

Rocky Vista University College of Osteopathic Medicine Presents

# RESEARCH APPRECIATION DAY 2020

## Vaccines: The Immune System in Action

Tuesday, November 10, 2020

### Event Program

ROCKY VISTA UNIVERSITY

[www.rvu.edu](http://www.rvu.edu)



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# WELCOME LETTER

## Welcome to Rocky Vista University's 9th Annual Research Appreciation Day!

Thank you to both our visitors and participants for making Research Appreciation Day a memorable event as we explore the Biomedical, Medical Education, Clinical, and Public Health studies that our students and faculty have produced.

We are pleased to have Dr. Richard Kennedy as the keynote speaker at this year's Research Appreciation Day. Dr. Kennedy is a professor of medicine at the Mayo Clinic in Rochester, MN where he studies the development of immune responses after vaccination. His research focuses primarily on vaccines against viral pathogens, such as poxviruses, influenza, measles and rubella. The goal of these efforts is to understand why some individuals develop robust immunity while others experience adverse events or fail to respond to a vaccine. He will present his talk titled, "Vaccines: the immune system in action".

Research Day will open with research resource rooms at 3 pm where students can learn how to conduct research at RVU. Following this warm-up session, Dr. David Forstein, DO FACCOG, Provost of RVU, and Amanda Brooks, PhD, Director of Research at RVU, will deliver Opening Remarks at 3:50, immediately proceeding our keynote speaker. Throughout the day and in the week surrounding Research Appreciation Day, poster presentations by students, faculty, staff, and residents in the areas of Medical Education, Public Health/Epidemiology, Biomedical Sciences, and Clinical Research will be available for download from the TEAMS page. The Awards Ceremony and Dr. Brooks's closing remarks will conclude the ceremony.

We would like to express our gratitude to Judy Simmons, Joe Richard, Kelli Petersen, and Gina Marzulla who have helped with this year's event. Again, thank you for joining us today and we hope you find yourself intellectually entertained.

Every Success,

***Amanda Brooks, PhD***

*Director of Research*

*Director of Physician Scientist Track in Utah*

*Associate Professor of Molecular Biology*

***Melissa Henderson, PhD***

*Vice Chair and Associate Professor of Biomedical Sciences*

***Mike Jorgensen, PhD***

*Director of Gross Anatomy*

*Co-Director – Pre-Doctoral Anatomy Fellowship Program*

*Associate Professor of Clinical Anatomy*



# SCHEDULE OF EVENTS

3:00 – 3:55 pm **The Warm up – Research Resource Rooms**

*(Informational workshops presented by faculty)*

**Room #1**

3:00 – 3:20 *Research 101 – Finding Ideas (Amanda Brooks, PhD)*

3:20 – 3:40 *Library Use to Write a Review (Jen Fisher, MLIS)*

**Room #2**

3:00 – 3:20 *IRB (Laura Dement, MA ED)*

3:20 – 3:40 *Grants (Mike Jorgensen, PhD)*

*(After leaving the Research Resource Rooms, please click here to return to the main session)*

3:50 – 4:00 pm **Welcome by Dr. Amanda Brooks and Dr. David Forstein**

4:00 – 5:00 pm **Introduction to Keynote Speaker by Dr. Amanda Brooks**  
Richard B. Kennedy, Ph.D, Mayo Clinic, Rochester, Minnesota  
*Vaccines: The Immune System in Action*

5:00 – 5:15 pm **BREAK**

5:15 – 6:30 pm **Student Presentations**

Lucas Chandra

Anna Jacobs

Blake McKinley

Amanda Anderson

Taylor Yancey

6:30 – 6:45 pm **BREAK**

6:45 – 8:00 pm **Student Presentations**

Svetlana Morrell

Kalvin Zee

Christian Clodfelder

Kevin McNeil

Lacie Phibbs

8:30 – 9:00 pm **Awards and Closing Remarks**



# Richard B. Kennedy, PhD

*Professor of Medicine  
Mayo Clinic*

*Dr. Richard Kennedy is Professor of Medicine at Mayo Clinic in Rochester, MN where he studies immune responses to vaccination in an effort to develop more personalized vaccine technologies. The goal of Dr. Kennedy's work is to improve current vaccines by understanding the causes of vaccine associated adverse events, thereby avoiding such events and informing the development of novel vaccines that protect against existing and newly emerging pathogens. Dr. Kennedy has over 100 publications; he has run multiple clinical trials; and he has been the PI on many NIH-funded proposals.*



# Student Oral Presentation Schedule

<i>Time</i>	<i>Title</i>
5:15	#29 Quantitative Ultrasound Imaging to Assess False Vocal Folds <i>Presented by Lucas Chandra, OMS II; Julian Ortiz, OMS II; Will Byrne-Quinn, OMS II; Austin Meyer, OMS II; Dr. Jing Gao</i>
5:30	#5 Impact of in vivo CSH RNA interference on placental vascularity regulators <i>Presented by Anna K. Jacobs, OMS I</i>
6:00	#45 The Rash That Progressed to Be a Life-Threatening Illness <i>Presented by Blake McKinley, OMS III</i>
6:15	#75 Utilization of Traditional vs Contemporary Medicine in Global Indigenous Populations: the Maasai of Kenya <i>Presented by Amanda Andersen, OMS IV; Sarah Pederson, OMS IV; Austen Anderson, OMS IV</i>
6:30	#74 The Effects of Premedical Anatomy and Clinical Experiences on Medical School Anatomy-Related Academic Performance <i>Presented by Taylor Yancey, OMS III</i>
6:45	#48 Emotional Intelligence, Cortisol and $\alpha$ -Amylase response to highly stressful hyper-realistic surgical simulation of a Mass Casualty Event scenario <i>Presented by Joseph M. Farrell, OMS II, RVUCOM; Svetlana Morrell, OMS II</i>
7:00	#58 Quantitative Ultrasound to Assess Adult Tendons <i>Presented by Kalvin Zee, OMS III; Anthony Tran, OMS II</i>
7:15	#59 Consequences of Delayed Care in MI/CVA Patients During the COVID-19 Pandemic <i>Presented by Christian Clodfelder, OMS II; Spencer Cooper, OMS II; Jeffrey Edwards, OMS II; Joshua Kraemer, OMS II</i>
7:30	#71 Effects of organ-system courses of the first two years of medical school on performance of COMLEX-USA Level 2 <i>Presented by Kevin McNeil, OMS II</i>
7:45	#10 Epigenetic histone modifications at the center of the Barker hypothesis and their transgenerational implications <i>Presented by Lacie Phibbs, OMS II; Dr. Rebecca Ryznar; Dr. Lon Van Winkle</i>



## Oral Presentation #29

### Quantitative Ultrasound Imaging To Assess False Vocal Folds

Lucas Chandra, OMS II, RVUCOM; Julian Ortiz, OMS II, RVUCOM; Will Byrne-Quinn, OMS II, RVUCOM; Austin Meyer, OMS II, RVUCOM; Jing Gao, MD, RVUCOM

**Research Category: Clinical Research**

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The normal anatomy of the larynx, which includes true vocal and false vestibular folds, are integral to everyday life including functions in phonation and respiration. These vocal folds function by abduction and adduction to manipulate vibratory sound waves to produce sound, as well as adjust aperture size in response to breathing demands. It has been well established through previous studies that true and false vocal folds undergo changes in tensility as a part of the normal human aging process. Traditional methods to diagnose asymmetry of the laryngeal tract and recurrent nerve paralysis are a challenge. Laryngoscopy alone cannot reliably distinguish between normal laryngeal asymmetry and pathologic hypomobility caused by paresis. These changes can be assessed and quantified using different techniques of ultrasound imaging. Previously published articles demonstrate the feasibility of ultrasound strain imaging (USI) in measuring mechanical properties and false vocal fold (FVF) symmetry between healthy volunteers and patients with vocal fold paralysis. Studies also show that shear wave elastography (SWE) is a feasible modality of non-invasively imaging the laryngeal anatomy. However, there is no report of assessing changes in mechanical properties and motion characteristics of FVF in abduction and adduction in different age groups using SWE and USI. The hypothesis is that the tissue of FVF is stiff in seniors and soft in young age, which can be quantified by SWE and USI. The aim of our study is to quantify patterns, symmetry, and commonalities of FVF amongst different age groups, and between men and women using SWE and USI. Results of this pilot study may be used as a reference in future clinical patient care to assess age-related vocal cord changes and diagnose laryngeal pathologies.



## Oral Presentation #5

### Impact Of In Vivo CSH RNA Interference On Placental Vascularity Regulators

Anna K. Jacobs, OMS I, RVUCOM, Colorado State University; Dr. Russel V. Anthony, Colorado State University; Amelia R. Tanner - Colorado State University

**Research Category: Biomedical Sciences Research**

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Intra-uterine growth restriction (IUGR) is a leading cause of neonatal mortality and morbidity, found in approximately 8% of human pregnancies. The sheep model has been shown to be the closest representative animal model to demonstrate pregnancy in humans because of the similarities between the human placenta and sheep cotyledons. It has been hypothesized that deficiency of chorionic somatomammotropin hormone (CSH) during pregnancy leads to IUGR. Because of this, our lab has developed an IUGR model using lentiviral-mediated in vivo RNA interference in sheep. We have recently shown that this method of gene editing can lead to significant reductions in near-term fetal and placental size resulting from CSH deficiency. This study sought to examine the impacts of CSH deficiency on key placental angiogenic regulators at the end of the first third of gestation (50 dGA) as altered relationships of angiogenic regulators could set the stage for the significant growth restriction seen later in gestation. CSH-deficient pregnancies harvested at 50 dGA demonstrated significant reductions in cotyledonary VEGFA expression compared to control pregnancies. Furthermore, the expression of VEGFR1 was reduced and VEGFR2 tended to be reduced in CSH RNAi cotyledons when compared to controls. Additionally, eNOS, which works cooperatively to potentiate VEGFA's impacts, was also significantly reduced in CSH RNAi cotyledons vs. controls. We predict that this research provides compelling evidence that placenta-specific gene knockdown can be accomplished in our sheep model. This project will allow further research to explore the function of genes related to placental insufficiency, which can be applied to IUGR and other human-pregnancy diseases.



## Oral Presentation #45

### The Rash That Progressed To Be A Life-Threatening Illness

Blake J. McKinley, OMS III, RVUCOM; J. Scott Parkinson, DO, Intermountain Healthcare

**Research Category: Clinical Research**

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**Case Presentation:** A previously healthy 18-year-old female presented to the Emergency Department with what she believed was a severe sunburn. She reported that five days prior, she had gone swimming at a local lake. A burning, pruritic, erythematous rash appeared on her shoulders the day after being exposed to the ultraviolet radiation (UVR) at the lake. The rash became widespread, extending to the palms of her hands and soles of her feet; ultimately, involving her oral and ocular mucosa. At time of admission, the rash had progressed to form bullae with skin sloughing and a positive Nikolsky sign, bleeding ulcers throughout the oral mucosa, and bilateral conjunctival hyperemia with purulent discharge. With the clinical presentation and histopathological findings, a diagnosis of SJS was made. The patient received fluid resuscitation and was then transferred via LifeFlight to a burn center for treatment and recovery.

**Discussion:** The patient reported not taking any over the counter or prescription medications at the time of rash onset. However, 7-10 days prior to rash onset, she reported taking one tablet of tramadol for hip pain. Tramadol was recognized as the causative agent. Its consumption was consistent with the proposed mechanism for SJS, a delayed hypersensitivity reaction. Although uncommon, tramadol has been reported to cause SJS. In conjunction with tramadol, UVR potentially contributed to the precipitation of the event. UVR exposure has been identified to precipitate the onset of SJS in conjunction with medications or systemic diseases.

**Conclusion:** Physicians should be aware that tramadol may cause SJS and that ultraviolet radiation may precipitate SJS in those taking tramadol.



## Oral Presentation #75

### Utilization Of Traditional VS Contemporary Medicine In Global Indigenous Populations: The Maasai Of Kenya

Amanda Andersen, OMS IV, RVUCOM; Sarah Pederson, MS, OMS IV, RVUCOM; Austen Anderson, MS, OMS IV, RVUCOM; Krysta Sutyak, DO '20, RVUCOM; Isain Zapata, PhD, RVUCOM; Camille Bentley, DO, MPH, FACOPF, RVUCOM

**Research Category: Public Health Research**

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The World Health Organization estimates over 80% of the population in developing countries use traditional medicine. Our previous study of the Quichua of Ecuador, Mayans of Guatemala, and Lakota Sioux on Pine Ridge Reservation found these populations were using both traditional and western medicine, with a large proportion using a combination of both. A 1992 study of the Maasai observed 73% of the population used herbal medicine when ill. RVUCOM Global Health Track has been treating the Maasai in Kenya since 2014; we want to understand what treatment methods this population prefers in order to provide culturally appropriate medical care. We hypothesized that the Maasai are more likely to rely on sources of traditional medicine for difficult-to-diagnose conditions without clear physical manifestations and causes; and health outcomes, measured by number of diagnoses per patient, will be more favorable in those who use a combination of western and traditional treatments. An anonymous questionnaire was designed to 1) screen Maasai individuals for common medical conditions, 2) assess how often, and for which specific health issues these individuals utilized traditional vs. western medicine, 3) assess substance use as an indicator of health status, and 4) assess aspects of traditional medicine being utilized. The survey was orally administered to 219 volunteer participants during free pop-up clinics in January 2020 hosted by RVUCOM at different rural villages surrounding Loitoktok, Kajiado County, Kenya. The questionnaires were evaluated for pairwise associations. Over half of our surveyed population uses a combination of traditional and western medicine. For specific ailments, patients tend to use treatments in the category that aligns with their overall preference for western, traditional, or both. We will use this information at future outreach clinics to improve our capacities as health care providers by strengthening rapport with patients while tailoring treatments to individual patients' needs.



## Oral Presentation #74

### **The Effects of Premedical Anatomy and Clinical Experiences on Medical School Anatomy-Related Academic Performance**

Rebecca Thomas, OMS III, RVUCOM; Taylor Yancey, OMS III, RVUCOM; Chad Skidmore, OMS III, RVUCOM; Neal Ferrin, DO '20, RVUCOM; Isain Zapata, PhD, RVUCOM; Jennifer Williams, PhD, RVU; Nena Lundgreen Mason, PhD, RVUCOM

#### **Research Category: Medical Education Research**

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The objective of this study was to examine the effects that pre-medical clinical experiences and anatomical education had on undergraduate medical course grades and anatomy practical exam scores. This study provided a unique perspective to this line of inquiry in that it included data from 9 student cohorts comprising 1789 medical students from a single institution. It was hypothesized that more pre-medical anatomical education and clinical experience would yield higher grades in anatomy-related assessments.

A survey that assessed the pre-medical clinical and anatomical experience of each new RVUCOM matriculate was completed. Results were compared to each student's course grades and practical exam scores. Descriptive statistics including frequency tables for categorical variables and mean, standard deviation, minimum and maximum values for practical scores and final grades were estimated using PROC FREQ and PROC MEANS respectively. Effects on practical scores and final grades were evaluated by generalized linear mixed models.

Several statistically significant positive and negative correlations were identified within the data. The most obvious effect characterized by data analysis was the cohort effect, seen as variation in the academic performance of each cohort from year-to-year. Other significant results included a positive correlation between pre-medical comparative anatomy coursework and anatomy assessment performance over the entire year's anatomy curriculum. Counterintuitively, some pre-medical clinical experiences, such as nursing experience, had a negative effect on course grades and practical exam performance.

This information could be useful to pre-medical students when deciding whether or not to enroll in undergraduate anatomy courses or participate in extra pre-medical clinical work. It may also be valuable to medical school admissions departments in regards to deciding to require either anatomy courses or a large volume of pre-medical clinical experiences from their applicants.



## Oral Presentation #48

### **Emotional Intelligence, Cortisol and $\alpha$ -Amylase response to Highly Stressful Hyper-realistic Surgical Simulation of a Mass Casualty Event Scenario**

Isain Zapata, PhD, RVUCOM, Joseph M. Farrell, OMS II, RVUCOM; Svetlana Morrell, OMS II, RVUCOM; Rebecca Ryznar, PhD, RVUCOM; Tuan N. Hoang, Naval Readiness Training Command, Naval Medical Forces; Anthony J. LaPorta, MD, FACS, RVUCOM

#### **Research Category: Clinical Research**

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Lifetime exposure to stress leads to increased risk of suffering from cumulative physiological and psychological ailments; health care workers are particularly susceptible to these impacts given their exposure to high stress environments and repeated traumas. Given that Emotional Intelligence plays a role in ameliorating the risk of being negatively impacted by these factors, there is special interest to develop and implement training interventions to better handle stress and mitigate burnout. A hyper-realistic surgical simulation training session, replicating the intensity of a Mass-Casualty Event scenario, was implemented to allow medical professionals to experience this in real time. It was hypothesized that improved emotional intelligence would lead to improved resilience within high stress environments, leading to lower stress levels. Emotional Intelligence was measured using EQ-I 2.0 twice, once upon arrival and on the last day of training, while salivary cortisol and  $\alpha$ -Amylase samples were obtained from participants at four specific timepoints surrounding each training day. Associations between pre and post-event Emotional Intelligence to cortisol and  $\alpha$ -Amylase were assessed using statistical analysis. Overall, the training did indeed lead to increased emotional intelligence, correlating with decreased sympathetic nervous system and Hypothalamus-pituitary-adrenal axis stress biomarkers, cortisol and  $\alpha$ -Amylase. This novel training provides at least short-term increases in emotional intelligence that is reflected as well in their physiological response. These results guide the long term effort to develop therapeutic tools to improve long term stress management, mitigate burnout, and reduce post-traumatic stress risk after an exposure to a Mass-Casualty event scenario.



