness have higher statistical links to depression compared to the other six domains. Identifying individuals with ACE domains comprised of sexual abuse or family mental illness can be crucial in prevention and intervention programs focused on the antecedents of depressive disorders, hopefully leading to improved patient outcomes.

**Evaluation of Predatory Journal Publication in Systematic Reviews in the Top Five Obstetrics and Gynecology Journals: A Cross-Sectional Analysis**

*Kelsey Snider, MM; Medical Student;*
*Rigel Bacani, BA,*
*Ryan Ottwell, BS,*
*Micah Hartwell, PhD,*
*Matt Vassar, PhD*

Background: Predatory journals are pay-for publications that lack editorial or peer-review processes foundational in high quality publishing efforts, which brings to question the validity and legitimacy of these research publications. The influence of predatory journals is far reaching, resulting in public distrust in scholarly research and even wasted funds. In medical research, the lack of a review process may directly influence patients as guidelines and systematic reviews inform physicians' diagnoses and treatment plans. As the number of predatory journals continues to rise, the goal of our study is to determine the prevalence of predatory journals in systematic reviews related to obstetrics and gynecology research.

Methods: The top five obstetrics and gynecology journals were obtained using the h-5 index on Google Scholar Metrics: American Journal of Obstetrics and Gynecology, Gynecologic Oncology, Obstetrics and Gynecology, Human Reproduction Update, and Obstetrical and Gynecological Survey. Using a crosssectional design, we searched PubMed for 10 systematic reviews and meta-analysis from each of the top 5 obstetrics and gynecology journals so that a final sample size of 50 systematic reviews was achieved.Two independent authors (KS and RB) extracted the primary studies included in each systematic review and identified those published in predatory journals by cross referencing Beall's list. Systematic reviews which contained predatory publication underwent further data extraction using a pilot-tested Google form, Additionally, the predatory publications were also extracted for general characteristics using a similar Google Form. Data extraction occurred in a masked, duplicate fashion by investigators K.S. and R.B. Any disagreements in the data were resolved via group discussion until an interrater reliability of 100% was achieved.

Results: Of the 50 systematic reviews analyzed, two (2/50, 4%) included a primary study published in a predatory journal (Table 1). One systematic review was referenced in a clinical practice guideline. The systematic review published in American Journal of Obstetrics and Gynecology was referenced once, and the other systematic review published in Gynecologic Oncology had not been cited. The primary studies in predatory journals had been cited a total of 19 times (Table 2).

Conclusion: The presence of predatory journals within studies involved in clinical practice guidelines indicate the need for more awareness and education on the rise of predatory journals, as this could have negative consequences on patient care. Additionally, more data is needed to determine the depth of predatory journal invasion in obstetrics and gynecology research.

Keywords: Predatory Journals, Obstetrics and Gynecology, Systematic Review, Cross-Sectional Analysis

Utilizing athletic training evaluation and intervention techniques to improve firefighter functional preparedness

Stephanie Sontag, MS;
Aric J. Warren, PhD, LAT, ATC,
Steve Lintern, MS, LAT, ATC,
 Jennifer L. Volberding, PhD, LAT, ATC