## Oral Presentation #58

### Quantitative Ultrasound To Assess Adult Tendons

Kalvin Zee, OMS III, RVUCOM; Anthony Tran, OMS II, RVUCOM; Thien Ngo, OMS II, RVUCOM; Edwin Seldon Davis, OMS III, RVUCOM; Jing Gao, MD, RVUCOM

#### Research Category: Clinical Research

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Assessing tendon stability via imaging modalities in real time is a novel endeavor; while the standard modalities of CT, MRI, and X-ray only provide static images, ultrasound can provide real-time images. These standard modalities are also incapable of quantitatively measuring stiffness in conjunction with movement, or stress that may only be seen during relaxation or contraction. Shear Wave Elastography (SWE) is an innovative ultrasound technique that can measure tissue stiffness following real-time tension of various muscles, tendons, and ligaments.

We hypothesized that increased Shear Wave Velocity (SWV) would be indicative of knee pathology with increased stiffness affecting the knee and its surrounding structures. SWV was obtained with SWE, with higher vs lower velocities indicating increased or decreased stiffness, respectively. SWV was used to measure the resting and mid-contraction tension of the patellar, quadriceps, and pes anserinus tendons in both pathological and non-pathological knees. The tendons were grouped as pathological or non-pathological based on a single knee joint with or without pain. Then the average tendon SWV of pathological vs non-pathological knees was put through a two-sample t-test to establish contrast between the population means.

We found the tendons of pathological knees to display higher SWV values, whereas non-pathological knees displayed lower SWV values. Our findings indicate feasibility of SWE for detecting tendon and joint pathology through evaluation of tendon stiffness.



## Oral Presentation #59

### Consequences Of Delayed Care In MI/CVA Patients During the COVID-19 Pandemic

Christian Clodfelder, OMS II, RVUCOM; Spencer Cooper, OMS II, RVUCOM; Jeffrey Edwards, OMS II, RVUCOM; Joshua Kraemer, OMS II, RVUCOM; Rebecca Ryznar, PhD, RVUCOM

**Research Category: COVID-19 Research**

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While COVID-19 certainly causes profound adverse health outcomes directly through individual infections, the health consequences of the pandemic are likely much broader. The rates of hospital visits have steeply declined for non-COVID-19 concerns, including myocardial infarction (MI) and stroke (CVA), with patients either choosing not to visit the hospital at all or waiting longer before their symptoms convince them to seek medical attention. The goal of this study is to examine the consequences of that delay in care through analysis of objective health outcomes, such as ejection fraction (EF) in MI and Modified Rankin Scores (mRS) in CVA, as well as mortality in those events. It is hypothesized that the longer time it takes for patients to seek care, the worse their outcomes will be, and that those worsened outcomes are more prevalent during the COVID-19 pandemic. Events will be correlated with hospital quality measures, such as time to EKG, door to balloon time, as well as paramedic reports and physician notes which allow measurement of time between symptom onset and therapeutic intervention. The data will be collected from local emergency departments in the area. RVU IRB approval has been obtained, and the team is currently working with Centura Health to get chart data from March 19th, 2020 to June 11th, 2020, as well as the equivalent period in 2019 for comparison. Preliminary anecdotal reports from ER physicians consulted during study development suggest that while emergency room visits for non-COVID-19 events have gone down, the acuity of those visits has increased during the COVID-19 pandemic. It is expected that data analysis will provide evidence to substantiate these anecdotal reports, support our hypothesis, and indicate a need for greater control of the pandemic due to the prevalence of collateral consequences and even more widespread impact than previously thought.



## Oral Presentation #71

### Effects Of Organ-System Courses Of The First Two Years Of Medical School On Performance Of COMLEX-USA Level

Kevin McNeil, OMS II, RVUCOM; Payton Christensen, OMS II, RVUCOM; Qing Zhong, MD, PhD, RVUCOM; Han Wang, Shenzhen DJI Sciences and Technologies Ltd

**Research Category: Medical Education Research**

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Comprehensive Osteopathic Medical Licensing Examination of the United States (COMLEX-USA) Level 2-Cognitive Evaluation (COMLEX-USA Level 2-CE) is a board examination that each medical student in an osteopathic medical school must pass to graduate. Students usually take it in the third or fourth year of medical school. A few researchers have investigated the relation between performance in preclinical/clinical sciences and performance on COMLEX-USA-Level 2-CE, but there is no study on the influence of each organ system course during the preclinical years on COMLEX-Level 2-CE performance. We aimed to investigate the relationship between each organ system course and performance on COMLEX Level 2-CE, in order to help students focus on important basic sciences much earlier before preparing for the exam. Academic data including pre-admission MCAT scores, course grades in the first two years of medical school, first attempt COMLEX Level 1 scores, and COMLEX-USA Level 2-CE scores were collected from students matriculated at Rocky Vista University College of Osteopathic Medicine from 2011 to 2017. Using Sigma Plot 14 software, we found that COMLEX 1, Cardiovascular System II, and Renal System II had the highest Pearson correlations with COMLEX 2; multiple linear regression showed that only the average score in all year-2 courses, and not year-1 courses, is a significant predictor of performance on COMLEX-USA Level 2; finally, backward stepwise regression shows that MCAT scores, third semester CVII, RENII, Respiratory System (RSII), Principles of Clinical Medicine III (PCMIII), and fourth semester Neuroscience System II (NSII) courses are significant predictors. In conclusion, performances in third semester courses are the most important predictors of scores on COMLEX-USA Level 2-CE; this knowledge helps fill a gap in the literature, and allows us to identify students at risk of failing COMLEX-USA Level 2-CE early, allowing us to provide appropriate guidance to them before taking the exam.



## Oral Presentation #10

### Epigenetic Histone Modifications At The Center Of The Barker Hypothesis And Their Transgenerational Implications

Lacie Phibbs, OMS II, RVUCOM; Rebecca Ryznar, PhD, RVUCOM; Lon J. Van Winkle, PhD, RVUCOM

**Research Category: Biomedical Sciences Research**

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Birth weight, fetal nutrition, and intrauterine environment have an influence on the risk of adult disease onset, as was first described by the Barker hypothesis. Metabolic syndromes, obesity, heart disease, and hypertension in adulthood have all been linked to epigenetic changes in utero. Multiple studies suggest that environmental challenges causing changes to one-carbon amino acid metabolism, such as maternal low protein diet, can alter histone and DNA chemical modification states. Since histones influence embryo development, these epigenetic changes may contribute to the risk of adult disease onset not just for offspring, but for multiple generations. In this paper, we hypothesize that the effects of parental metabolic status on fetal epigenetic programming are transgenerational and warrant further investigation. Numerous studies are reviewed and potential research techniques to study these transgenerational epigenetic effects are offered and discussed.



# Poster Session

<i>Poster</i>	<i>Abstract Title</i>	<i>Presenting Author</i>
<u>Biomedical Sciences Research</u>		
2	Combining Effective CAR T Cells With CD5 Immune Checkpoint Inhibition To Optimize Cancer Cell Death	<i>Tyler Cox, OMS II</i>
3	Diabetic Cardiomyopathy: Understanding the Independent Relationship Between Diabetes and Heart Failure	<i>W. Tyler Crawley, OMS IV</i>
6	Velocity Vector Imaging to Assess Longitudinal Wall Motion of Adult Carotid Arteries	<i>Juhyun Lee, OMS IV</i>
7	Quantitative Ultrasound to Assess Effects of Water Intake on Adult Livers	<i>Rebecca Lee, OMS III</i>
8	Epitope Characterization of Anti-drug Antibodies—A Tool for Discovery and Health.	<i>Kelly Mohr, OMS II</i>
11	The Relationship Between Demographic Identity and Presentation of Hyperemesis Gravidarum & Nausea/Vomiting in Pregnancy	<i>Haley Shumway, OMS IV; Rachel McCann, OMS III; Adelene Morrow, OMS I; Dr. Benjamin Brooks; Dr. Amanda Brooks</i>
12	Data on the Function of CDH17 in Pancreatic Cancer Growth	<i>Joseph Stenberg, OMS II</i>
13	Cycling Performance Based on Training Modalities in Untrained Cyclists	<i>Landon Stevenson, OMS II</i>
14	Acute Fracture of Achilles Tendon Calcific Tendonitis: a case report	<i>Daniel Sullivan, OMS III</i>
15	Is Incentive Spirometry Effective At Reducing Postoperative Pulmonary Complications In High Risk Populations?	<i>Hunter Temple, OMS II; Erin McCartney, OMS II; Camille Beaton, OMS II; Justin Tse, OMS II; Emily Chea, OMS II</i>
16	Targets for Combination Antibody Therapy against Pseudomonas aeruginosa Infections	<i>Whitney Ward, OMS II; Luke Proctor, OMS IV; Alexandra Koontz, OMS III; Conner Roggy, OMS III; Katie Clark, OMS II</i>
17	An Accessory Muscle Of The Posterior Crural Compartment Of Clinical Significance: A Cadaveric Case Report	<i>Tylynn Zarbock, OMS IV; Jaron Maggard, OMS IV</i>



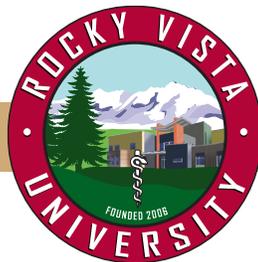
# POSTER PRESENTATIONS

<i>Poster</i>	<i>Abstract Title</i>	<i>Presenting Author</i>
<u>Clinical Research</u>		
18	Pediatric Knife Injuries: A Stab in the Dark	<i>Ali Mroue, OMS III; Erik Christensen, OMS III</i>
19	Cortisol changes and chronic diseases risk factors in the first year of medical school	<i>Nathan Balkman, OMS III; Bri-an Daines, OMS III; David Jeffs, OMS III; Blake Christensen, OMS III; Trevar Dahl, OMS II</i>
20	Individual & Cultural Predictors of Vaccine Hesitancy in the LatinX Community Amidst the Covid 19 Pandemic	<i>Macarena Basañes, OMS II</i>
21	Electronic Medical Record System's Effect on Frequency of Cervical Cancer Screening	<i>Michelle Becker, PAS3; Dr. Isain Zapata; Dr. Lise Johnson</i>
23	Genetic Mutations in Pancreatic Cancer Across A Community Wide Cancer Center	<i>Lielt T. Bedilu, OMS IV</i>
24	Effects of the COVID-19 Pandemic on Mental Health and Its Relationships with Exercise & Wilderness	<i>Brandon Barton, OMS III; Brantley Bond, OMS III</i>
25	From Sea to Air: Surgical Simulation in Extreme Environments	<i>Christopher Brazell, OMS III</i>
26	Hypoglycemic Sensorimotor Polyneuropathy in a Diabetic Patient After Rapid Overcorrection of Chronic Hyperglycemia	<i>Devin Broadhead, OMS III</i>
27	Color M-mode ultrasound in assessment of adult carotid arteries	<i>Jessica Carlson, OMS II; Tyler Adams, OMS II; Dr. Jing Gao</i>
28	Mimickers of brain metastasis: A case report	<i>Anthony Casper, OMS IV</i>
30	Prednis-OH NO! – A Case of Anaphylaxis Induced by Prednisone	<i>Nicholas Chapman, OMS IV</i>
31	Physician Burnout in Emergency Medicine: Improving Process Flow of Admitted Patients From the Emergency Department to the Hospital	<i>Dr. Mark Katz; Dr. Ben Hsu; Dr. F. Ronald Feinstein</i>
32	Shortness of breath, it's not always in the chest	<i>Elise Ewens, OMS III; Anne George, OMS II</i>
33	Assessing OB/GYN Care of Transgender Patients	<i>Martha Zoe Gordon, OMS IV; Dr. Brandi Ring</i>
34	Primary Adenocarcinoma of the Seminal Vesicle	<i>Sarah Hendee, OMS I</i>



# POSTER PRESENTATIONS

<i>Poster</i>	<i>Abstract Title</i>	<i>Presenting Author</i>
35	Performance Improvement in a Hip Fracture ERAS Study	<i>Christina Henderson, OMS II</i>
36	A Morbidity and Mortality Case Study on Pediatric Brain Death	<i>Benjamin Horn, DO '20</i>
37	A Pediatric Case Presentation Of A Misdiagnosed Langerhans Cell Histiocytosis (Histiocytosis X)	<i>Benjamin Horn, DO '20</i>
38	Investigating Efficacy of Different Forms of Patient Education for Stretches and Exercises	<i>Emily Jensen, OMS IV; Gage Williamson, OMS IV</i>
39	Quantitative Ultrasound in the Assessment of Osteopathic Manipulative Treatment	<i>Tyler Kolstad, Do '20</i>
40	Point-of-Care Ultrasound Use by EMS Providers in Out-of-Hospital Cardiac Arrest	<i>Michael Kreiser, OMS II</i>
41	Contrast-Enhanced Ultrasound to Assess Gallbladder Polyps	<i>Regis Lee, OMS II</i>
42	Pharmacotherapeutics of Dravet Syndrome: A Scoping Review	<i>Colton McBride, OMS II; Jeremy Bergman, OMS II; Dr. Michael Wells</i>
43	Central Nervous System Lymphoma Presenting with Lobar Hemorrhage and Edema: A Case Report	<i>Caitlin McCusker, OMS IV; Sarah Pederson, OMS IV</i>
44	Case Report: Pott's puffy tumor – a rare complication of sinusitis in a pediatric patient	<i>Emily McGovern, OMS III</i>
46	Ruling Out Deadly Rare Cancers; A Case Study of Rhabdomyosarcoma	<i>Colby McWhorter, OMS IV</i>
47	Scarcity of the LGBTQ Community in Dermatology Literature	<i>Michelle Militello, OMS III</i>
49	The Effects of Orthopedic Hardware on Chronic Postoperative Pain	<i>W. Paydon Newman, OMS IV; Marcus Oliver, OMS IV; Dr. Bruce Davey</i>
50	Orthogonal Plate Fixation in Complex Periprosthetic Femur Fracture	<i>Adrian Olson, OMS IV</i>
51	Intrathecal Baclofen Use During Pregnancy & Breastfeeding with 5-Year Follow-Up: Literature Review & Case Report	<i>Sarah Pederson, OMS IV; Adrian Olson, OMS IV</i>
52	Gender Authorship Distribution in Academic Dermatology	<i>Colby Presley, OMS IV</i>
53	Tongue-Type Calcaneal Fracture in a Youth Football Player	<i>William C. Searls, OMS II</i>



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## Abstract #2

### Combining Effective CAR T Cells With CD5 Immune Checkpoint Inhibition To Optimize Cancer Cell Death

Tyler D. Cox, OMS II, RVUCOM, Brigham Young University; Josie T. Christensen, Brigham Young University; Deborah Johnson, Brigham Young University; Kiara V. Whitley, Brigham Young University; Claudia T. Freitas, Brigham Young University; and K. Scott Weber, Brigham Young University

**Research Category: Biomedical Sciences Research**

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Chimeric antigen receptor (CAR) T cell immunotherapy has had great success in treating cancer patients by specifically targeting cancer cells and triggering a precise immune response. Despite great success with hematological cancers, CAR T cells struggle to infiltrate solid tumors due to direct competition with cancer cells for metabolic resources and the tumor's immunosuppressive environment. A part of these immunosuppressive effects is cancer cells ability to trigger T cell surface checkpoint proteins, which subsequently inhibit T cell growth. Blocking these checkpoint proteins prolongs T cell activation and survival. CD5 is a surface protein that functions similar to the current immune checkpoint proteins. It is expressed on the T cell surface and negatively regulates T cell activation. Blocking CD5 may be a novel means to increase T cell activation and promote CAR T cell cytotoxicity for solid tumors. We propose to examine this idea by placing previously published and successful CD19-CARs in murine T cells lacking CD5. We will test their cytolytic capacity in comparison to normal CD5 T cells. Here, we have prepared CD5<sup>-/-</sup> and CD5<sup>+/+</sup> CD19 CAR primary murine T cells as a key, first step. Construction of a murine anti-CD19 CAR was successfully built and confirmed via gel electrophoresis. Furthermore, the CAR construct was ligated to both a dTomato fluorescence gene and self-inactivating lentiviral genes. Further steps will include transfection into a Plat. E. cell packaging line followed by transduction of the CAR construct into CD5<sup>-/-</sup> and CD5<sup>+/+</sup> primary murine T cells. Following this, T cell activation will be compared by measuring cytokine levels of IL-2, IFN $\gamma$ , IL-17, IL-6 and IL-10 production via ELISA and flow cytometry cytometric beads array. This strategy of using T cells without CD5 on the cell surface could effectively improve CAR T cell cytolytic capability and potential therapy in immunosuppressive environments like those found around solid tumors.



## Abstract #3

### **Diabetic Cardiomyopathy: Understanding the Independent Relationship Between Diabetes and Heart Failure.**

W. Tyler Crawley, OMS IV, RVUCOM; Rage Geringer, MD, Sky Ridge Medical Center; Jason Snarr, DO, Sky Ridge Medical Center

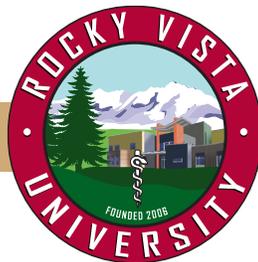
#### **Research Category: Biomedical Sciences Research**

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Type 2 diabetes mellitus (DM) and heart failure (HF) are common chronic disorders. While both often occur individually, there is an increase rate of the two diseases occurring concomitantly. This association between DM and HF is well documented, but the evidence supporting diabetic cardiomyopathy is less understood. This is due to the presence of other comorbid conditions such as hypertension (HTN) and coronary artery disease (CAD), both of which are independently associated with the development of HF.

In this case, a 34-year-old African American female with a past medical history of poorly controlled type 2 diabetes was admitted for anemia. Her workup included an electrocardiogram, chest x-ray, echocardiogram, CT angiography of the chest, and a cardiac MRI. Notable lab results included an elevated troponin of 0.132, a hemoglobin A1C of 13.9%, and a D-dimer of 1.27. Her echocardiogram showed evidence of heart failure with abnormal ventricular relaxation, which was consistent with the finding of fibrosis and scarring noted on her cardiac MRI. Based on these findings and the patient's markedly uncontrolled diabetes, the patient was diagnosed with diabetic cardiomyopathy (DCM).

DCM is believed to develop as a result of the effects of DM systemically, on the myocardium, and its direct effects on individual cardiomyocytes. One of the earliest manifestations of DCM is left ventricular hypertrophy (LVH), primarily affecting the ventricular septal and left posterior myocardial walls and associated diastolic dysfunction. Many of these changes occur asymptotically, which highlights the importance of providers having a clinical awareness of diabetic cardiomyopathy when managing diabetic patients. Understanding the development of DCM and how best to identify and treat this condition is vital to improving patient morbidity and mortality.



## Abstract #6

### Velocity Vector Imaging to Assess Longitudinal Wall Motion of Adult Carotid Arteries

Jing Gao, MD, RVUCOM; Juhyun Lee, OMS IV, RVUCOM; Andrew Phan, MS, OMS IV, RVUCOM; J. Brian Fowlkes, PhD, University of Michigan

**Research Category: Biomedical Sciences Research**

The morphology changes in intima-media thickness and plaque formation in the common carotid artery (CCA) has been used to monitor atherosclerotic changes in arterial system of the body. The function of CCA wall has not been deeply investigated. We prospectively assessed CCA longitudinal wall motion using commercially available velocity vector imaging (VVI). Age, hypertension, and CCA atherosclerotic plaque presence may affect VVI parameters and patterns. We tested the hypotheses based on VVI parameters of longitudinal motion pattern, motion parameters (strain, strain rate, displacement), and time-to-peak motion parameters (time-to-peak strain, time-to-peak strain rate, displacement). Subjects were divided into young (20-44 y), mid-age (45-64 y), and senior ( $\geq 65$  y) age groups. Statistical analyses included one-way ANOVA post-hoc testing to examine the difference in VVI parameters among the three age groups and in paired groups; unpaired t tests to examine the difference in VVI parameters between CCAs with and without atherosclerotic plaque, between hypertensive and normotensive subjects without atherosclerotic plaque; linear regression to analyze correlations of VVI parameters to age, carotid intima-media thickness; and intraclass correlation coefficient to test inter- and intra-observer reliability in performing VVI of the CCA. Significant differences were found in VVI parameters and patterns among the three age groups, between hypertensive and normotensive, and CCAs with and without plaque. CCA motion and time-to-peak motion parameters were positively correlated to age and carotid intima-media thickness. CCA wall motion dyssynchrony was remarkable in seniors. The repeatability and reproducibility for performing CCA VVI were good. VVI is feasible to assess changes in longitudinal CCA wall mechanical properties and synchrony with aging, atherosclerosis, and hypertension. In addition, changes in CCA longitudinal wall motion appears earlier than its morphology alterations.



## Abstract #7

### Quantitative Ultrasound to Assess Effects of Water Intake on Adult Livers

Jason Lee, OMS IV, RVUCOM; Rebecca Lee, OMS III, RVUCOM; Jing Gao, MD, RVUCOM

**Research Category: Biomedical Sciences Research**

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Non-alcoholic fatty liver disease (NAFLD) is main source of chronic liver disease that may lead to liver cirrhosis, a prominent cause of mortality in many developed and developing countries if untreated. Non-invasive Quantitative Ultrasound, including attenuation imaging (ATI) and elastography of the liver, has become a diagnostic tool and may soon replace the previous gold standard liver biopsy to assess NAFLD. ATI assesses liver steatosis. Shear wave elastography measures liver stiffness, which has been shown to be a reliable indicator of the degree of liver fibrosis and can also predict disease progression. It is hypothesized that physiologic conditions such as hydration could induce a change in liver stiffness. We measured liver shear wave velocity (SWV, m/s), shear wave dispersion (SWD, m/s/KHz), attenuation coefficient (dB/cm/MHz), main portal vein velocity (PVV, cm/s), hepatic artery peak systolic velocity (PSV, cm/s), end diastolic velocity (EDV, cm/s), and resistive index (RI) immediately before and at different time points (15, 30, 45, and 60 minutes) after water intake (1.0 L water and 1.5 L water for body weight < 150 lbs and  $\geq$  50 lbs, respectively) in 19 adult healthy volunteers. The difference in SWV, PVV, hepatic artery PSV, and EDV before and after water intake were significant whereas the difference in SWD, ATI, and RI were not based on repeated measures ANOVA tests. We also observed the correlations of SWV to PVV, PSV, and EDV in linear regression analyses. Water intake significantly affects liver shear wave velocity, portal vein velocity, and hepatic artery PSV and EDV. Fasting prior to liver shear wave elastography and Doppler sonography is highly recommended for accurate assessment of liver stiffness and hemodynamics.



## Abstract #8

### **Epitope Characterization Of Anti-Drug Antibodies—A Tool For Discovery And Health: An overview of the necessity of early epitope characterization to avoid anti-drug antibodies and promote patient health.**

Matthew McMaster, OMS IV, RVUCOM; Kelly Mohr, OMS II, RVUCOM; Austin Page, OMS III, RVUCOM; Benjamin D. Brooks, PhD, RVU; Francina Towne, PhD, RVU; Adam Closmore, North Dakota State University

**Research Category: Biomedical Sciences Research**

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The market for monoclonal antibody (mAb) therapies is growing rapidly as the pharmaceutical industry expands its development across a broad spectrum of diseases. Unfortunately, as shown in the recent failure of bococizumab by Pfizer, these treatments often stimulate formation of problematic anti-drug antibodies (ADAs). ADAs can cause side effects and limit efficacy for many patients. To increase efficacy and decrease safety concerns from ADAs, immunogenicity characterization is needed early in the drug development process. Here, we present emerging techniques that hold promise to improve ADA assays and their potential applications to pharmaceutical development and personalized medicine. This manuscript outlines the importance of epitope characterization to better understand immunogenicity and describes a strategy for using this information in treating patients taking mAb therapies. We propose using high-information assays to characterize epitopes to help mAb therapy engineering and potentially improve individual patient outcomes. To understand this, we will discuss three different aspects of ADAs: (1) the problem of ADAs and what is currently being done about them, (2) the current state of epitope characterization and how it's being utilized, and (3) how early epitope characterization can advance drug discovery and improve outcomes for patients taking mAb therapies.



## Abstract #11

### **The Relationship Between Demographic Identity and Presentation of Hyperemesis Gravidarum & Nausea/Vomiting in Pregnancy**

Haley Shumway, OMS IV, RVUCOM; Rachel McCann, OMS III, RVUCOM; Adelene Morrow, OMS I, RVUCOM; Benjamin Brooks, PhD, RVU; Amanda Brooks, PhD, RVUCOM

**Research Category: Biomedical Sciences Research**

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The objective of this study is to investigate the relationship, if any, between socioeconomic status, race, and other demographics and hyperemesis gravidarum & nausea/vomiting during pregnancy. Hyperemesis gravidarum is a rare condition, yet greatly affects the lives of women that are faced with it. We will assess this relationship with a survey that will be sent out to various support groups found on platforms such as Facebook, independent websites, etc. This survey will collect email addresses and will later be deidentified. Analysis will be performed using a Likert scale and direct comparison between the physical presentation of the subjects during pregnancy and their demographic information. This information can help us identify risk factors for these conditions which can be helpful for further treatment options and screenings.



## Abstract #12

### Data On The Function Of CDH17 In Pancreatic Cancer Growth

Joseph Stenberg, OMS II, RVUCOM; Yuan Hao, Pancreas Center, The First Affiliated Hospital of Nanjing Medical University; Guangfu Li, Ellis Fischel Cancer Center, University of Missouri

**Research Category: Biomedical Sciences Research**

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Pancreatic cancer (PC) is currently the 4th leading cause of cancer-related deaths in the US. However, PC deaths continue to rise due to the lack of progress in prevention, early diagnosis, metastasis detection, and treatment options. Liver-intestine cadherin (CDH17) has been documented to function as both a tumor stimulator and diagnostic marker for PC for over 15 years. Despite this, its function in highly malignant PC has yet to be explored. Using various assays, induced knockdown and overexpression of CDH17 in human PC cell line Panc-1 were achieved to assess oncogenic influence. These in vitro studies demonstrated that CDH17 modulated Panc-1 cell proliferation, colony formation, and migration. Additionally, using murine Panc02-H7 cell line and an orthotopic murine model of PC, we revealed that CDH17 functions as an oncogenic molecule of PC through regulation of the Akt and Bcl-2 apoptotic pathways. We speculate similar mechanisms are occurring via CDH17 in Panc-1 human cell line, however the definitive mechanism in human PC remains to be dissected.



## Abstract #13

### Cycling Performance Based on Training Modalities in Untrained Cyclists

Lex Gidley, Gonzaga University; Landon Stevenson, OMS II, RVUCOM; Morgan Steiner, BYU Idaho; Joseph Petteliot, BYU Idaho; Yoshiaki Suenaga, BYU Idaho; Scott Randall, BYU Idaho; Brianne Shirts, BYU Idaho

**Research Category: Biomedical Sciences Research**

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Training programs to improve cycling performance in novice cyclists constantly change and disagree with one another. Common training modalities include aerobic high intensity interval training and anaerobic continuous training. We tested hypothesis that anaerobic cycling interval training (CIT) program training is superior to aerobic continuous cycling (CC) and Resistance weight lifting training (WT). Participants performed baseline tests to assess strength and endurance via a one rep max squat and deadlift test, cycling graded exercise test (GXT) and timed 3.5 mile stationary bike course. GXT obtained max power and collected oxygen consumption, max VO<sub>2</sub> measures, blood lactate, ventilatory threshold, heart rate and rate of perceived exertion. Kinematics measured ankle, knee and hip angles during GXT to assess cycling technique. Participants were randomly assigned a training program, CIT, CC or WT and underwent an 8 week rigorous training modality. Upon completion, one rep max squat and deadlift, GXT, and the 3.5 mile course were repeated. Peak power results in CIT ( $68.4 \text{ W} \pm 30.7$ ) elicited significant improvements over CC ( $34.2 \text{ W} \pm 17.5$ ) and RT ( $35.0 \text{ W} \pm 23.3$ ). CC showed significant improvements in the time trial ( $-3.19 \text{ min} \pm 2.71 \text{ min}$ ) versus RT ( $-0.64 \text{ min} \pm 1.93 \text{ min}$ ), but not over CIT ( $-1.26 \text{ min} \pm 2.73 \text{ min}$ ). Technique and form improved in CC and CIT groups but not RT when compared to kinematics of elite cyclists. Training modality should be selected based upon athletes goal of increased speed or increased max power. Future research may combine high intensity training and continuous training regimens and compare to isolated training program results.



## Abstract #14

### Acute Fracture of Achilles Tendon Calcific Tendonitis: a case report

Daniel Sullivan, OMS III, RVUCOM; McKennan Thurston, MD; Tanner Clinic

**Research Category: Biomedical Sciences Research**

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Calcification within or surrounding the Achilles tendon is not uncommon; however, extensive pathologic calcification which then undergoes an acute fracture is a rare occurrence with little evidence of standard of care. This case report describes a rare case of extensive, chronic, insidious calcification surrounding the achilles tendon which underwent an acute fracture after an episode of minor trauma. The patient is a 72 year-old Caucasian male who presented with pain in the lower posterior leg after injuring his ankle while mowing his lawn. When the patient was two years old, he underwent corrective surgery for in-toeing of the right foot, but he didn't notice any abnormalities with his lower leg, ankles, or feet until the traumatic event. Inspection of the lower posterior leg revealed a vertical, linear surgical scar extending up his posterior lower leg. Palpation of the achilles tendon revealed a "woody" feel and a Subsequent ultrasound revealed calcification surrounding the achilles tendon. This calcification spanned from the insertion of the achilles tendon superiorly approximately 10-15 centimeters. The X-ray demonstrated a fracture of the pathologic calcification. The patient underwent conservative treatment, including physical therapy for approximately one month. Surgery was not used. He now reports no pain, weakness, or decreased strength or range of motion in the lower extremities. Case reports of this particular condition describe varying treatment regimens used, many patients being treated with surgical interventions in order to repair the ruptured achilles tendon and remove the calcifications; however, our case is one example of acute fracture of calcification which did not require surgical intervention and only required physical therapy in order for the patient to regain function and terminate the pain.



## Abstract #15

### **Is Incentive Spirometry Effective At Reducing Postoperative Pulmonary Complications In High Risk Populations?**

Hunter Temple, OMS II, RVUCOM; Erin McCartney, OMS II, RVUCOM; Camille Beaton, OMS II, RVUCOM; Justin Tse, OMS II, RVUCOM; Emily Chea, OMS II, RVUCOM

**Research Category: Biomedical Sciences Research**

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Incentive spirometry (IS) devices are used to mimic long, deep breaths that help decrease pleural pressure and promote lung expansion<sup>1</sup>. Although IS is currently recommended for high risk patients to prevent postoperative pulmonary complications (PPC), many studies have concluded IS is not clearly beneficial; therefore, more studies are needed to clarify the effect and justify the use of IS<sup>2</sup>. The objective of the article was to evaluate IS effects in high-risk populations on incidences of PPCs, atelectasis, pneumonia, and length of stay (LOS). We also sought to clarify effects on other secondary outcomes such as muscle activity, FEV<sub>1</sub>, and vital capacity. We searched 3 electronic databases in the English language: MEDLINE, PubMed, and Google Scholar. The search included all randomized controlled trials and matched pair analysis published between January 2010-June 2020 that evaluated the effects of IS in at least one of our designated high-risk populations: median age of 65+, high-risk procedures, COPD, sepsis, smoking history, flail lung, tracheostomies, and strokes. Our search methods produced 422 total articles, 12 matched our inclusion criteria and were used in this study. The authors extracted the data into an excel spreadsheet, assessed risk of bias, and analyzed the data. The evidence from this study showed that IS has no significant effect on PPC and pneumonia in high risk patients. Atelectasis and LOS showed no significant effect with IS, with the exception of one article. In regards to secondary outcomes, vital capacity and muscle activity were both improved with IS with the exception of one article. It is still unclear if IS improves FEV<sub>1</sub>. In summary, the quality of evidence from our included studies was poor and indicates that more studies need to be conducted in the future to safely decide if IS is effective in high risk populations.



## Abstract #16

### **Targets For Combination Antibody Therapy Against *Pseudomonas Aeruginosa* Infections**

Whitney Ward, OMS II, RVUCOM; Luke Proctor, OMS IV, RVUCOM; Alexandra Koontz, OMS III, RVUCOM; Conner Roggy, OMS III, RVUCOM; Katie Clark, OMS II, RVUCOM; Benjamin Brooks, PhD, RVU; Francina Towne, PhD, RVU; James Small, MD, PhD, FCAP, RVUCOM

#### **Research Category: Biomedical Sciences Research**

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Despite advances in antimicrobial therapy and even some vaccines, *Pseudomonas aeruginosa* remains a significant cause of infectious disease, primarily due to antibiotic resistance. Although *Pseudomonas* is commonly treatable with readily available therapeutics, these therapies are not always efficacious for certain classes of patients (e.g. cystic fibrosis) and for drug resistant strains. The increasing emergence of drug resistance highlights the need to identify new therapeutic strategies against resistant bacteria, especially in *Pseudomonas*. Combinations of monoclonal antibodies against different targets and epitopes have demonstrated synergistic efficacy with each other as well as in combination with antimicrobial agents typically used to treat these infections, and they have reduced the ability of infectious agents to develop resistance. In this manuscript we detail drug targets for the potential development of polyclonal antibody (pAbs) therapies to combat the development of multi-drug resistant *Pseudomonas aeruginosa* infections, one of the serious threats listed by the CDC's and WHO's list of worldwide threats. In particular, we identify potential drug targets for combinational immunotherapy against *Pseudomonas aeruginosa* to fight current and future drug resistance.



## Abstract #17

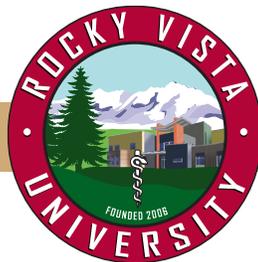
### **An Accessory Muscle Of The Posterior Crural Compartment Of Clinical Significance: A Cadaveric Case Report**

Tylynn Zarbock, OMS IV, RVUCOM; Jaron Maggard, OMS IV, RVUCOM; Michael Jorgensen, PhD, RVUCOM

**Research Category: Biomedical Sciences Research**

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Accessory and anomalous muscles are common in humans, although their unique morphologic characteristics can make accurate identification difficult. In this case report, we attempt to identify an anomalous accessory muscle of the posterior crural compartment detected during cadaveric dissection and discuss its clinical significance based on the muscle's relationship to surrounding structures. The muscle described here was found on the right lower limb of an 81-year-old female cadaver and extended from the distal femur to attach to the gastrocnemius muscle at the point where the medial and lateral heads fuse. Proximally, it was found lateral to the popliteal vessels and crossed posterior to these vessels and tibial nerve to its insertion. It displayed characteristics similar to both an accessory plantaris muscle and gastrocnemius tertius, thus making its ultimate identification difficult. Though the muscle displayed a morphologically similar appearance to the plantaris, we suggest that its common insertion with the gastrocnemius best identifies it as a gastrocnemius tertius. In addition, due to its relationship with the popliteal neurovasculature, it is possible that this muscle could have resulted in neurovascular entrapment due although it is unknown whether or not this cadaver exhibited symptoms.