Firefighting is an inherently high risk and potentially life-threatening career, and firefighters often maintain full active duty status while battling chronic conditions related to the risks and continuous preparation for the job including, but not limited to low back pain, cardiovascular problems, and other aches and pains making it difficult to perform their duty. PURPOSE: To determine the effectiveness of a functional assessment based, athletic trainer prescribed fitness regime on firefighter functional testing and performance. METHODS: Firefighters from a single suburban fire department ($\bar{X}\pm SD$; N=24, Body Mass=91.4±14.6 kg, Height=69.3±3.8 cm, Service Years=13.2±9.2) volunteered for this study. Subjects performed a basic health/fitness assessment that included The Functional Movement Screen (FMS) that is a series of 7 movement patterns assessed by clinicians on a scale of 1-3, sit and reach test, and blood pressure. Following the assessment, subjects began a semi-individualized 12-week training intervention consisting of functional training, strength training, and/or running based on movement deficiencies indicated by the initial assessment. All programs included corrective exercises for deficiencies including T-spine mobility, shoulder rotator cuff weakness, core and low back stability, calf tightness and ankle dorsiflexion improvement, and hip mobility and strengthening. Athletic trainers involved in programming were CSCS. Following the 12-week intervention, subjects were reassessed with the initial health assessment. Paired samples t-tests were used to analyze assessment changes for each measure. RESULTS: Three of the seven FMS tests significantly improved following the intervention including Hurdle Step Pre (2.00±0.00) to Post (2.38±0.49) (p=0.001), Stability Pushup Pre (1.88±0.45) to Post (2.83±0.38) (p<0.001), and Rotary Stability Pre (1.58±0.65) to Post (2.21±0.51) (p=0.001). Total FMS score (scale 0-21) improved Pre (15.17±1.66) to Post (16.75±2.03) (p=0.001) although Shoulder Mobility decreased Pre (2.54±0.51) to Post (1.83±0.70) (p=0.001). Sit and Reach performance improved Pre (25.54±9.89 cm) to Post (29.54±6.37 cm) (p=0.006). Systolic Blood Pressure decreased Pre (131.21±12.15 mmHg) to Post (119.33±11.44 mmHg) (p=0.002). CONCLUSION: Athletic training evaluation and intervention techniques may be a beneficial way to improve functional preparedness, trunk stability, and health measures like blood pressure associated with the demands and stress of tactical populations. PRACTICAL APPLICATION: Firefighters and other tactical populations may want to implement athletic training led interventions to improve functional movement related problems caused by the high physical demand of the job.

**Evaluation of Predatory Journal Publication in Systematic Reviews in the Top Five Dermatology Journals: A Cross-Sectional Analysis**

*Jordan Staggs, BS; Medical Student*
*Elizabeth Garrett, B.A.,*
*Brooke Hightower, B. S.,*
*Ryan Ottwell, B.S.,*
*Micah Hartwell, Ph.D.,*
*Matt Vassar, Ph.D.*

Introduction: Predatory journals are a growing concern in research as these journals do not follow publication rules and often go without robust review and editing. The research published in predatory journals pose a threat to scientific literature as the information within a predatory publication can be false or misleading as they often are not peer-reviewed. This misinformation may be referenced in medical literature which could affect medical decision making; and ultimately, patient care. To our knowledge, no studies have evaluated whether systematic reviews — the gold standard of scientific evidence — contain predatory publications. Thus, the purpose of this study was to identify whether systematic reviews and meta-analyses published in the top 5 dermatology journals included primary studies from predatory journals.

Methods: Using a cross-sectional design, we searched PubMed for systematic reviews published from the following journals: the Journal of the American Academy of Dermatology (JAAD), JAMA Dermatology, British Journal of Dermatology (BJD), Journal of Investigative Dermatology (JID), and the Journal of the European Academy of Dermatology and Venereology (JEADV). Ten publications were independently screened from each journal so that a total of 50 systematic reviews were extracted for their included primary studies. Predatory journals were determined using Beall's list. If a systematic review was found to contain a primary study published in a predatory journal additional data were extracted using a pilot-tested Google Form. Data were extracted in masked triplicate fashion by authors J.S. B.H. and E.G.. Author disagreements were resolved by group discussion.

Results: Two systematic reviews contained predatory journals (2/50; 4%). JAAD was the publishing journal for both of the systematic reviews containing predatory publications. Neither systematic reviews were referenced in a clinical practice guideline, but they were collectively referenced 45 times in other publications (Table 1). In total, the primary studies that were published by a predatory journal were cited 16 times (Table 2).

Conclusion: Our study shows that even the most highly accredited dermatology journals are infiltrated by predatory publications. Further research should explore the accuracy of these predatory journal publications and their potential impact on patient care.