## Abstract #18

### **Pediatric Knife Injuries: A Stab In The Dark**

Taline Aydinian, OMS III, RVUCOM; Ali Mroue, OMS III, RVUCOM; Erik Christensen, OMS III, RVUCOM

**Research Category: Clinical Research**

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Trauma is a leading cause of morbidity and mortality in the pediatric population in the United States. Knives are ubiquitous in American households and are easily accessible by pediatric patients, leading to a question of incidence of pediatric knife injuries. The data gathered by NEISS from 2010-2019 estimates US knife injuries occurring in the pediatric population by retrospectively assessing emergency department records. This was analyzed by one-way ANOVA and illustrated a fairly linear decrease in knife related injuries in the pediatric population from 2010-2019. In 2010, there were 192,529 cases documented. At the end of 2019, only 157,280 were reported. All data was analyzed with a 95% confidence interval. Not only was there a decrease in pediatric knife injuries specifically, but a decrease in all injuries, with no clear explanation to why. At the same time, the number of urgent care centers and urgent care visits has continued to increase upwards over the last decade. It is hypothesized that the current data being reported is inaccurate in that only ED visits are recorded. Thus, we suspect the number of pediatric knife injuries to not be truly trending down in a statistically significant way, but instead, that these injuries are being taken care of in a different healthcare setting. Currently, much of this data is reported utilizing NEISS ED data without consideration to how it translates in a time where many prefer urgent cares when possible secondary to reduced healthcare costs. Investigating the trends of common traumatic injuries allows for better prevention of pediatric morbidity and mortality. More research on the cause of this trend is needed to further understand the reason behind this decrease.



## Abstract #19

### **Cortisol Changes And Chronic Diseases Risk Factors In The First Year Of Medical School**

Nathan Balkman, OMS III, RVUCOM; Brian Daines, OMS III, RVUCOM; David Jeffs, OMS III, RVUCOM; Blake Christensen, OMS III, RVUCOM; Trevar Dahl, OMS II, RVUCOM; Dale Woodbury, PhD, RVUCOM

**Research Category: Clinical Research**

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A first-year medical student's exposure to extreme psychosocial stressors, poor sleep and wake cycles, and extreme time spent sedentary contribute to a rapid increase in abdominal fat, cardiovascular disease risk factors, and chronic elevations in cortisol levels compared to the average US population. This study seeks to identify and quantify specific anthropometry factors and biomarkers that contribute to changes in the body habitus in medical students during the first 12 months of medical school.



## Abstract #20

### **Individual & Cultural Predictors of Vaccine Hesitancy in the LatinX Community Amidst the COVID-19 Pandemic**

Macarena Basaños, OMS II, RVUCOM; Benjamin Brooks, PhD, RVUCOM; Isain Zapata, PhD, RVUCOM; Bradley Thornock, PhD, RVUCOM

#### **Research Category: Clinical Research**

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Data shows that though the LatinX community makes up a small proportion of Utah's population, the Latino population makes up upwards of 43% of Utah's diagnoses and deaths from Covid19. Though this has been well documented, there is a gap in the literature on how to prevent this disproportionate burden once an appropriate Covid19 vaccine is eventually released.

The project aim is to survey the LatinX population on their opinions about vaccines in general, and whether they are planning on eventually getting the Covid19 vaccine. The project is in its preliminary data gathering stages; however, once sufficient data is available we plan to analyze factors such as age, sex, years living in the US, if they routinely get vaccinated for Flu, healthcare coverage, confidence in the medical system, and knowledge about Covid19 to name a few. The goal will then be to form a hands-on sustainable solution so that this community is not disproportionately burdened by Covid 19 or the next epidemic/pandemic to come. The aim is to start off with the LatinX population within Utah and once the initial pilot study is complete, hopefully include data from larger metropolitan areas as well to increase survey participant diversity.

The benefits anticipated from the research outcomes could potentially be great in the understanding of how best to approach future pandemics with regards to teaching and implementing strategies to specifically aid the LatinX population.



## Abstract #21

### Electronic Medical Record System's Effect on Frequency of Cervical Cancer Screening

Michelle Becker, PAS3, RVU; Isain Zapata, PhD, RVUCOM; Lise Johnson, PhD, RVU

#### Research Category: Clinical Research

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Papanicolaou (Pap) Testing is performed by Primary Care Physicians, Obstetrics/Gynecologists, Midwives, etc. to screen for cervical cancer. American College of Obstetricians and Gynecologists (ACOG) recommends screening all women between 30-65 years of age every five years, however these recommendations change with prior abnormal Pap smears, age, and other comorbidities. ACOG recommendations are not followed precisely by all providers for many different reasons. Over-screening, and therefore inappropriate use, of these guidelines often leads to unnecessary healthcare costs. According to Reed et al., \$2.6 - \$7.3 million was saved when the ACOG recommendations changed in 2012 to eliminate routine annual cervical cytology screening. These healthcare savings are not fully maximized when women are over screened due to unavailable records.

The purpose of this study is to investigate the prevalence of early Pap testing due to missing clinical records. The information gathered in this research aims to prove that repeat Pap testing could be avoided if healthcare systems used a nationalized Electronic Medical Record (EMR) system.

This research project consisted of a survey of 51 Family Medicine and Women's Health providers. Twenty of the survey participants reported that they repeated Pap tests due to missing results. One respondent noted specifically that missing records are commonly due to patients' previous Pap tests being conducted externally to the provider's healthcare system, making the results unobtainable. Based on this survey, when Pap testing results are missing, Family Medicine providers are more likely to request patient records, whereas Women's Health providers are more likely to rescreen the patient during the visit. The data obtained through this study was analyzed using Mantel-Haenszel Chi-Square calculations and mean comparisons.

These results suggest that Pap testing is performed more frequently by both Family Medicine and Women's Health providers than ACOG recommendations, leading to increased healthcare costs. Based on this survey, thirty-six providers report performing 1-5 repeat Pap tests per month. According to MD Save in Colorado Springs, CO, one Pap with a pelvic exam averages \$165. If these thirty-six providers performed merely one repeat Pap smear per month, \$71,280 in excess medical costs would be incurred annually. The excess medical cost being spent on repeat diagnostic testing could be redirected toward the cost of adopting a national EMR system, ideally resulting in long-term healthcare savings.

Limitations to this study include small sample size, lack of patient age consideration, differences in recommendations set forth by professional organizations, snowball sampling for participant recruitment, and recall bias by the respondents.

Further research should be conducted to determine the ability to extrapolate this data to the greater population and the effects that a national EMR system would have on decreasing the number of Pap tests, consequently reducing unnecessary healthcare costs.



## Abstract #23

### Genetic Mutations in Pancreatic Cancer Across A Community Wide Cancer Center

Sujatha Nallapareddy MD, Rocky Mountain Cancer Center; Laura Brzeskiewicz, MS, CGC, Rocky Mountain Cancer Center; Lielt T. Bedilu, MS, OMS IV, RVUCOM; Shalika Devireddy, Johns Hopkins University

#### Research Category: Clinical Research

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Despite advances in oncologic treatment, pancreatic adenocarcinoma (PADC) remains one of the most aggressive forms of cancer to date. Here we explore the presence of gene mutations in a population of PADC patients treated at a community wide cancer center across Colorado. In this study, 136 unselected patients with PADC underwent genetic counseling, of which 125 consented to a multi-gene panel test. Patients who tested positive for pertinent mutations were additionally stratified on the basis of cancer staging, family history, treatment, and health outcomes, with significant findings uncovered. Overall, 33 out of 125 patients that underwent genetic testing were positive, leading to a 26.4% positive rate, which was found to be substantially higher than what has been previously published. Mutations were identified in 15 genes, with BRCA 1/2 accounting for the majority (9 patients) at a 7.2% positive rate, which is similar to that found in the literature for PADC BRCA carriers. Additionally, 22.4% of patients with PADC tested positive for mutations that have previously established screening & management guidelines. Of those who tested positive, 76% were found to have family history that qualified them for testing prior to their pancreatic cancer diagnosis. The high rate of mutations found suggest that broad, panel-based genetic testing in all PADC patients is essential. Cascade testing for affected patients' family members may allow for prevention of cancer or identification of cancer early on, and potentially lead to better treatment outcomes. Further studies showing the prevalence of the identified genes and disease development in the relatives of the studied population, or in similar populations, would allow us to understand the clinical significance and positive effects of wider utilization of broad panel-based genetic testing.



## Abstract #24

### Effects of the COVID-19 Pandemic on Mental Health and Its Relationships with Exercise & Wilderness

Brandon Barton, OMS III, RVUCOM; Brantley Bond, OMS III, RVUCOM

**Research Category: Clinical Research**

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In 2020, the SARS-CoV-2 Virus (COVID-19) has created the most significant pandemic in 100 years, causing significant morbidity and mortality worldwide. Often overlooked, it has also caused a change in people's daily lives and concerns about the effect on mental health, even for those who do not personally contract the disease. This study was designed to assess how the pandemic has affected mental health – stress, anxiety, and happiness – and to assess if it is correlated with type – indoor, outdoor, or wilderness – and amount of exercise. The hypothesis tested was: during COVID-19, are various types and amounts of exercise correlated to positive changes in mental health? In order to test this, a survey was completed by 114 Rocky Vista University (RVU) medical students across Colorado and Utah. The survey was a one-time questionnaire taken during the pandemic time about students' exercise habits and mental health during and prior to the COVID-19 pandemic. This data was then analyzed using Paired T-Tests, Sample Statistics, and Linear Regression Models. It was discovered that there were statistically significant negative changes in students' stress, anxiety, and happiness levels during the pandemic. These changes were mostly not correlated with exercise levels of the students; however, there were indications that for students who exercise, those with a higher percentage of their exercise being in wilderness areas (trail running, hiking, biking, etc.) is positively correlated with happiness and may be correlated with stress and anxiety. This indicates that spending time exercising outdoors could be a component of maintaining good mental health during the COVID-19 pandemic and that further study with larger and more broad populations could provide more conclusive findings.



## Abstract #25

### From Sea to Air: Surgical Simulation in Extreme Environments

Christopher Brazell, OMS II, RVUCOM; Bryan Eldreth, OMS III, RVUCOM; Renato Rapada, DO '19, RVU-COM; Eric Pierce, MS, Naval Surface Warfare Center - Panama City Division; Tuan Hoang, MD, FACS, RVU-COM; Matthew Pena, MD, FASA, UC Davis; Mike Juliano, MD, US Navy; Reginald Francoise, MD, FACS, Vail Medical Center; Nina Shattuck, PhD, Naval Postgraduate School; Cameron Bass, PhD, Duke University; Anthony LaPorta, MD, FACS, RVUCOM

#### Research Category: Clinical Research

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In this three-phase experiment, the U.S. Navy assessed the feasibility of placing modular resuscitation and operation rooms aboard small, mobile ships to reduce the time between battlefield injury and life-saving surgical care. The purpose of this study is to quantify the ability of US Navy medical teams to perform critical surgical trauma resuscitation using high-fidelity patient simulators onboard US Navy ships under high sea states. Three surgical teams were formed from 15 active duty military members. Simulated surgeries were performed aboard the USNS Brunswick using "Cut Suit" technology developed by Strategic Operations Inc to simulate four common battlefield injuries. Participants were fitted with individual monitors to assess dynamic and kinematic motion tracking and Motion Sickness Assessment Questionnaires (MSAQ) were given to participants. Each surgery was graded by subject matter experts on a Likert-type scale from zero to five with four or five deemed successful. 112 operations were performed in phase III and 89% were deemed successful with 46% completed at the roughest conditions tested. MSAQ scores revealed low motion sickness scores throughout most of the study and MSAQ positively correlated with sea state conditions. The only significant predictor for patient outcome scores was surgeon/team performing operations. Surgical performance scores provide evidence that ship motion does not adversely affect surgical outcomes. Our next investigation tests the previous procedures in non-traditional aircraft such as the V-22, a vertical take-off and landing tiltrotor aircraft currently used by the U.S military for casualty evacuation. Future research should also investigate the potential implications in the civilian sector for surgical stabilization in certain motion-induced trauma evacuation settings where immediate intervention is necessary.



## Abstract #26

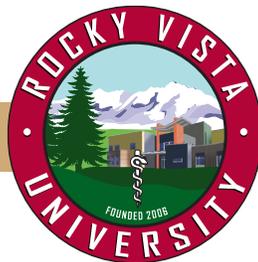
### **Hypoglycemic Sensorimotor Polyneuropathy In A Diabetic Patient After Rapid Overcorrection Of Chronic Hyperglycemia**

Devin Broadhead, OMS III, RVUCOM; Stephen Devenport, MD, Granger Medical Clinic

**Research Category: Clinical Research**

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Diabetes is one of the most common chronic diseases in the United States, affecting an estimated 10.5% of the population. Peripheral neuropathy is arguably the most frequent complication that can accompany diabetes, with a lifetime prevalence as high as 50%. Although chronic hyperglycemia is a frequent and well-known cause of diabetic neuropathy, treatment induced hypoglycemia and/or rapid correction of hyperglycemia are under-recognized sources of neuropathy in diabetes. This case report presents a 66-year-old female with type II diabetes who developed prominent sensorimotor neuropathy after experiencing several hypoglycemic episodes. Due to difficulties with insulin titration, over the course of three months the patient quickly lowered her chronically elevated average serum glucose concentration to the point of suffering multiple periods of hypoglycemia. This led to the development of paresthesia in the patient's hands and feet, as well as significant weakness in both upper and lower extremities on physical exam. Clinicians caring for patients with diabetes who develop neurologic symptoms following improved glycemic control or hypoglycemia should be aware of the possibility of a diabetic neuropathy, as prompt recognition can eliminate the need for expensive investigations. Further research is needed to analyze the mechanism, treatment, prevention, and prognosis of hypoglycemic peripheral neuropathy in diabetes; consequently, this may be a promising area for future study.



## Abstract #27

### Color M-Mode Ultrasound In Assessment Of Adult Carotid Arteries

Jessica Carlson, OMS II, RVUCOM; Tyler Adams, OMS II, RVUCOM; Jing Gao, MD, RVUCOM

**Research Category: Clinical Research**

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The common carotid artery (CCA) is the major blood vessel supplying the head and neck and it is subject to various parameters regarding cardiovascular evaluation. In the aging of artery walls they become thickened and stiff, due to various comorbidities such as intima-media thickening, plaque buildup, and decrease of elasticity due to hypertension, degeneration and other environmental stresses. In this study we introduced the use of color M-mode ultrasound, a conventional ultrasound technique and available in almost all ultrasound scanners, for the evaluation of CCA distensibility in association with patient age. We hypothesized, that a color M-mode scan of the CCA of patients in an advanced age group would indicate a decreased distensibility and lower CCA diameter when compared to younger patients.

This study evaluated 100 patients (56 male and 45 female, ages 22-83) using color M-mode. An ECG tracing was used to identify blood flow during cardiac systole and diastole. The total number of arteries evaluated based on image quality and ECG detected was 124. Each image was evaluated for CCA diameter (CCA-D) during the cardiac cycle and distensibility. The mean pixel count in color M-mode was processed off-line.

Statistical evaluation date using ANOVA indicated that significant differences in CCA distensibility, CCA-D and systole pixel count for red, green and blue among the three age groups and decrease with age. These results are consistent with understanding that artery wall stiffness increases with age. This study demonstrates the feasibility of color M-mode in CCA evaluation and furthers the application of this ultrasound technique as useful point of care tool in monitoring arterial atherosclerosis. Importantly, we observed good intra- and inter-observer reliability of off-line imaging processing in measuring CCA distensibility and mean pixel count.



## Abstract #28

### Mimickers Of Brain Metastasis: A Case Report

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#### Research Category: Clinical Research

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The central nervous system is one of the most common sites of metastasis for cancer. Multiple non-neoplastic pathologies may mimic brain metastases and are important to consider before proceeding with treatment for patients with undiagnosed brain lesions. We report the case of a 49-year-old male who presented with abrupt onset neurologic symptoms in the setting of a previously diagnosed lung lesion. Imaging revealed multiple brain lesions presumed to be consistent with metastatic lung cancer. After consultation with radiation oncology, further work-up was recommended before pursuing treatment with radiotherapy. These lesions were later determined to be abscesses from *Streptococcus intermedius*, which required neurosurgical intervention. In addition to abscesses, other reported mimickers of brain metastases are identified. Recommendations are provided on how to approach patients with brain lesions of an unknown etiology.



## Abstract #30

### **Prednis-OH NO! – A Case of Anaphylaxis Induced by Prednisone**

Nicholas Chapman, OMS IV, RVUCOM; Rage Geringer, Sky Ridge Medical Center; Greg Hicks, Sky Ridge Medical Center

#### **Research Category: Clinical Research**

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Anaphylaxis is a potentially life-threatening condition caused by the sudden release of inflammatory mediators into systemic circulation. Anaphylaxis in response to corticosteroids is uncommon, but given the frequency of steroid use in various settings, it is an important condition for clinicians to consider. Any patient that presents with shortness of breath, wheezing, hypotension, urticaria, or other characteristic signs of anaphylaxis following the administration of steroids should be promptly evaluated. The primary objective of this case presentation is to discuss an example of such a reaction, as well as the proposed pathophysiology and management thereafter. To complete this case presentation, a review of current literature on the subject was performed. Findings indicate that sensitization to corticosteroids may occur as a result of various different structural components, including the native molecule itself, haptens, preservatives, excipients, or conjugated esters. Many incidences of anaphylaxis due to corticosteroid use occur despite a lack of extensive systemic corticosteroid therapy and cross reactivity between different corticosteroids is common. Numerous tests exist that may aid in the identification of the causative component, including immunoCAP assays, lymphocyte transformation tests, basophil activation tests, and graded drug challenges, although these tests are associated with a high false negative rate. Accurate identification of the causative agent will allow for avoidance or rapid desensitization prior to future corticosteroid use. While anaphylactic reactions in response to corticosteroids are uncommon, delayed diagnosis of this reaction can result in significant complications or even mortality.