Keywords: Dermatology, Predatory journal, Systematic reviews

**Evaluation of Predatory Journal Publication in Systematic Reviews in the Top Five Neurology Journals: A Cross-Sectional Analysis**

*Bethany Sutterfield, BS; Medical Student;*
*Mahnoor Khalid, BS,*
*Ryan Ottwell, BS,*
*Micah Hartwell, PhD,*
*Matt Vassar, PhD*

Background: Predatory journals publish research in an accelerated process that often costs researchers money and, at times, their work. The articles these journals publish have not been appropriately reviewed and can contain false or unmerited information. Other researchers could then cite these journals in their papers without realizing they are predatory publications. The inclusion of predatory publications may perpetuate misinformation and can affect medical literature harmfully; and, ultimately, patient care. Predatory journals can be particularly dangerous if cited in systematic reviews as they are the gold standard of scientific literature. Thus, our primary objective to determine the number of predatory journals included in systematic reviews published by highly reputable neurology journals.

Methods: Using a cross-sectional design we systematically searched PubMed for systematic reviews and meta-analyses published in the top 5 neurology journals based upon h-5 indices. H-indices were obtained using Google Scholar Metrics. The first ten systematic reviews were included from the following journals: Brain, Journal of Neuroscience, Neurology, Neuroimage, and The Lancet, so that a final sample size of 50 systematic reviews were obtained. A study was excluded for the following reasons: 1) the study was not a systematic review, 2) the study was not available in english, or 3) the study was not accessible. Each systematic review was independently screened by B.S. and M.K., and the primary studies included in each review were extracted. These primary studies were then examined using Beall's List of Predatory Journals to determine if they were published in a predatory journal. If a systematic review included a primary study published in a primary journal, then additional data were extracted from both the systematic review and the predatory publication using a pilot-tested Google Form. Data was extracted in masked, duplicate fashion by authors B.S. and M.K., disagreements were resolved by group discussion. When an agreement could not be resolved author R.O. was available for adjudication.

Results: In total 47 systematic reviews were included in our final sample — the Journal of Neuroscience only published seven systematic reviews. Of the 47 systematic reviews no primary study was found to be published by a predatory journal (0/380, 0%).

Conclusions: Our study found systematic reviews published by the top 5 neurology journals are void of predatory publications. Future research should explore whether other neurology journals publish systematic reviews which contain primary studies published in predatory journals.

Keywords: Predatory journals, Neurology, Systematic review

# Metrics of OSUCOM Exam Question Statistics Abstract

*Lindsay Terry, BS; Medical Student*
*Joseph A. Price III, Ph.D*

Determining whether statistics on medical school exam are reported accurately or not has recently been an object of focus. Our goal was to find the answer to this same question for exams at our institution. Percent difficulties, discrimination index, and point biserial of each exam question are compiled and reported. These exam statistics were taken over a sample of 26 courses from the Oklahoma State College of Osteopathic Medicine curriculum. The programming software R was used for a graphical exploration of the data. Exam data shows that question difficulty is negatively skewed and that both discrimination index and point biserial are positively skewed. Only point biserial is highly skewed. Kurtosis is also only significant for point biserial. This is significant because we have greater insight as to whether exam questions are well-written, based on how they perform.

Keywords: Exam, Percent difficulties, Discrimination index, Point biserial

**Oxycodone-induced dependence modifies BDNF levels within the fronto-cerebellar circuitry in adult male rats**

*Alejandro Torres, BS; Graduate Student;*
*Zinar Simsek, Dolores Vazquez Sanroman PhD*

Introduction: Recent studies support the involvement of the cerebellum in addiction. Opioid receptors mu- and kappa-varieties are present in the cerebellum; nonetheless, the effects of oxycodone in the cerebellum are unknown. Brain-Derived Neurotrophic Factor (BDNF), the precursor proBDNF, and the matureBDNF regulate opioid induced-plasticity in the mature brain; thus, it may be pivotal in oxycodone rewarding properties and responses.

Aim: determine the effects of oxycodone induced-conditioned place preference (CPP) on levels of ProBDBF/mature-BDNF in the prefrontal cortex and cerebellum. On PND120, male adult rats were tested for CPP after being randomly assigned to the oxycodone drug group (four daily 20-min pairings with oxycodone (3 mg/kg, s.c.) and four daily pairings with saline on alternate days) or the vehicle group (eight 20-min pairings with saline). Following conditioning, rats were given a 20-min CPP test for evaluating oxycodone preference. After the preference test, brains were collected and analyzed for Pro and Mature BDNF levels with an immunoassay (ELISA).