## Abstract #31

### **Physician Burnout in Emergency Medicine: Improving Process Flow of Admitted Patients From the Emergency Department to the Hospital**

Mark Katz MD, Kaiser Permanente West Los Angeles; Ben Hsu, MD, Kaiser Permanente West Los Angeles; F. Ronald Feinstein, DMD, MD, FACS, Keck School of Medicine

**Research Category: Clinical Research**

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Physician burnout is a work-related syndrome that involves depersonalization, emotional and physical exhaustion and a sense of reduced personal accomplishment. The extent to what physician burnout does in the workplace is severe; according to Johns Hopkins University, medical errors are the third leading cause for death in America, as more than 54% of the 7,000 physicians surveyed, reported symptoms of burnout, 33% experienced excessive fatigue, nearly 7% had thoughts of suicide and 4% reported a failing safety grade in their primary work area. (Dyrbye, 2016) The most widely accepted standard for burnout is Maslach Burnout Inventory (MBI) which includes a human services survey. This survey is comprised of 22 items, each scored with from a 0-6 basis on self-reported frequency. (Makory, 2016). The emergency department has one of the highest rates of burnout of all medical departments. By interviewing the Chief of Emergency Medicine at Kaiser West LA, we have identified an opportunity for improvement in the complex admission process that contributes to the overall stress of physicians and its effect on their well-being. There is a great need for a holistic and system-based approach to address the epidemic of burnout among healthcare providers. The goal is to apply systems engineering and LEAN techniques to a specific problem identified in process flow and reduce physician stress that contributes to burnout. Project Sponsor requested prioritizing the administrative challenges in the admission process from ER into hospital. From decision to admit to patient arrival on unit currently takes an average of 90 minutes. Of the 13 physicians surveyed, 69% reported feeling burned out. Re-engineering the process using LEAN would have lower cost than increasing hospital capacity and require a shorter time to implement than shaping demand. This also provides greater efficacy compared to shaping demand and increasing hospital capacity.



## Abstract #32

### Shortness Of Breath, It's Not Always In The Chest

Elise Ewens, OMS III, RVUCOM; Anne George, OMS III, RVUCOM;

#### Research Category: Clinical Research

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#### Introduction:

79 million Americans are infected with HPV according to the CDC. Between 2012 and 2016, an average of 43,999 cases of HPV-associated cancer were reported. Our case depicts the possible deleterious effects of HPV and serves as a springboard for discussion of the impact of the HPV vaccine.

#### Case presentation:

Our patient is a 72 year old male with a history of COPD, CHF/EF, significant tobacco use history, and alcohol dependence who presented with the chief complaint of dyspnea for several weeks. Treatment was initiated for acute on chronic hypoxemic/hypercapnic respiratory failure. However, during hospitalization, a roughly 4 cm x 4 cm R sided neck mass was found on physical exam. Subsequent imaging showed extensive centrally necrotic infiltrating malignancy extending from the base of the tongue through the epiglottis, hypopharynx, and larynx highly suspicious for squamous cell carcinoma. Further workup confirmed T4, N2B squamous cell carcinoma with bilateral cervical metastatic adenopathy. Patient also tested positive for HPV. Our patient underwent tracheostomy, PEG tube and Q port placement while in the hospital with plans for a radical debulking procedure, followed by radiation therapy.

#### Discussion:

This patient had multiple risk factors for squamous cell carcinoma: he was a former alcoholic, had an extensive smoking history, and was HPV positive. While all of these are currently preventable, for this patient, an HPV vaccination was not a possibility due to his age and the relatively recent release of the HPV vaccine in 2006. According to NPCR data in 2012-2016, oropharyngeal cancer has the highest potential to decrease in incidence due to the fact that current vaccination protects against subtypes of HPV that have the highest incidence of oropharyngeal cancer. Promoting this vaccine is especially important as it has been challenged repeatedly by the public and surrounded by stigma. In 2018, a report by the NIS-Teen showed that "just 51% of all teens had received all recommended doses of the HPV vaccine." Our case demonstrates the need for further public health interventions to increase awareness of the importance of HPV vaccination in order to decrease incidence of HPV-related cancers. The burden of disease demonstrated in this report showcases the importance of the HPV vaccine in potentially preventing future cases like this.



## Abstract #33

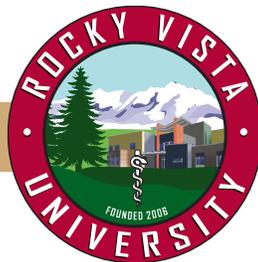
### Assessing Culturally Competent OB/GYN Care for Transgender Patients

Martha Zoe Gordon, OMS IV, RVUCOM; Brandi Ring, MD, FACOG, FAWM, Mile High OB/GYN

#### Research Category: Clinical Research

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Transgender individuals suffer disproportionately poor healthcare outcomes, and research has identified many systemic factors underlying these inequities. Although studying healthcare for the transgender population writ-large may serve to guide the correction of systemic disparities, this population is poorly generalizable because it includes individuals from a variety of socioeconomic, ethnic, age, and other identity groups, rendering population-based studies of low functional utility to an individual physician/patient dyad. On this more intimate scale, the quality of the therapeutic relationships between individual physicians and their patients become an essential determinate of health outcomes. This study aims to investigate such relationships and interrogate the hypothesis that provider-centered factors (such as office practices, medical education and training, and individual experiences and attitudes) influence the provision of healthcare for transgender patients. This will be accomplished through examination of a private (five full-time provider equivalent) obstetrics and gynecology practice and its physicians because, though the transgender community has broad healthcare needs, the practice of OB/GYN encompasses many of the services that are indicated to address these needs, making this specialty uniquely valuable for this investigation. The practice will be studied via a chart review and analysis of office policies pertaining to care of transgender patients. The curriculum vitae of each physician in the practice will then be reviewed to establish their educational and training backgrounds. A quantitative survey will then be administered to each provider to delineate their experiences in caring for transgender individuals, followed by a qualitative interview to further characterize any factors that have influenced how they accommodate and care for these patients. By illustrating these factors and their impacts, this study aims to guide alterations in medical education, training, and practice management that would ultimately improve physician patient relationships and health outcomes for the transgender patient population.



## Abstract #34

### Primary Adenocarcinoma of the Seminal Vesicle

Bryn Launer, University of Colorado School of Medicine; Sarah Hendee, OMS I, RVUCOM; Dr. Shandra Wilson, Littleton Adventist Hospital; Dr. Mirna Knight, Littleton Adventist Hospital

#### Research Category: Clinical Research

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A primary seminal vesicle adenocarcinoma is a rare diagnosis of cancer due to the seminal vesicles' anatomically close proximity to the prostate, bladder, and rectum and typically absent or nonspecific early clinical signs. Both of these factors makes it difficult to determine the primary site of malignancy based on morphology alone. However, we report the case of a 77-year-old man with primary seminal vesicle adenocarcinoma with extension into the prostatic urethra. He presented with a two-year history of hematuria progressing to hematospermia. Cystoscopy at initial presentation of hematuria was unremarkable; cystoscopy at presentation of hematospermia found a tumor emanating from the verumontanum (seminal colliculus). Initial biopsy was consistent with urothelial carcinoma and the patient was treated with BCG. Despite this, the tumor progressed in size and the patient subsequently underwent radical cystoprostatectomy. Pathologic review was consistent with primary seminal vesicle adenocarcinoma and followed a similar course in comparison to a review of 23 other published cases. The patient is now 2 years post-surgery and under surveillance without evidence of recurrence. By publishing this case we hope to raise awareness in the differential diagnosis of lower urinary tract pathology as early detection promises the best chances for a cure.



## Abstract #35

### Performance Improvement In A Hip Fracture ERAS Study

Christina Henderson, OMS II, RVUCOM; Thomas T. Mydler, MD, Good Samaritan Medical Center; Barbara Stewart, MSN, RN, CPN, Good Samaritan Medical Center; Rebecca C. Davis, RN, BSN, Good Samaritan Medical Center; Dana Nordquist, BSN, RN, Good Samaritan Medical Center; Kim Tate, PharmD, BCPS, MHA, Good Samaritan Medical Center; John H. Eisenach, MD, Good Samaritan Medical Center

### Research Category: Clinical Research

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Hip fractures are a major public health concern in the United States with over 100,000 hip fracture repairs performed annually. A large proportion of hip fractures occur in the geriatric population and often present with major comorbidities. One method to improve the outcomes of hip fracture patients is the adoption of an Enhanced Recovery After Surgery (ERAS) program. ERAS is a multidisciplinary approach to perioperative care with the goal of standardizing patient care to reduce the physiological stress of surgery, complications, and mortality. Initially, a combination of fascia iliaca compartment blocks, multimodal pain management and clear fluid intake up until 4 hours prior to surgery was implemented. Hospital staff also encouraged early ambulation, early urinary catheter removal, delirium prevention protocols, stratified venous thromboembolism (VTE) risk and prevention, and post-discharge planning for ERAS patients. Monthly hip fracture reports were pulled from a database and a master excel sheet was used to compare pre-ERAS and ERAS patients. Unadjusted data found a reduction in mortality, ED admission to surgery, delirium, surgical site infection (SSI), VTE, length of stay (LOS), and discharge to a nursing facility rather than home rates in ERAS patients compared to pre-ERAS. Urinary tract infection (UTI) rates did not improve which may be attributed to various factors. Improvement in surgical care to enhance the recovery process for patients will be a vital component in mainstreaming an ERAS program in all departments at Good Samaritan Medical Center.



## Abstract #36

### A Morbidity And Mortality Case Study Analysis On The Complexities Of Pediatric Brain Death

Benjamin Joseph Michael Horn, MA, OMS IV, RVUCOM

**Research Category: Clinical Research**

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The clinical diagnosis of brain death is declared under the irreversible cessation of all neurological functions of the entire brain, including the brainstem, in a comatose patient. Pediatric brain death determination, while rare, is not an infrequent process in the intensive care unit setting. Herein I present a morbidity and mortality case study review of a 2-week-old patient who suffered brain death secondary to total cardiovascular respiratory arrest. The purpose of this review is to briefly describe the case herein as well as highlight the complex nuances inherent to declaring brain death in a pediatric patient. The process and conversations that enthrall this delicate period are also discussed in the hopes of identifying how similar cases such as this can be addressed in the future. In summary, the significance of this case study is in the review of how to perform the brain death exam from a pediatric perspective, as well as how best to navigate the ethical dilemmas and emotions that can arise in similar cases such as this.



## Abstract #37

### A Pediatric Case Presentation Of A Misdiagnosed Langerhans Cell Histiocytosis (Histiocytosis X)

Benjamin Joseph Michael Horn, MA, OMS IV, RVUCOM

**Research Category: Clinical Research**

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Langerhans Cell Histiocytosis (LCH), previously referred to as Histiocytosis X, is a rare hematological disorder that predominately impacts infants and children of young age. The disorder is marked by the uncontrolled proliferation of normal antigen presenting cells usually within the bones. The purpose of this case presentation is to describe a case of LCH in a 4-1/2-year-old child who initially presented with a presumed diagnosis of torticollis; the patient was later found on imaging and later pathological biopsy to have evidence of vertebra plana consistent with epithelioid type cells diagnostic of Langerhans Cell Histiocytosis. Following biopsy and curettage to promote inflammatory healing, the patient was placed in a c-collar to prevent further collapse of the vertebra as the patient healed. Utilizing a case and literature review, I discuss the clinical, radiological, and histopathological characteristics of LCH, as well as the complications from the initial misdiagnosis. The significance of this case review is denoted in the rarity of this diagnosis, as well as potential complications that can arise in misdiagnosis of this hematological disorder.



## Abstract #38

### Investigating Efficacy Of Different Forms Of Patient Education For Stretches And Exercises

Emily Jensen, OMS IV, RVUCOM; Gage Williamson, OMS IV, RVUCOM; Chris LaFontano, DO, RVUCOM; Jordan Hesper, DO '20, Garney Health Medical Center; Whitney Liehr, DO '20, UC Davis

#### Research Category: Clinical Research

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Patient education is a vital aspect of medical care and reasons for noncompliance as well as evaluating the form of education has not been studied. This is critical information in the medical setting because successful patient care relies on patient education. We are evaluating patient compliance through stretching and exercising prescription. Our hypothesis is that patients are more compliant with their rehabilitation exercises if they are provided with instructions via physical pamphlets or videos and that younger patients will have a higher rate of compliance with video instructions while older generations will be more compliant with pamphlets. To test this, research participants will be coming from the OPP Fellows' clinics on both campuses. Participants are offered participation in the study if they have any musculoskeletal complaint related to the spine. From there, they are randomly divided into one of three groups – verbal only instruction, paper hand out, or video instruction. Each patient will always receive verbal and physical demonstration of any new stretches and/or exercises. Upon follow up, patients will be given a group specific questionnaire that inquires how often they were asked to complete their stretch(es) and/or exercise(s), how often they completed them, how helpful the form of instruction was and any reasons for why they didn't comply to the prescribed stretch(es) and/or exercise(s). Data is still being collected until the spring and we expect to see that verbal only will have the least compliance with better results seen with pamphlet and video instruction. Additionally, we expect a lot of the noncompliance reasons would be because of time and/or forgetfulness. The findings from this study will be a good starting point to help practitioners better educate their patients by knowing there should be a reference of some kind as well as addressing common noncompliance issues from the start – helping them set a specific time or reminder to do what is expected.



## Abstract #39

### **Quantitative Ultrasound in the Assessment of Osteopathic Manipulative Treatment**

Tyler Kolstad, DO' 20, RVUCOM; Jing Gao, MD, RVUCOM

**Research Category: Clinical Research**

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Historically, studies have measured the efficacy of osteopathic manipulative treatment (OMT) without a reliable quantitative method. Patients are assessed by pre- and post-treatment perception of pain and the pre- and post-treatment presence of somatic dysfunction: tissue texture abnormality, asymmetry, restriction of motion, and tenderness (TART changes). Pain is a subjective assessment, making it an inaccurate measure for clinical outcome. Palpatory assessment of somatic dysfunction is useful clinically for diagnosis and treatment, yet, these objective findings are poor measures due to low inter-examiner reliability. For example, examiners are often inaccurate in their identification of bony landmarks. Recently, the use of ultrasound has shown promise in providing evidence-based quantification of OMT. Ultrasound has been used to measure spine vertebra rotational symmetry in a neutral position, to assess improvements of rotational symmetry from pre- to post-OMT. The use of ultrasound shear wave elastography (SWE) is promising in the evaluation of tissue stiffness associated with somatic dysfunction. Shear wave propagation is measured to be faster as tissue becomes stiffer (increased somatic dysfunction), allowing tissue stiffness to be quantifiable. It is believed that a somatic dysfunction may result from muscle contraction or spasm due to the pain, an imbalance of tissue activity, the development of muscle fibrosis, or combination of all of the above. SWE has shown that there is significant tissue property changes from pre- to post-OMT on somatic dysfunction. The use of ultrasound may allow for a reliable quantitative method for measuring the efficacy of OMT.



## Abstract #40

### Point-of-Care Ultrasound Use by EMS Providers in Out-of-Hospital Cardiac Arrest

Michael Kreiser OMS II, RVUCOM; Brianna Hill, OMS II, RVUCOM; Dikchhya Karki, OMS II, RVUCOM; Elke Wood, OMS II, RVUCOM; Lt. Ryan Shelton, MPS, NREMT-P, South Metro Fire Rescue; Jodi Peterson, South Metro Fire Rescue; Isain Zapata, PhD, RVUCOM; Paul A. Khalil, MD, University of Louisville School of Medicine, Norton Children's Hospital; Anthony J. LaPorta, MD, FACS, RVUCOM; Amanda G. Toney, MD, University of Colorado School of Medicine, Denver Health Medical Center

#### Research Category: Clinical Research

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Point-of-care ultrasound (POCUS) is a useful adjunct in emergency care, assisting trauma evaluation, intervention guidance, and cardiac assessment. During cardiac arrest, POCUS can discern pulses and cardiac activity when the physical exam is equivocal or, conversely, confirm asystole after lengthy resuscitation efforts. Although these same determinations are integral to prehospital emergency care during out-of-hospital-cardiac arrest (OHCA), POCUS has yet to be integrated into EMS systems. Paramedics may be able to acquire and interpret POCUS scans for OHCA, while adhering to resuscitation protocols, but few have investigated this capacity in the field. A retrospective observational cohort study was performed using South Metro Fire Rescue (SMFR) paramedics. Following a four-hour training session, which included a didactic lecture and hands-on instruction, POCUS was integrated into the SMFR resuscitation protocol during out-of-hospital cardiac arrest. Expert review of POCUS scans was performed for adequacy of images and accuracy of their interpretation. SMFR resuscitation protocol adherence data evaluated end-tidal carbon dioxide monitoring, epinephrine administration, and compression pause length. With minimal training, paramedics were able to obtain adequate POCUS scans during OHCA and accurately interpret these images for cardiac activity. Furthermore, POCUS scans were obtained with a high degree of adherence to resuscitation protocol. Our study suggests that POCUS could be safely and effectively integrated into paramedic protocols for OHCA management. The adjunct has utility in patient care and, once further employed, may be evaluated for impact on decision-making and patient outcomes.



## Abstract #41

### Contrast-Enhanced Ultrasound To Assess Gallbladder Polyps

Regis Lee, OMS II, RVUCOM; Lianhua Zhu, First Medical Center, Chinese PLA General Hospital; Peng Han, First Medical Center, Chinese PLA General Hospital; Bo Jiang, First Medical Center, Chinese PLA General Hospital; Ziyu Jiao, First Medical Center, Chinese PLA General Hospital; Nan Li, First Medical Center, Chinese PLA General Hospital; Wenbo Tang, First Medical Center, Chinese PLA General Hospital; Xiang Fei, First Medical Center, Chinese PLA General Hospital; Jing Gao, MD, RVUCOM

#### Research Category: Clinical Research

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Gallbladder polyps have an incidence of 5–7% in adult population and can represent a wide range of pathological findings including non-neoplastic gallbladder polyps such as cholesterol and inflammatory polyps, and neoplastic gallbladder polyps such as adenomas and polyp-like carcinomas. Previous studies have found stalk width to be an independent risk factor for adenomas, but the efficacy as a diagnostic tool and the differences in stalk width measured by B- mode ultrasound (US) and vascular stalk width measured by contrast-enhanced ultrasound (CEUS) have yet to be explored. We assessed the value of CEUS in distinguishing adenomas from cholesterol gallbladder polyps by retrospectively analyzing US and CEUS in 164 patients with gallbladder polyps. Gallbladder polyps were divided into a cholesterol polyp and adenoma group based on surgical pathology. Differences in patient's age, gender, maximum polyp size, number of polyps, presence of gallbladder stone, vascularity, and stalk width measured by US and vascular stalk width measured by CEUS were analyzed by multiple logistic regression analyses. Among all the factors, only vascularity and stalk width of the gallbladder polyps were statistically different between the two groups. At first, stalk width was found to be wider than vascular stalk width between the two groups, but we discovered this was due to certain limitations on US creating an overestimation in measurement. By measuring enhancement time with CEUS, we found that this could help overcome this issue. Furthermore, when comparing vascularity, a known independent risk factor in adenomas, with vascular stalk width, the specificity of vascular stalk width was found to be higher. Utilization of vascular stalk width by CEUS as a diagnostic tool can help provide us with an accurate assessment of gallbladder morphology and guide us towards appropriate treatment.



## Abstract #42

### Pharmacologic Remedies For The Treatment Of Dravet Syndrome: A Scoping Review

Colton McBride, OMS II, RVUCOM; Jeremy Bergman, OMS II, RVUCOM; Michael Wells, PhD, RVUCOM; Clyde Jensen, PhD, RVUCOM

#### Research Category: Clinical Research

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Dravet Syndrome (DS) is a rare form of epilepsy that is considered to be drug-resistant, and a significant reduction in seizure frequency for patients with DS has proven to be historically challenging to achieve. To satisfy the paucity of knowledge regarding treatment options, this systematic review was performed to inventory research, discover commonalities, and compare the efficacy of medications investigated for the treatment of DS from 2015-2020. Inclusion criteria were a) oral drug interventions, b) used to reduce the frequency of seizures, c) individuals with DS under the age of 18, and d) peer-reviewed clinical trials published in English. Articles were excluded with a) an emphasis on diet, lifestyle choices, or surgical remedies, and b) concentration on scientific research, patient safety, or medical education. Methodology utilized to compile this scoping review was divided into 5 stages: 1) establishing the research question, 2) identifying relevant studies, 3) selecting applicable studies, 4) charting and extracting data, and 5) summarizing and reporting results. Nine articles, from several databases meeting inclusion and exclusion criteria, were selected for final review of efficacy and common adverse effects. CBD, in addition to more conventional antiepileptic medications, including fenfluramine, perampanel, and stiripentol, were considered for drug regimens in patients with DS. Fenfluramine was found to be the most efficacious of these 4 options when considering reduction in seizure frequency, and CBD was demonstrated to be a valuable option because of its ability to reduce the frequency of many different types of seizures. Perampanel should be considered therapeutically since it may allow for complete seizure control, and stiripentol may be used as an effective adjunctive therapy. It is desired that this review, highlighting patient populations who may benefit from certain pharmacologic remedies, may provide physicians and families valuable options when caring for patients with this poorly understood disease.



## Abstract #43

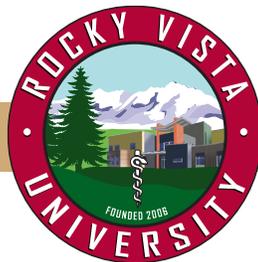
### Central Nervous System Lymphoma Presenting With Lobar Hemorrhage And Edema

Caitlin McCusker, OMS IV, RVUCOM; Sarah Pederson, OMS IV, RVUCOM;

**Research Category: Clinical Research**

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Hemorrhagic presentation of CNS lymphoma whether primary or secondary is rare. Our study outlines the case of a patient with a right medial lobe intracerebral hemorrhage and her hospital course as she was diagnosed with an atypical presentation of CNS lymphoma. A 63-year-old woman with left-sided hemiparesis, hemineglect, homonymous hemianopsia, and confusion was transferred to a comprehensive stroke center after outside CT imaging showed a hemorrhagic lesion in right medial temporal lobe with out of proportion edema concerning for an underlying mass lesion without mass or midline shift. She also had a fever of 38.1 C, hyponatremia, thrombocytopenia and transaminitis prior to her transfer. Initial differential diagnosis included ischemic stroke, infection, or inflammatory demyelinating process. An MRA of the brain without contrast on admission showed acute right hemisphere periventricular, dorsal basal ganglia, temporal lobe ischemic infarct with hemorrhagic transformation in right mesial temporal lobe. An angiogram showed a 2cm area of subtle abnormal vasculature within hemorrhage concerning for an underlying mass lesion. Brain biopsy showed a macrophage-rich lesion with hemorrhage and necrosis. Throughout the course of this patient's work-up, infectious, stroke, and demyelinating etiologies were ruled out. Splenomegaly was also later noted without lymphadenopathy. Peripheral blood smear showed a monotonous subpopulation of small mature lymphocytes and smudge cells, suspicious of a lymphoproliferative disorder. Flow cytometry showed a low-grade, monoclonal B-cell population consistent with a B-cell lymphoma/leukemia. Our case shows an atypical hemorrhagic presentation of CNS lymphoma that can provide clinicians with further insight. In patients with a hemorrhagic mass lesion, CNS lymphoma should be considered as a differential diagnosis.



## Abstract #44

### Pott's Puffy Tumor – A Case Report Of A Rare Sinusitis Complication In A Pediatric Patient

Emily McGovern, OMS III, RVUCOM

**Research Category: Clinical Research**

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Pott's puffy tumor (PPT) is a rare and serious consequence of frontal sinusitis in predominately pediatric patients. Only 92 pediatric patients with PPT were reported from 1998 to 2018.<sup>1</sup> PPT causes osteomyelitis of the frontal bone and can be complicated by meningitis, epidural or subdural abscess, venous sinus thrombosis, or orbital cellulitis.

This report describes the case of a six-year-old male who presented with forehead swelling, fever, severe headache, and bilateral eye pain that began only as a headache four weeks prior. His symptoms progressively worsened despite having partially completed a 10-day course of amoxicillin/clavulanic acid for possible sinus infection. On physical examination, the patient's head was atraumatic with well-defined, firm, non-erythematous, mildly tender swelling from the bregma to the nasal bridge. Computed tomography with contrast findings included acute sinusitis, a 4.1cm PPT overlying focal thinning of the frontal bone, and a 5.4cm epidural abscess overlying the left frontal lobe. Irrigation of the frontal scalp abscess and burr hole evacuation of the epidural abscess was performed. Cultures were positive for *Staphylococcus anginosus*, which was treated with a 61-day course of metronidazole and ceftriaxone.

This case was unique not only in its rarity, but also in its presentation. On initial assessment for his headache, there was no indication of nasal symptoms to suggest sinusitis. Clinicians should consider PPT in patients presenting with severe headache, acute forehead swelling, and fever who have been untreated or partially treated for possible sinusitis. Treatment requires immediate surgical drainage and a six- to eight-week antibiotic course.



## Abstract #46

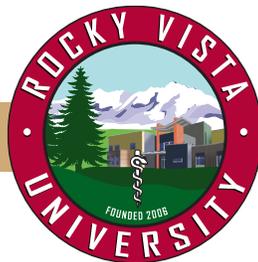
### A Common Blunder For A Rare Disease; Misdiagnosed PEComa

Colby McWhorter, OMS IV, RVUCOM; Steve Grover, MD, GYN, Utah Valley Hospital

**Research Category: Clinical Research**

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Perivascular Endothelial Cell Tumors (PEComas) are extremely rare and often deadly. Due to the rarity of the disease, they are often misdiagnosed and since some are extremely malignant this can be a cause for alarm. Even though “rare presentations of common diseases are more common than common presentations of rare diseases” as my trauma surgeon once said holds true there are times when this is not the case and as physicians we have to be on the lookout for zebras in the arctic. This is a case where the a PEComa presented in an abnormal location and due to the nature of this disease and its presentation it was misdiagnosed at first as mostly likely non-cancerous and then as rhabdomyosarcoma, both of which were wrong. The correct diagnosis was reached and a treatment plan determined after further review from outside specialists. Staying well educated and up to date on current practices will help physician keep a broad differential in order to not exclude potentially deadly diseases from the diagnosis.



## Abstract #47

### Scarcity Of The LGBTQ Community In Dermatology Literature

Colby L. Presley, OMS IV, RVUCOM; Michelle Militello, MS, OMS III, RVUCOM; Kayd J. Pulsipher, OMS III, RVUCOM; Kristen H. Ward, OMS III, RVUCOM; Mindy D. Szeto, University of Colorado School of Medicine; Shane Swink, MS, DO, Lehigh Valley Health Network; Melissa R. Laughter, PhD, University of Colorado Anschutz Medical Campus; Robert P. Dellavalle, PhD, MD, MSPH, University of Colorado Anschutz Medical Campus, US Department of Veterans Affairs Rocky Mountain Regional Medical Center

#### Research Category: Clinical Research

Members of the lesbian, gay, bisexual, transgender, queer (LGBTQ) community face many health disparities that include conditions relevant to dermatology. The LGBTQ self-identified community composes 2.7-5.3% of the United States (US) population. These patients are at a particularly high risk of infectious diseases, acne, alopecia, postoperative scars, and skin cancer. Dermatologic care for LGBTQ patients has not been widely discussed within the literature. Herein, we aim to examine the availability of dermatologic literature focused on this community and trends in these publications over the ten-year period of 2010-2020, noting publications before and after 2015, when the Defense of Marriage Act (DOMA) legalized marriage equality in the US. The top ten US and top two international dermatology journals, as well as top five medicine journals ranked by h-index [Scimago.com], were surveyed October 23, 2020 for PubMed publications using Medical Subject Headings (MeSH) = "Sexual Minorities and Gender." With the exception of Sexually Transmitted Diseases, none of the top ten American or international dermatology journals published LGBTQ articles from 2010-2014. Starting in 2015, post DOMA, JAAD and JAMA Derm ranged from 1-7 LGBTQ publications per year. Dermatologic Surgery published one article regarding this community between 2015-2020. The remaining journals did not publish any articles on this topic after 2015.

As this community grows, dermatologists will undoubtedly treat LGBTQ patients within their practice. Therefore, an increase in evidence based medicine will be of benefit. Singer et al. demonstrated that this community is higher risk for skin cancer, making low publications in surgical dermatology an area of focus by researchers. Acne, scars, tanning behavior, and alopecia are complications for homosexual and transitioning patients that clinical dermatology literature can address.



## Abstract #49

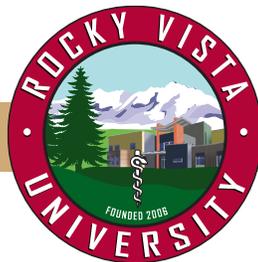
### The Effects of Orthopedic Hardware on Chronic Postoperative Pain

W. Paydon Newman, OMS IV, RVUCOM; Marcus Oliver, OMS IV, RVUCOM; , Bruce Davey MD, RVUCOM

**Research Category: Clinical Research**

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Few studies compare the general outcomes of chronic pain due to orthopedic hardware and subsequent changes in pain following the removal of hardware. This study was designed to investigate correlations between these factors. We predicted a positive correlation between chronic pain and hardware. We also expected a reported decrease in pain post-removal of hardware. We designed a questionnaire to assess the effects of orthopedic hardware on self-reported chronic pain. The anonymous questionnaire began with a informed consent and contained the following assessments: an initial qualifying question to exclude participants who had been diagnosed with potential confounding medical conditions; participant demographics; history of orthopedic surgeries; perceived pain rated on a 0-10 scale; history of orthopedic hardware removal; changes in pain if the hardware was removed; area of the body in which orthopedic hardware was utilized. The collected data was subsequently analyzed interpreted. The analysis demonstrated ~81% of participants experienced pain associated with orthopedic hardware. ~96% reported decreased pain post-removal of hardware. The study demonstrated a profound correlation between orthopedic hardware and chronic pain. These findings establish the need to further investigate this association and call to question the surgical practice of recommending permanent orthopedic hardware.



## Abstract #50

### Orthogonal Plate Fixation In Complex Periprosthetic Femur Fracture

Adrian Olson, OMS IV, RVUCOM; Eric Hjaltalin, OMS III, RVUCOM; Darryl Auston, North Suburban Medical Center

#### Research Category: Clinical Research

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Periprosthetic fractures of the femur typically occur in patients after total knee arthroplasty (TKA), or total hip arthroplasty (THA). TKA or THA implants may predispose patients to periprosthetic fractures where osteopenic or osteoporotic bone interfaces with a rigid implant. The resulting fractures often present a challenge to the treating surgeon as the TKA or THA implants may interfere with healing or prevent placement of fixation devices such as plates or intramedullary devices. Here we present a report on a challenging periprosthetic fracture treated successfully with orthogonal femoral plating after failed traditional lateral femoral plating.

A 58 year old male patient with asthma, tobacco dependence, hypertension, obesity and chronic normocytic anemia, bilateral total knee arthroplasty with revision knee system implants, and a history of medical non-compliance. Our patient experienced one TKA periprosthetic femur fracture and three additional revision procedures. The patient eventually achieved an acceptable functional outcome at one-year follow-up, despite a cascade of multiple adverse events and re-operations. This unfortunate case illustrates a unique series of treatment options for femoral revision fixation constructs in periprosthetic fracture management and revision treatments which included lateral plating, orthogonal plating, and ultimately definitive treatment with IM nailing plus orthogonal plating.

Periprosthetic fractures are increasing both in the absolute number of fractures per year and in frequency, and, as a result, orthopaedic surgeons will face these challenging injuries more often. The optimal treatment must be individualized, taking into consideration the fracture location relative to the TKA or THA implant, the implant stability, the underlying quality of the bone, and the medical and functional status of the patient. As illustrated in this case, often fracture fixation constructs must be modified to achieve fracture union.



## Abstract #51

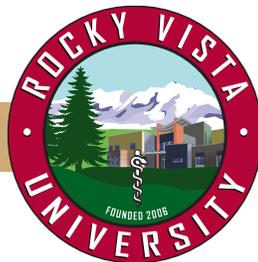
### **Intrathecal Baclofen Use During Pregnancy & Breastfeeding With 5-Year Follow-Up: Literature Review & Case Report**

Sarah Pederson, OMS IV, MS, RVUCOM; Adrian Olson, OMS IV, MS, RVUCOM; Zachery Rosensweet, DO '17, RVUCOM; Mihaela Alexander, MD, Colorado Neurodiagnostics

#### **Research Category: Clinical Research**

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Since the development of intrathecal baclofen (ITB) therapy, there have been a handful of case reports on maternal/ fetal safety with ITB use; however, no clinical studies exist. Case reports are possibly the only sources of clinical information available for assessing safety and guiding clinicians. Cases of consecutive pregnancies on an ITB pump, breastfeeding and extensive follow-up of the patient and child in particular are rare. This study reviews the current literature and presents a case of a patient who underwent two pregnancies on the same implanted ITB pump. Using the search terms “intrathecal baclofen pump”, “pregnancy”, “complications”, and “breastfeeding” on PubMed and Google Scholar, we found 14 journal articles with 18 cases of well-documented ITB pump use during pregnancy. A woman on ITB therapy for spasticity from a prior stroke, was closely monitored by her neurologist and obstetrician during two pregnancies for signs of maternal, fetal or pump-related complications. There were no adverse side effects during pregnancy, labor, vaginal delivery and cesarean section, or with epidural anesthesia. Two consecutive healthy infants were delivered and breastfed for 12 months postpartum without complications. At 5-year follow-up, mother continues to report no complications from the ITB pump and that her children are healthy and reaching developmental milestones. After a review of the current literature, we found no report of adverse maternal or neonatal complications due to ITB administration during pregnancy as was the case with our patient. The addition of our case to the existing literature adds to the knowledge thus far that ITB is relatively safe during vaginal delivery and C/S, breastfeeding, and epidural anesthesia despite no published controlled trials. This study fills many of the gaps in the literature, but there still remains the question of ITB pump safety in three or more consecutive pregnancies or in a multiple pregnancy.



## Abstract #52

### Gender Authorship Distribution In Academic Dermatology

Colby L. Presley, OMS IV, RVUCOM; Kayd J. Pulsipher, OMS III, RVUCOM; Mayra B.C. Maymone, DDS, MD, DSc, University of Colorado Anschutz Medical Campus; Melissa R. Laughter, PhD, University of Colorado Anschutz Medical Campus; Madeleine Yemc, University of Colorado Anschutz Medical Campus; Tessa Zangara, University of Colorado Anschutz Medical Campus; Chandler Rundle, MD, Saint Joseph's Hospital; Robert P. Dellavalle, MD, PhD, MSPH, University of Colorado Anschutz Medical Campus, US Department of Veterans Affairs Rocky Mountain Regional Medical Center

#### Research Category: Clinical Research

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Previous studies suggest the need for further bibliometric analysis of female authorship in academic dermatology. In an effort to further illuminate patterns of gender representation in dermatologic publications, we have completed this analysis to close the gap in the literature and demonstrate a needed effort for diverse representation in dermatologic academia. Our study hypothesizes an unbalanced distribution of female authors in first and senior authorship of academic dermatology literature. Clarivate Analytic's Web of Science (WoS) was used to isolate the names of all first and last authors on published works in the Journal of Investigative Dermatology (JID), the Journal of the American Academy of Dermatology (JAAD), and JAMA Dermatology (JAMA Derm) from 2009 to 2019. Gender API ([www.gender-api.com](http://www.gender-api.com)), a large online database linking known gender-name relationships, was used to predict binary gender (female vs. male) for each name. Results were reported as percent female first or last author for all publications in the journal by year. Statistical analysis was performed using one-way ANOVA, with significance set to p value < 0.05. The results demonstrated that female first authorship (FFA) has been consistent with that of their male counterparts for the past ten years. However, female senior authorship (FSA) has been substantially less than their male colleagues. To reduce inequalities among dermatologic research, studies should be directed at increasing the percentages of female dermatologist academics contributing to the current literature. It is paramount that the conversation surrounding gender disparities in dermatologic research continues.