Results: oxycodone induced CPP [ $F_{(1, 21)} = 55.02$, $p < .001$]. Furthermore oxycodone induced-CPP increased levels of Pro-BDNF in the PFC [$F_{(1, 21)} = 14.46$, $p < .001$] and decreased levels in the cerebellum [ $F_{(1, 21)} = 7.82$, $p < .01$]. Conclusions: Oxycodone CPP modified Pro-BDNF levels in a "seesaw" mechanism in the fronto-cerebellar circuitry. Thus, pro-BDNF may be required neurotrophins in the opioid-induced reorganization of frontocerebellar circuitry and fronto-cerebellar dysfunction.

Keywords: BDNF, Cerebellum, Oxycodone, Addiction

**An Analysis of Rates of Discontinuation and Nonpublication in Colorectal Cancer Clinical Trials**

Brett Traxler, BS;
Tomi Adewumi, MBS, MHA,
Madison Puckett, BS,
 Corbin Walters, BS,
Chase Meyer, DO,
Matt Vassar, PhD

Background: Thousands of clinical trials are conducted every year across the world. In 2018, the National Institutes of Health — a United States government agency for biomedical and public health research subsidized by American citizen taxes — allocated over $200 million for evaluating treatments for colorectal cancer (CRC). This data provides necessary information for the advancement of pharmaceuticals and medical procedures. The nonpublication of the data from completed clinical trials poses an ethical dilemma for patients and providers. Discontinuation of trials also threatens patients as they are given potentially harmful experimental drugs or undergo procedures in which no data gets published. Here, the rates of discontinuation and nonpublication of clinical trials relating to colorectal cancer are shown in the provided tables.

Methods: We performed an advanced search on ClinicalTrials.gov on pertaining to the treatment of CRC using the keyword colorectal cancer. We attempted to locate a publication for each registered trial by their NCT number. For each clinical trial, links to the publication provided by ClinicalTrials.gov were searched and verified to be correct. If a publication was unable to be found using the methods above, we attempted to locate the email address of the lead investigator or sponsor listed on the ClinicalTrials.gov website to inquire status of trial.

Results: Of the 123 (123/428, 28.7%) discontinued trials, a reason for discontinuation was provided for 49 (49/123, 39.8%) trials on ClinicalTrials.gov and 8 (8/123, 6.5%) from email correspondence with trial authors making a total of 57 (57/123, 46.3%) reasons for discontinuation of trials found. After email correspondence, 50 (50/123, 40.7%) trials were terminated, 5 (5/123, 4.1%) were withdrawn, 2 were suspended (2/123, 1.6%), and 66 (66/123, 53.7%) were discontinued for unknown reasons. Of the 305 (305/428, 71.3%) completed trials, 244 (244/305, 80.0%) had a verifiable publication, while 61 (61/305, 20.0%) did not publish their findings or were unable to be located. Of the 244 (244/305, 80.0%), 233 (233/244, 95.5%) had provided links on ClinicalTrials.gov or were easily searchable using research protocols highlighted above, with 11 (11/244, 4.5%) located from links provided by email correspondence with trial authors.

Conclusion: We found that over half of all results of clinical trials related to CRC did not get published. This is a problem that creates significant waste within medical research. Our study found in colorectal cancer research, nearly 1 in 3 clinical trials do not get published and 1 in 4 trials are discontinued. Not only that, but also over 1 in 5 patients were involved with clinical trials that did not publish results. More transparency is needed when it comes to clinical trials pertaining to CRC. Publication of results from both completed and discontinued RCTs can help researchers make more informed decisions. Nonpublication of clinical trials subjects patients to potentially harmful interventions while foregoing the only benefit that ensues from said interventions, which is the possibility to advance scientific research and education.

Keywords: Colorectal Cancer, Clinical Trials, Nonpublication, Discontinuation

**Prevalence of financial conflicts of interest among systematic review authors regarding the management of proximal humerus fractures**

Cole Verble, BS;
Matthew C. Ferrell, B.S.,
Arjun Reddy, B.A.,
 J. Michael Anderson, B.S.,
Michael Weaver M.S.,
Micah Hartwell Ph.D.,
Matt Vassar, Ph.D

Background: A systematic review is an important evidence synthesis technique used to collate results from individual studies, such as on treatments for proximal humerus fractures. Thus, a need exists for reliable and unbiased systematic reviews. The aim of this study was to characterize the influence of financial bias on the results and conclusions of systematic reviews and to characterize the nature of disclosed and undisclosed COIs of their authors.

Methods: Ovid MEDLINE and Ovid Embase databases were searched to locate systematic reviews covering proximal humerus fracture treatments. Following these searches, title and abstract screening was performed in a triplicate, masked fashion. Data from the final reviews comprising our sample were extracted in the same manner as screening. These data included several characteristics about the systematic reviews and about the authors, including: PubMed ID and/or DOI; journal name; publication date; name of authors; affiliations; compared treatment interventions; source of funding; full COI statement; risk of bias assessment; verbatim risk of bias statement; whether systematic review author(s) on any of the primary studies included in the review; number of self-cited primary studies; the articles primary outcome or the first outcome reviewed; whether an overall pooled effect estimate was calculated; pooled effect estimate for the primary outcome; type of calculated pooled effect estimate; significance of pooled effect estimate; the primary outcomes favorability of pooled effect estimate; and what was favored in the narrative results and conclusions. All authors of each systematic review were screened for non-disclosed COIs through a stepwise process which included 3 additional databases – the Open Payments database, Dollars for Profs, and the United States Patent and Trademark Office (USPTO). We evaluated for risk of bias using the Cochrane Collaboration's criteria.

Results: We found no relationship between authorial COI and the results and conclusions of the systematic reviews; however, this finding is tempered by the small sample size of the included studies. Among the 17 included systematic reviews, 7 (41.2%) had at least one non-disclosed COI. Of the 7 reviews with a non-disclosed COI, 2 (28.6%) were found to have a high risk of bias. We were unable to assess for an association between industry funding and study outcomes and conclusions since no systematic reviews funded by industry were retrieved.

Conclusions: Findings from this study should be placed in light of our small sample size. Larger studies to elucidate the effect of financial bias on the results and conclusions of systematic reviews are clearly warranted.

Clinical Relevance: Financial bias has the potential to affect the outcomes and conclusions of systematic reviews. Patient care and clinical decision making are contingent upon well-designed, well-executed, and well-reported studies; thus, it is critical to understand the role of financial bias in systematic reviews.

**Prevalence of financial conflicts of interest among systematic review authors regarding the management of proximal humerus fractures**

Cole Verble, BS;  Matthew C. Ferrell, B.S.,
Arjun K. Reddy, B.A.,  J. Michael Anderson, B.S.,
Michael Weaver M.S.,  Micah Hartwell PhD.,  Matt Vassar, PhD

Background: A systematic review is an important evidence synthesis technique used to collate results from individual studies, such as on treatments for proximal humerus fractures. Thus, a need exists for reliable and unbiased systematic reviews. The aim of this study was to characterize the influence of financial bias on the results and conclusions of systematic reviews and to characterize the nature of disclosed and undisclosed COIs of their authors.

Methods: Ovid MEDLINE and Ovid Embase databases were searched to locate systematic reviews covering proximal humerus fracture treatments. Following these searches, title and abstract screening was performed in a triplicate, masked fashion. Data from the final reviews comprising our sample were extracted in the same manner as screening. These data included several characteristics about the systematic reviews and about the authors, including: PubMed ID and/or DOI; journal name; publication date; name of authors; affiliations; compared treatment interventions; source of funding; full COI statement; risk of bias assessment; verbatim risk of bias statement; whether systematic review author(s) on any of the primary studies included in the review; number of self-cited primary studies; the articles primary outcome or the first outcome reviewed; whether an overall pooled effect estimate was calculated; pooled effect estimate for the primary outcome; type of calculated pooled effect estimate; significance of pooled effect estimate; the primary outcomes favorability of pooled effect estimate; and what was favored in the narrative results and conclusions. All authors of each systematic review were screened for non-disclosed COIs through a stepwise process which included 3 additional databases – the Open Payments database, Dollars for Profs, and the United States Patent and Trademark Office (USPTO). We evaluated for risk of bias using the Cochrane Collaboration's criteria.