## Abstract #53

### Tongue-Type Calcaneal Fracture in a Youth Football Player

Raymond Kleposki, RN, MSN, CPMP, Texas Scottish Rite Hospital; Gerad Montgomery, RN, MSN, CPNP, Texas Scottish Rite Hospital; K. John Wagner III, BS, , Texas Scottish Rite Hospital; William C. Searls, BS, OMS II, RVUCOM, Texas Scottish Rite Hospital; Charles W. Wyatt, RN, MSN, CPNP, , Texas Scottish Rite Hospital; Philip L. Wilson, MD, Texas Scottish Rite Hospital, University of Texas Southwestern Medical Center

#### Research Category: Clinical Research

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We report a case of a 12-year male presenting with a closed displaced intraarticular tongue-type fracture of the calcaneus. Calcaneal fractures in the pediatric population are rare, representing only 0.005% of all pediatric fractures. Even less common are tongue-type fractures, which are longitudinal fractures that exit the calcaneal tuberosity posteriorly and involve a portion of the articular surface. In general, most displaced calcaneal fractures result from high-energy traumas such as falls from height or motor vehicle accidents. Interestingly, this patient reported with a tongue-type calcaneal fracture after a kick to the posterior portion of his tarsus at the level of the Achilles tendon during a football game. The common occurrence of being kicked in sport and the relatively low-energy impact rarely directly leads to this type of injury. Therefore, it is possible that an underlying pathology could have existed prior to trauma. Immediately following the injury, the patient presented to an emergency department and was referred to fracture clinic. After initial XR findings, the patient was immediately referred to an orthopaedic surgeon who performed an open reduction and internal fixation (ORIF) that same day. Adequate reduction of the fracture was achieved. Postoperative images suggest routine healing with joint spaces within normal limits. Long term data for children undergoing ORIF for displaced intraarticular calcaneal fractures has not been well documented in the literature. It is known, however, that posttraumatic arthritis can occur after articular incongruence. The importance of proper reduction and fixation is thus emphasized for children undergoing this procedure. Long term follow up for this patient is still pending.



## Abstract #54

### Comparison Of The Bouquet Speculum And Traditional 2-Blade Speculum

Daniel Sullivan, OMS III, RVUCOM; Jacob King, OMS II, RVUCOM; Telyn Peterson, OMS III, RVUCOM; James Small, MD, PhD, FCAP, RVUCOM

**Research Category: Clinical Research**

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Although the 2-blade “duckbill” plastic disposable vaginal speculum has been used for many years, the design fails to solve the common problems that are often encountered during vaginal speculum examinations. Many women experience pain or discomfort during the exam. Visualizing the cervix is often difficult due to the lateral walls of the vagina collapsing inward as the blades are dilated, and the speculum is often inserted for longer than expected in order to visualize the cervix. This randomized single-blinded clinical study will compare the typical 2-blade plastic disposable vaginal speculum to the novel 5-petal Bouquet speculum. Elements that will be analyzed via data derived from patient and physician questionnaires will include patient comfort level during the vaginal exam, visibility of the cervix, ease-of-use for the physicians, and the time of speculum insertion. We hypothesize that the data analysis will reveal that the 5-petal Bouquet vaginal speculum provides higher comfort, better visibility, lesser time of vaginal insertion, and increased ease-of-use.



## Abstract #55

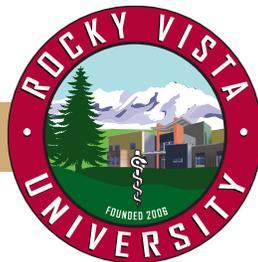
### A Review Of Quantitative Tools To Measure Post Stroke Spasticity

Anthony Tran, OMS II, RVUCOM

**Research Category: Clinical Research**

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After a stroke, upper motor neuron damage can result in spasticity. This is known as poststroke spasticity (PSS), and is the result of a velocity-dependent increase in tonic stretch reflexes due to hyperexcitability of the stretch reflex. Current clinical assessment methods include the modified Ashworth scale (MAS) and the modified Tardieu scale (MTS), which involves visual observations of muscle resistance or muscle tone respectively. These assessments are subjective, making them prone to inconsistencies. The aim of this review is to identify whether quantitative measurements of PSS exist and are can replace the standard qualitative tests. A literature review revealed several modalities capable of quantifying PSS. This included quantitative ultrasound (QUS), electromyography, and magnetic resonance elastography. Of these techniques, QUS was of particular interest because of its feasibility and the level of detail it provided. The general principle to these techniques involves measuring the stiffness of a tissue in real time using waves propagated from an ultrasound transducer. This review identifies Quantitative Ultrasound as a viable method of quantifying PSS, enhancing the ability to diagnose and treat this condition.



## Abstract #56

### Thermoacoustic Technique To Assess Non-Alcoholic Fatty Liver Disease

Michael Trujillo, OMS III, RVUCOM; Jing Gao, MD, RVUCOM; Michael Thornton, Endra Life Sciences

#### Research Category: Clinical Research

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Non-alcoholic fatty liver disease (NAFLD), subdivided into non-alcoholic fatty liver (NAFL) and non-alcoholic steatohepatitis (NASH), is a severely under-recognized medical condition. Recent studies estimate a prevalence of 10-46%, a surprising statistic that is unfortunately increasing with time.

One contributing factor to the under-reporting of cases of NAFLD is that it is typically asymptomatic until later stages where lifestyle modifications and medical intervention are less fruitful. It is crucial therefore, to develop accurate screening and diagnostic tools that can detect changes that take place in the early stages of NAFLD.

The current gold-standard method of diagnosing and staging NAFLD is liver biopsy. Liver biopsy, however, is an invasive procedure, making it a poor screening tool. Several imaging modalities have been developed to sidestep the invasiveness of biopsy, most notably the proton density fat fraction scan of magnetic resonance imaging/spectroscopy. MRI imaging is advantageous in that it is a noninvasive procedure and is an imaging modality free from ionizing radiation. MRI, however, is a very specialized and costly tool that is often reserved for use in higher acuity patients.

Ultrasound-based imaging techniques are an alternative to MRI, which do not utilize ionizing radiation and gain advantage from being inexpensive, to date, however, they have only remained effective in assessing moderate to severe NAFLD.

Herein we present an ultrasound-based imaging modality relying on newly developed thermoacoustic imaging technology that shows promise for accurately assessing early stages of NAFLD using MRI-PDFF as reference. Preliminary data suggest that a scan using our newly developed methodology is specific, accurate, cost-effective, avoids exposure to ionizing radiation, and shows good inter-observer and intra-observer reliability. These results demonstrate promise for widespread implementation for early detection and management of NAFLD.



## Abstract #57

### A Survey Of Osteopathic Physician Representation In The Dermatologic Literature

Kayd J. Pulsipher, OMS III, RVUCOM; Colby L. Presley, OMS IV, RVUCOM; Mindy D. Szeto, University of Colorado School of Medicine; Cara Barber, MD, University of California, San Diego Campus; Abby Meckley, OMS III, RVUCOM; Taylor M. Runion, OMS II, RVUCOM; Michelle Militello, MS, OMS III, RVUCOM; , Chandler W. Rundle, MD, St. Joseph Hospital; Robert P. Dellavalle, MD, MSPH, PhD, University of Colorado School of Medicine, US Department of Veterans Affairs Rocky Mountain Regional Medical Center

#### Research Category: Clinical Research

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A small percentage of active dermatologists in the United States are osteopathic physicians (DO) while the majority are allopathic physicians (MD). Osteopathic physician's representation in dermatologic literature is unknown. We hypothesize that DO physicians are underrepresented in dermatologic literature. We aim to evaluate the representation of osteopathic physicians in comparison to allopathic physicians in the top peer-reviewed dermatology journals. The top ten dermatology journals were selected by using their h-index score. Journals without author credentials/terminal degrees were excluded from selection. Using the individual journal's websites, all articles published in 2019 and 2020 (January through August) were accessed. Two independent reviewers searched each article within these issues to evaluate and tabulate author credentials. The number of authors with a DO degree, and number of authors with a MD degree were recorded. Osteopathic physicians were found to be underrepresented in dermatologic journals. Implementing additional focus and funding on research experiences in osteopathic medical education would likely increase osteopathic physicians research involvement overall. Osteopathic dermatologists, equipped with clinical experiences from rural areas, should be a part of the voice shaping the literature which guides clinical decisions in dermatology. In an effort to help progress the field of dermatology and provide better health care to dermatology patients, we urge osteopathic physicians to become more involved in dermatologic research.



## Abstract #60

### Perceptions Of The Pandemic: The Psychological Impact Of COVID-19 In Medical Education

Rachel McCann, OMS III, RVUCOM; Mikala Russell, OMS III, RVUCOM; Zoya Sandhu, OMS III, RVUCOM; Isain Zapata, PhD, RVUCOM; Mark Wardle, DO, RVUCOM

**Research Category: COVID-19 Research**

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The COVID-19 global pandemic has presented significant challenges to educators and students, forcing many educational institutions to resort to exclusively online learning. Research has shown that those in medical education are notably psychologically impacted by these changes, especially, students preparing for careers as physicians, as many were pulled from clinical experience and hands-on lab work. This study aims to determine the extent to which faculty and students in one institution are affected by these implications, as well as how these populations' behaviors changed during the pandemic. In order to assess this, two anonymous surveys were sent to the entire student body and faculty of one medical school. Respondents were asked to specify whether they were students or faculty and answer a number of questions regarding their adherence to CDC recommended behaviors, their perceptions of how their education/work will be affected by these institutional changes and the institution's communication regarding changing policies and practices. Analysis of the responses demonstrated that students were psychologically impacted by these changes more significantly when compared to faculty members. For instance, students were more likely to agree when asked if they were concerned about the pandemic negatively impacting their education/work. Furthermore, both faculty and students were less likely to abide by CDC recommendations by the second survey compared to the first, and in general, most respondents were not satisfied with the institutional administration's response and communication about the changing situation. On this basis, it is recommended that there be a specific focus placed on student well-being as this pandemic continues, which includes more transparent communication and firm action from the institution, as well as further mandates to follow CDC recommendations when representing the medical school. Further research is needed to explore the efficacy of different communication styles and student wellness initiatives.



## Abstract #61

### Geographical And Socioeconomic Barriers Broken Through Teledermatology During COVID-19

Kayd J. Pulsipher, OMS III, RVUCOM; Colby L. Presley, OMS IV, RVUCOM; Chandler W. Rundle, MD, Saint Joseph Hospital; Hope R. Rietcheck, University of Colorado School of Medicine; Michelle Millitelo, MS, OMS III, RVUCOM; Robert P. Dellavalle, MD, University of Colorado School of Medicine, U.S. Department of Veteran Affairs, Eastern Colorado Health Care System

#### Research Category: COVID-19 Research

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At the onset of the COVID-19 pandemic, telemedicine was identified as an efficient means to reduce exposure risk between physicians and patients. It is unknown how this will impact dermatologic care currently and into the future. Our study hypothesizes that United States (US) telemedicine rankings increased at the precipice of COVID-19 and after the WHO declaration of a pandemic, and that these apps increased teledermatology treatments. We aim to evaluate US telemedicine mobile applications (apps) rankings pre- and post-COVID-19 and their potential impact upon how dermatologic care is delivered in the future. A search was performed on the Apple App Store to determine rankings of medical apps. The top 50 apps within this category were recorded and evaluated to determine telehealth capabilities via reading app store description. Using Sensor Tower, software that analyzes app rankings over time, individual weekly app rankings prior to and throughout the COVID-19 pandemic were also recorded. During the pandemic, telemedicine apps saw an increase of 210.92 ranked positions on average. Within US telehealth during this time, skin conditions became the 5th most common diagnosis. Dermatologists and patients report high satisfaction using teledermatology during COVID-19, with intent to continue using these services in the future. The accelerated use of teledermatology in the COVID-19 era has provided substantial information on how teledermatology can be utilized in the future. The geographical and socioeconomic barriers preventing some patients from receiving dermatologic care have been minimized through the use of teledermatology. With the increased accessibility provided by teledermatology across the US, patients in areas previously underserved by dermatologists no longer need to endure their dermatologic conditions without proper evaluation and care.



## Abstract #62

### Co-infections Associated with SARS-CoV-2: A Literature Review

Prakhar Singal, OMS II, RVUCOM; Jingfan Wu, OMS II, RVUCOM; Dellvin Nguonly, OMS II, RVUCOM; Madison L. Brown, OMS II, RVUCOM

#### Research Category: COVID-19 Research

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Since first appearing in December 2019, the novel coronavirus, SARS-CoV-2, has caused a worldwide pandemic. COVID-19 has overwhelmed health care systems, and information about the virus is being released quickly without compilation for practical use. We conducted a literature review to gather data about co-infections occurring with SARS-CoV-2 to analyze patterns that may be useful for clinicians. Co-infections are concerning as they may increase patient morbidity and the likelihood for clinical complications. After performing a database search and selection process, we amassed 63 studies which reported numeric data collected from adults with acute COVID-19 who were tested for co-infection with other organisms. Data was extracted from these studies and categorized into types of co-infections (bacterial, viral, fungal, parasitic, and multiple). After averaging the rate of co-infections from relevant studies, our calculated overall co-infection rate was 12.92%. Among bacterial co-infections, *Klebsiella pneumoniae*, *Streptococcus pneumoniae*, and *Haemophilus influenzae* were the most common organisms identified from the sample size and had the highest positivity rate. Among viruses, Influenza A, Epstein-Barr Virus, and Influenza B were the most common viral co-infections, along with having the highest positivity rate. Among fungal co-infections, the most commonly positive-tested organisms were unspecified *Aspergillus*, *Aspergillus fumigatus*, and *Candida albicans*. There were only two parasitic co-infection case reports found in the literature and 18 patients with multiple co-infections simultaneously were reported. These findings demonstrate that a large proportion of SARS-CoV-2 co-infections are caused by other respiratory pathogens, as well as opportunistic and nosocomial organisms. Knowledge of these common SARS-CoV-2 co-infection pathogens will help guide clinicians to screen and treat for these aforementioned organisms when treating patients with COVID-19. Further studies of co-infections in COVID-19 patients may yield vital data about patient dispositions, such as which co-infection pathogens may increase the severity of COVID-19 and the potential to develop long-term sequelae.



## Abstract #63

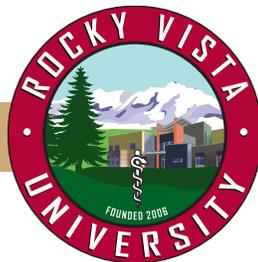
### **SARS-CoV-2 Infection And Its Association With Thrombosis And Ischemic Stroke**

Jonathan Snell, MBS, OMS II, RVUCOM

**Research Category: COVID-19 Research**

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This review of current literature provides background to the COVID-19 pandemic, as well as an examination of potential pathophysiologic mechanisms behind development of thrombosis and ischemic stroke related to COVID-19. SARS-CoV-2 infection is well-documented to cause severe pneumonia, however, thrombosis and thrombotic complications, such as ischemic stroke, have also been documented in a variety of patient demographics. SARS-CoV-2 infection is known to cause a significant inflammatory response, as well as invasion of vascular endothelial cells, resulting in endothelial dysfunction. These factors, coupled with imbalance of ACE2 and RAS axis interactions, have been shown to create a prothrombotic environment, favoring thromboembolic events. Ischemic stroke is a severe complication of COVID-19 and may be a presenting symptom in some patients.



## Abstract #64

### The Evaluation Of Anxiety And Depression Among Medical Students

Mitchell Allen, OMS II, RVUCOM; Bryan Daines, OMS III, RVUCOM; Blake McKinley, OMS III, RVUCOM; Kayd Pulsipher, OMS III, RVUCOM; Isain Zapata, PhD, RVUCOM; Ben Wilde, DO, RVUCOM

**Research Category: Medical Education Research**

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Previous studies have identified higher levels of depression and anxiety among medical students, residents, and physicians compared to the general U.S. population. As designers of the study, we hypothesize that higher levels of anxiety and depression begin within the first year of medical school. We also hypothesize that having chronic health conditions, fewer hours of sleep, poor quality of sleep, and fewer hours of exercise contribute to increased levels of anxiety or depression. A survey was created using validated questionnaires to analyze levels of anxiety (GAD-7) and severity of depression (PHQ-9). Additional questions were included in the survey regarding sleep, exercise habits, and chronic medical illness. Sleep quality questions were modified from the Pittsburgh Sleep Quality Index. The survey contained questions regarding both pre- and post-matriculation assessment to quantify possible change. The survey was sent to the students in the Rocky Vista University College of Osteopathic Medicine Class of 2023 and was completed by 83 students. Results were then analyzed by Poisson distributions. Overall, the average GAD-7 and PHQ-9 score rose between pre-matriculation to the first semester of medical school, representing increased levels of anxiety and depression. As we consider factors that might contribute to the higher levels of depression and anxiety among medical students, sleep quality was shown to be the only significant contributing factor. Addressing sleep quality could prove to impact clinical treatment of students with borderline levels of depression or anxiety. Our future studies among the Class of 2024 will implement the complete Pittsburgh Sleep Quality Index, rather than a modified version, to better assess the impact of sleep quality on medical student's anxiety and depression levels. We will also screen for the potential influence of COVID-19.