 Results: We found no relationship between authorial COI and the results and conclusions of the systematic reviews; however, this finding is tempered by the small sample size of the included studies. Among the 17 included systematic reviews, 7 (41.2%) had at least one non-disclosed COI. Of the 7 reviews with a non-disclosed COI, 2 (28.6%) were found to have a high risk of bias. We were unable to assess for an association between industry funding and study outcomes and conclusions since no systematic reviews funded by industry were retrieved.

Conclusions: Findings from this study should be placed in light of our small sample size. Larger studies to elucidate the effect of financial bias on the results and conclusions of systematic reviews are clearly warranted.

 Clinical Relevance: Financial bias has the potential to affect the outcomes and conclusions of systematic reviews. Patient care and clinical decision making are contingent upon well-designed, well-executed, and well-reported studies; thus, it is critical to understand the role of financial bias in systematic reviews.

Keywords: Conflicts of Interest, Proximal Humerus Fractures, Systematic Reviews

**Utilizing athletic training evaluation and intervention techniques to improve firefighter motion**

*Jennifer L Volberding, PhD, LAT, ATC;*
*Aric J. Warren PhD, LAT, ATC,*
*Steve Llintern MS, LAT, ATC*

The profession of firefighting is an inherently high risk and potentially life-threatening. Firefighters are required to maintain a full active duty status while battling chronic conditions related to the risks and continuous preparation for the job. These risks may include but are not limited to low back pain, cardiovascular problems, and other aches and pains making it difficult to perform their duty. Often, these chronic aches and pains may be directly related to decreased range of motion. PURPOSE: To determine how often firefighters suffer chronic pain and the impact of a twelve week intervention strategy to improve range of motion. METHODS: Firefighters from a single suburban fire department ($\overline{X}\pm SD$; N=23, Body Mass=91.4±14.6 kg, Height=69.3±3.8 cm, Service Years=13.2±9.2) volunteered for this study. A health history was conducted to determine if the participants complianed of chronic pain that did not require them to miss work and how often that pain occurred. Subjects then performed a basic health/fitness assessment that included a comprehensive range of motion assessment that included thirteen measurements on each limb: hip flexion, hip extension, hip internal rotation, hip external rotation, hip abduction, hip adduction, knee flexion, ankle dorsiflexion, ankle plantarflexion, shoulder extension, shoulder flexion, shoulder internal rotation, and shoulder external rotation. Following the assessment, subjects began a semi-individualized 12-week training intervention consisting of functional training, strength training, and/or running based on movement deficiencies indicated by the initial assessment. All programs included a comprehensive stretching protocol and all participants received a stretch band and instruction. Following the 12-week intervention, subjects were reassessed with the initial health assessment. Paired samples t-tests were used to analyze assessment changes for each measure. RESULTS: Thirteen participants stated that they suffer from chronic pain that did not require them to miss work for an average of 4.69 + 2.01 days per week. Seven of the twenty six range of motion assessments demonstrated a statistically significant change over the 12-week program. Four improved: right hip flexion ($p < 0.03$), right hip internal rotation ($p < 0.00$), left hip flexion ($p < 0.4$) and left hip internal rotation ($p < 0.02$). Three motions decreased: right hip external rotation ($p < 0.2$), left hip external rotation ($p < 0.3$) and left ankle plantarflexion ($p < 0.04$). CONCLUSION: Generalized whole body stretching techniques have been demonstrated in the literature to improve range of motion. This study demonstrated improvement in hip range of motions. Improvements in hip range of motion can decrease the risk of low back injuries, which are prevelant in the firefighting population. Future studies should implement more subject specific stretching strategies to focus on individual deficits. PRACTICAL APPLICATION: Firefighters and other tactical populations may want to implement range of motion strategies to movement and function related problems caused by the high physical demand of the job.

**Spin in Abstracts of Systematic Reviews and Meta-Analyses of Melanoma Therapies: A Cross-Sectional Analysis**

*David Wenger, BA; Medical Student;*
*Ross Nowlin, BS,*
*Alexis Wirtz, BS,*
*David Wenger, BS,*
*Ryan Ottwell, BS,*
*Courtney Cook, DO,*
*Wade Arthur, BS,*
*Micah Hartwell, PhD,*
*Matt Vassar, PhD*

Spin is defined as the misrepresentation of a study's results, which may lead to misperceptions or misinterpretation of the findings. Spin has previously been found in randomized controlled trials and systematic reviews of acne vulgaris treatments and treatments of various non-dermatological conditions. The purpose of this study was to quantify the presence of spin in systematic reviews and meta-analyses of melanoma therapies and identify any related secondary characteristics of these articles. A total of 200 systematic reviews met the inclusion criteria. We identified spin in 38% of the abstracts. The most common type of spin found was type 3, occurring 40 times; the least common was type 2, which was not present in any included abstracts. We found that abstracts pertaining to pharmacologic interventions were 3.84 times more likely to contain spin than the reference group. We found no significant correlation between funding source, other study characteristics, and the presence of spin. We have found that spin is fairly common in systematic reviews of melanoma treatments. Here we offer recommendations with rationale to reduce spin and improve the overall reporting in systematic review abstracts.

**Evaluation of Industry Relationships Among Authors of Systematic Reviews and Meta-analyses Regarding Ménières Disease**

*David Wenger, BA*
*Ross Nowlin, BS,*
*J. Michael Anderson, BS,*
*Michael Weaver, MS,*
*Austin Johnson, BS,*
*Micah Hartwell, PhD,*
*Matt Vassar, PhD*

Systematic reviews (SR) and meta-analyses (MA) are frequently used in the formation of clinical practice guidelines and ultimately treatment recommendations. As such, undisclosed industry ties in SRs and MAs introduce bias into the foundation of treatment guidelines potentially leading to poor recommendations. The purpose of this study was to quantify the presence of conflicts of interest (COI) in SRs and MAs of Ménières disease treatment and identify any related secondary characteristics of these articles. A cross-sectional approach was used on May 28, 2020, to search the MEDLINE and Embase databases from their inception. To meet inclusion criteria, a study must be a SR or MA pertaining to a head-to-head treatment comparison for Ménières disease. Studies must be reported in English and published between September 1, 2016 and June 2, 2020. Data extraction was conducted in a masked, duplicate fashion and included: favorability of study results/discussion, presence of author on the Open Payments Database, Pro Publicas Dollars for Profs, Google Patent, and the United States Patent and Trademark Office (USPTO) and the accuracy of COI disclosure in the included study. A risk of bias assessment was subsequently performed on the included studies according to the Cochrane Collaboration risk of bias assessment criteria. A total of 13 systematic reviews conducted by 49 authors met the inclusion criteria. Analysis of these studies and authors indicated that COIs are present in authors of SRs about Meniere's Disease; with 38.5% of reviews containing a conflict of interest and 17.75% of authors having an undisclosed COI. Approximately 1 in 5 authors of SRs regarding Ménières disease contained an undisclosed COI. Overall authors of SRs pertaining to Ménières disease appear to be properly disclosing COI at higher rates than other fields of medicine; however, further room for improvement has been noted. We recommend standardization of COI reporting across medical journals as well as improved disclosure methods in relation to international research in an effort to ensure a fully transparent and trustworthy product.

**Cancer screening among veterans compared to civilians: A cross-sectional analysis of the Behavioral Risk Factor Surveillance System**

Jonas Weygandt, BS; Jonas Weygandt, BS,
 Kristyn Robling, BS., Liza-Ann Whitaker, BS,
 Kristen McPherson, MPH., Micah Hartwell, PhD,
Benjamin Greiner, DO, MPH

Background: A 2009 study found that cancer rates among active-duty military personnel were lower for all cancers except breast and prostate. Rates of cancer screenings also differ among veterans based on which insurance was used to cover healthcare costs. Veterans using veteran-status related health care such as TRICARE, military health insurance for active duty and veteran personnel, were more likely to report being screened for colorectal cancer via colonoscopy than veterans using private insurance. However, no study has compared rates of screening for cancer between veteran and civilian populations in the United States; thus, the purpose of this study is to compare differences in screening rates for colorectal, lung, breast, and cervical cancers between veteran and civilian populations.

Methods: A cross-sectional analysis of the 2018 and 2019 Behavioral Risk Factor Surveillance System (BRFSS) was performed to assess the rates of cancer screening among Veterans compared to civilians. Respondents were classified as having been screened for cancer if they answered "yes" or "no" to the corresponding screening questions. Other data extracted included sociodemographics and comorbid conditions. In accordance with the U.S. Preventive Services Task Force Grade guidelines, persons greater than 24 years of age were included in the cervical cancer screening, 50 years of age for colon cancer screening, and 40 years of age for the breast cancer screening— the latter based on the recommendations from the American Cancer Society. To determine the adjusted risk ratios (ARR) of veterans receiving screening compared to civilians, multivariate logistic regression models were constructed. ARRs were adjusted for the following variables: age, gender, race, education, and healthcare coverage.

Results: Among the women-focused analyses, only 2.6% and 2.2% of respondents were veterans for cervical cancer and breast cancer, respectively. Approximately 10% were veterans for skin and lung cancer screening evaluation and nearly 15% were veterans in the CRC analysis. Prevalence of screening was higher for veterans among all types of cancer with the exception of cervical breast cancer. When controlling for age, race, education, and healthcare coverage, veterans were statistically more likely to be screened for CRC (ARR: 1.05; 95%CI: 1.04-1.07), skin cancer (ARR: 1.28; 95%CI: 1.24-1.32), and lung cancer (ARR: 1.32; 95%CI: 1.15-1.52; Table 3). The odds of having completed a cervical or breast cancer was not significantly different between veterans and civilians.

Conclusion: Our study showed that veterans were more likely to complete colorectal, skin, and lung cancer screenings than the civilian population. Although veterans were equally or more likely to receive cancer screenings, improvements can still be made to increase screening usage in this population. These solutions should be multifactorial and address occupational exposures during service as well as personal, organizational, and societal barriers. Examples include client reminders, physician audits, and one-onone patient education, all of which have been shown to be efficacious in reducing personal barriers to cancer screenings.

Keywords: Cancer Screening, Civilians, United States, Veterans

**Do author conflicts of interest and industry sponsorship influence outcomes of systematic reviews and meta-analyses regarding glaucoma interventions? A cross-sectional analysis**

*Audrey Wise, BS;*
*Deepika Mannem, MS,*
*J. Michael Anderson, BS,*
*Michael Weaver, MS,*
*Micah Hartwell, PhD,*
*Matt Vassar, PhD*

Background: Previous studies have demonstrated that authors' conflict of interest can influence outcomes of systematic reviews (SRs). Therefore, we aimed to determine whether the presence of one of more conflicts was associated with more favorable results and conclusions in systematic reviews of glaucoma interventions.

Methods: MEDLINE and Embase were searched for systematic reviews of glaucoma treatments published between September 1, 2016 and June 2, 2020. Author conflicts of interest were located using multiple databases (e.g., CMS Open Payments Database, Dollars for Profs, Google Patents, the United States Patent and Trademark Office USPTO) and previously published disclosure statements. Study sponsorship was determined using each review's funding disclosure statement.

Results: Our study included 26 systematic reviews conducted by 108 authors. Of these reviews, nine (34.6%) were conducted by at least one author with an undisclosed conflict of interest. Of those nine, three (33.3%) reported results favoring the treatment group, and five (55.6%) reported conclusions favoring the treatment group. Of the 17 systematic reviews with no conflicted authors, one (5.9%) reported results favoring the treatment group, and two (11.8%) reported conclusions favoring the treatment group. Fisher's exact tests demonstrated that these differences held a statistically significant association between author conflicts and the favorability of the reviews' conclusions towards the treatment group (P = 0.04).

Conclusions: We found that systematic reviews conducted by one or more authors with conflicts of interest were more likely than those with no conflicted authors to draw favorable conclusions about the investigated intervention.

Keywords: Glaucoma; Systematic Reviews; Conflict of Interest; Industry Sponsorship