## Abstract #65

### Creating 3D PDFs With Photogrammetry For Online Anatomy Education During The COVID-19 Pandemic

Zachary Brodie, OMS II, RVUCOM; Mike Jorgensen, PhD, RVUCOM

**Research Category: Medical Education Research**

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The COVID-19 pandemic and related mitigation procedures have impacted many students' ability to obtain hands-on anatomy training with cadavers. While applications and cadaver images can be used to provide a similar experience, both have drawbacks such as cadaver images being static and digital applications lacking a realistic appearance. Photogrammetry can be used to bridge the gaps that currently exist. Photogrammetry uses a series of photos which are then imported into a software program that can build an interactable 3D model<sup>1</sup>. Because it relies on photographs of cadaveric structures, Photogrammetry can provide the realistic appearance found in cadaver images and allow for the manipulation of the structures that popular applications provide<sup>2</sup>. Using Photogrammetry, a methodology was developed to create surface model 3D PDFs of cadaver hearts. Specimens were captured using a DSLR camera and the photos were imported into Agisoft Metashape for model generation. A key focus of the method was avoiding the expensive and technically complex software that is commonly used in 3D modeling and using a distribution method that could easily run on most laptops. These 3D models will be distributed to first year Osteopathic Medical Students at Rocky Vista University for use during cardiovascular anatomy. Students will be provided with an optional survey that will be used to gauge the usefulness of the 3D models and provide feedback for possible future implementations. The survey results will be available after 11/3/20. With the uncertainty surrounding the return to in-person classes, this methodology can help to provide students with surface models that accurately mimic the color and texture of cadaver images with the benefit of 3D manipulation common in applications. Emphasis on a simplified workflow could allow for easy implementation by anatomy departments without requiring additional training with technically demanding and expensive software.



## Abstract #66

### 3D Modeling In Anatomy Education: A Review Of Current Implementations

Zachary Brodie, OMS II, RVUCOM; Christylynne Grenz, OMS II, RVUCOM; Julio Andre Hernandez, OMS II, RVUCOM; Bosten Loveless, OMS II, RVUCOM; Joshua Calvano, OMS IV, RVUCOM; Joseph Fike, OMS IV, RVUCOM; Shuhan He, Massachusetts General Hospital

#### Research Category: Medical Education Research

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Cadaver-based learning has long been considered the gold standard of medical anatomy education.<sup>1</sup> However, cadaver-based learning can be limited by dissection quality, structural size, and specimen longevity. These limitations can be increasingly pronounced in areas of small and complex anatomy.<sup>1</sup> Implementing three-dimensional (3D) modeling techniques into anatomy education can allow for students to appreciate spatial relationships. This is referring to a student's ability to understand the 3D orientation of anatomical structures that are otherwise difficult, while using traditional dissection and two-dimensional (2D) atlases alone.<sup>2</sup> We performed a literature review to answer the following question: Is there value in implementing 3D modalities in combination with traditional anatomy education? A systematic literature search was performed using the PubMed MeSH database and 43 papers were selected for literature review. 40 papers were utilized in the final literature review after exclusion criteria was applied. Literature review was conducted using the data coded variables based on common factors in the articles including impact on spatial awareness, impact on structure identification and relationships, impact comparing cadaver or 2D learning modalities to 3D generated modalities, technical considerations, variability in data set and collection, and ease of use. Of the 40 articles, 8 articles demonstrated an implementation of 3D modalities to teach humans and they were selected for the focused synthesis for further analysis and comparison. Analysis of 3D implementations indicated positive improvements with several learning outcomes including spatial understanding and structure identification. Common limitations included methodologies that required training in the software to build the 3D models and dataset limitations. There appears to be a benefit of including the use of 3D models in combination with traditional anatomy education. We propose that 3D models should be added to the current cadaver-based learning as a supplemental tool.



## Abstract #67

### Generating Predictive Models To Be Able To Predict Performances On The COMLEX-USA Level 1 By The End Of The Third Semester

Payton Christensen, OMS II, RVUCOM; Kevin McNeil, OMS II, RVUCOM; Han Wang, Shenzhen DJI Sciences and Technologies Ltd; Qing Zhong, MD, PhD, RVUCOM

**Research Category: Medical Education Research**

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Osteopathic Medical Licensing Examination of the United States (COMLEX-USA) Level 1 (COMLEX-USA Level 1) is a board examination that each medical student in an osteopathic medical school must pass. Students take the exam sometime in the three months following the conclusion of the fourth semester. There are currently no models to predict student performances on this exam based on a two-pass, organ system curriculum in literature. Our goal is to build a predictive model at the end of third semester, so students will have enough time to receive extra assistance if they need. We hypothesize that scores on the Medical College Admission Test (MCAT), and performances in preclinical sciences will predict outcomes of the COMLEX-USA Level 1. Data from six cohorts of medical students matriculated at Rocky Vista University College of Osteopathic Medicine from 2012 to 2017 were collected, including independent variables of MCAT scores, performances on each course from the first three semesters, with the dependent variable being that of the score on the COMLEX-USA Level 1. Predictive models were built with multiple linear regression, backward stepwise regression, or random forest, using Python language and SPSS. We found that the performances of third semester Renal System II, Cardiovascular System II, and Respiratory System II courses had the highest correlation with the scores of COMLEX-USA Level 1. MCAT score was a significant, but weak, predictor of COMLEX-USA Level 1. The three models confirmed that the most significant predictors were performances on above three courses. The models had a similar accuracy of prediction. In conclusion, students who perform poorly in Renal II, Cardiovascular II, and Respiratory II have a higher risk of performing poorly, or failing, the COMLEX-USA Level 1 on their first attempt. Our models fill the literature gap and have the advantage of giving students who are in need enough time to receive extra help.



## Abstract #68

### Impact Of Joint Graduate Medical Education On The Match Rates Of Osteopathic And Allopathic Medical Students In General Surgery

William Tyler Crawley, OMS IV, RVUCOM; Ryan Carney, OMS IV, RVUCOM; Cyprien Jungels, OMS IV, RVUCOM; James Small, PhD, RVUCOM

**Research Category: Medical Education Research**

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Graduate medical education (GME) has traditionally been separated into allopathic and osteopathic residency programs with two separate residency application services or “matches” each year. This changed with the 2020 application cycle as all residency programs merged into a single-accreditation system for GME and a single residency application process. This is a change we believe could disproportionately affect DO students. Our study sought to evaluate how the number and percentage of osteopathic (DO) and allopathic (MD) medical students matching into general surgery residency programs has changed over the past 5 application cycles (2015-2020) as programs have transitioned to the single GME system. This was achieved through directly surveying the program coordinators for the 330 accredited general surgery residency programs for data on their match rates from 2016-2020. We also directly surveyed program directors for information regarding their match rates in the 2020 match, which was the first unified residency match, as well as whether they felt changing to a single GME system affected their evaluation and selection of applicants.

Our preliminary data has shown that when it comes to general surgery residency, 91.7% of responding programs previously accepted or are open to accepting DO students. Among responding program directors, it was felt that changing to a single GME system either did not affect their selection of residents or was beneficial to more competitive DO students. Of these programs, an overwhelming majority either only accept the USMLE (62.5%) or prefer students to take it regardless of being an MD or DO applicant (20.8%). While our study is still ongoing, we feel that these preliminary results highlight how important this information is to both DO and MD students looking to pursue general surgery residency.



## Abstract #69

### Evaluating Osteopathic Medical Student Perceptions Of Research, Research Training And Resources And Rocky Vista University College Of Osteopathic Medicine

Jeffrey Edwards, OMS II, RVUCOM; Rebecca Ryznar, PhD, RVUCOM

**Research Category: Medical Education Research**

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Performing research while in medical school is valuable to students for many reasons, including the development of critical thinking skills, specific knowledge acquisition to enhance clinical perspectives, contributing to scientific dialogue, and increasing competitiveness in the residency match. It is in the latter pursuit that DO students tend to fall behind their MD counterparts, as many allopathic schools have more research resources than osteopathic colleges and even require research in their curricula. The goal of this study is to examine osteopathic student interest in research as well as perception of research training and opportunities at RVUCOM through a survey, to then provide study participants with an online training workshop that emphasizes building familiarity with the student research process, and finally to collect a post-workshop survey to evaluate the effect of additional training on student perceptions and interest in performing research. Statistical analysis of Likert responses using one-sample and two-sample t-tests, as well as a Wilcoxon signed-rank test, will support or fail to support the hypotheses that (1) students at RVU are interested in research, (2) students at RVU desire additional research training and resources to meet that interest, (3) increased research training leads to increased student interest in research, and (4) increased research training leads to increased student confidence in their ability to carry out research while in medical school. Pre-workshop surveys will be sent out the week of 10/19/2020; the workshop will take place on 11/4/2020 and include presentations from RVU faculty on the pragmatic aspects of student research areas and types, networking, grant-writing, the IRB process and working with human subjects, and RVU resources, with the post-workshop survey being solicited immediately after the workshop. If hypotheses are supported the study will provide impetus for osteopathic colleges to provide additional research training and resources to their students.



## Abstract #70

### Racial And Ethnic Minority Medical Students Have Increased Confidence And Perceived Competence When Training For A Female Genitourinary Exam Using Models And Specialized Standardized Patients

Mallory Kelley, OMS III, RVUCOM; Kelsey Link, MA, RVU; Isain Zapata, PhD, RVUCOM; Susan Carter, MD, RVU

**Research Category: Medical Education Research**

The female genitourinary exam (FGUE) is an essential component of a complete medical education for all future physicians. For many medical students, the intimate nature of the exam can be anxiety-provoking. The purpose of this study is to investigate what factors make students feel confident and competent when performing a FGUE. We anticipated that students would increase their confidence and perceived competence from OMS-I to OMS-II, would prefer the use of specialized standardized patients (SSPs) over models, and that the results would vary by student demographics. Hard copy surveys were provided to Rocky Vista University – College of Osteopathic Medicine classes of 2023 (OMS-I) and 2022 (OMS-II) pre- and post-intervention in the Spring semester of 2020 in Parker, CO. Guidelines on a complete FGUE and educational interventions including the use of models and SSPs were provided by the Department of Primary Care and the Principals of Clinical Medicine courses II (OMS-I) and IV (OMS-II). Survey responses were evaluated via Generalized Linear Mixed Models for numeric responses, statistical modeling, and descriptive statistical analyses with SAS v.9.4. The results demonstrated that the OMS-I and OMS-II osteopathic medical students of racial and ethnic minorities rated themselves as more confident and had a higher perceived competence than Caucasian counterparts. Students felt that using SSPs alone was the best mode of learning the exam compared to either models alone or the combination of models and SSPs together, and students' current specialty of choice did not correlate with increased confidence or perceived competence. The utility of these findings will help medical educators use methods that best prepare their students for becoming successful physicians capable of performing an effective FGUE.



## Abstract #72

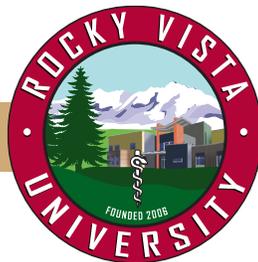
### **Influence Of MCAT Retesting On Performance Of Preclinical Medicine And COMLEX-USA Level-1 And Level 2-CE**

Anton Nguyen Pham, OMS III, RVUCOM; Qing Zhong, MD, RVUCOM

**Research Category: Medical Education Research**

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The Medical College Admission Test (MCAT) is utilized as one of the preadmission variables by the medical school admissions committees in the selection of students since 1928 in United States. Students are permitted to retake the MCAT up to three times in one calendar year and four times across two calendar years, with a maximum of seven attempts in their lifetime in order to maximize their score. The MCAT score is used as a predictor of how well a student can perform in medical school, with extensive research investigating the relationship between MCAT scores and preclinical performance as well as medical board examinations, yet sparse research have focused on the effects of retaking the MCAT. Furthermore, there has been no exploration into the influence of retesters' MCAT scores and the number of MCAT attempts on COMLEX Level 1 and Level 2-CE in literature. Our goal was to investigate whether MCAT retaking affects the performance of preclinical courses and board examinations. We hypothesize that increased attempt of MCAT will negatively affect performance in medical school and board examinations. Data from 904 students who matriculated at Rocky Vista University College of Osteopathic Medicine during 2012-2017 included MCAT scores on first attempt, second attempt, third attempt, fourth attempt, preclinical course scores, and first attempted scores of COMLEX Level 1 and Level 2 CE. One-way ANOVA, X2 test, and Pearson correlation coefficient were performed. The analysis revealed that compared to non-retesters, retesters had a significantly lower first-time and average MCAT scores, with the lowest seen in those who retook it four times. In addition, scores of COMLEX Level 1 in retesters who took the MCAT four times were significantly decreased compared to that in non-retesters. In conclusion, increased attempts of the MCAT negatively influenced performance of COMLEX Level 1 and Level 2-CE.



## Abstract #73

### Mind Wandering During Easy And Difficult Texts

Megan Hedding, BYU-Idaho; Cira Long, BYU-Idaho; Christina Pinargote, BYU-Idaho; Yesenia Sanchez, BYU-Idaho; Andrea Valencia, BYU-Idaho; Bradford J. Wiggins, PhD, BYU-Idaho. Presented by Kyle Shepherd, OMS II, RVUCOM.

### Research Category: Medical Education Research

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Higher education involves reading material that often employs technical vocabulary. These texts can be difficult to digest and can promote the reader's mind to be distracted. Additionally the reader must construct a situational model of the text in order to interpret its meaning and extrapolate its implications. This study was closely replicating a study done in 2013. We hypothesized that a higher difficulty text would promote difficulty in constructing this situational model and promote a lower level of comprehension and a higher incidence of 'mind wandering'. Subjects were tested by reading passages of alternating, standardized difficulty, with variables such as reading speed, reading comprehension, and the absence or presence of 'mind wandering'. A mixed-effects logistic regression model was used to predict the degree of mind wandering while reading a difficult vs. easy text. Additionally, a mixed effects linear regression model was used to predict the effects of mind wandering on reading speed. The results indicated that mind wandering was 24% more likely on a difficult text, comprehension was 72% lower on a difficult text, and that mind wandering increased reading times significantly. Our results were mixed in their support of the original authors' findings. The strongest support was in using text difficulty to predict MW frequency. In contrast to the original study, we could not demonstrate differences in reading time based on text difficulty. Limitations to this replication include the reader's interest (or lack thereof) in the topic, the presentation of material one sentence at a time, and the self paced nature of the experiment. Future studies could probe further into interest, still including the text difficulty/equal content format that was the goal of this study



## Abstract #76

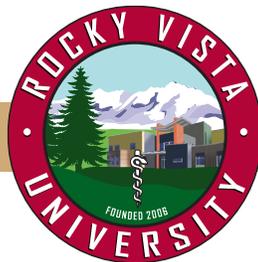
### **Racial Differences In Eczema In The United States: A Review Of Genetic Factors, Socioeconomic Status, And Healthcare**

Ashna Rahman Haque, OMS III, RVUCOM; Qing Zhong, MD, PhD, RVUCOM

**Research Category: Public Health Research**

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Eczema is a chronic inflammatory skin disease with a prevalence of 10% in children and 3% in adults. When comparing Whites, non-white Hispanics and Blacks, eczema has been found to have a greater incidence and severity amongst the black population, while remaining under diagnosed. Although recognition of this association is present, the mechanism by which it manifests has yet to be determined. Our goal is to review the literature to find the contributors for racial differences in eczema in the United States. We did a literature search on PubMed and Google Scholar and used the key words of “disparity”, “race”, and “eczema”. There are evidences showing that the increased incidence of atopy in the black population could due to genetics, socioeconomic status, familial structure, environment, health care access, or insurance. A comparison and summary of those factors between races in the United States will help awareness and recognition of racial disparity in eczema. This will improve diagnosis, treatment, and healthcare outcomes in affected patients.



## Abstract #77

### Preventable Disease in Colorado: A Study on Rural MMR Vaccination Rates

Blaire Mallahan MS, OMS IV, RVUCOM; Isain Zapata, PhD, RVUCOM; David Ross, DO, RVUCOM

#### Research Category: Public Health Research

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Although the Colorado Immunization Coalition has instituted programs and advocated for legislature mandating childhood Measles, Mumps, and Rubella (MMR) vaccination, Colorado consistently ranks among the lowest states in MMR coverage. In 2020, the state's MMR vaccination rate was 87.4%, which is below the level needed to protect against outbreaks of measles. Colorado law requires all students attending schools and licensed childcare centers to be vaccinated against MMR unless an exemption is filed; this exemption can be medical, religious, or personal. The goal of our study was to identify socioeconomic and geographic factors that motivate or demotivate parents to vaccinate their children against MMR. We expected a difference in MMR vaccination rates in rural vs. urban Colorado school districts and will explore the demographic differences between these communities. Utilizing data from MMR vaccination compliance reports and demographic enrollment data published by the Colorado Department of Public Health and the Environment, we compared rural vs. urban school districts between 2017-2020. Rural school districts were classified by the Colorado Department of Education based on enrollment and distance to an urban center. Statistical analysis was performed using generalized linear models to evaluate associations between compliance parameters and demographic parameters. Factor analysis was then used to evaluate parameter relationships. The results of these analyses indicated higher MMR vaccine compliance in rural school districts and increased compliance each school year since 2017. Higher MMR vaccination rates and fewer personal exemptions are seen in communities with a larger minority population. Factor analyses demonstrated the role of bureaucracy and vaccine hesitancy on MMR vaccination rates. We therefore concluded that, despite improvements in MMR vaccination rates since 2017, significant discrepancies in compliance remain – these differences may be attributed to geographic and demographic factors. Continued efforts to improve Colorado's MMR vaccine compliance should take these factors into consideration.



## Abstract #79

### Lessons learned from a large-scale active shooter training prior to the STEM School shooting

Ryan Shelton, South Metro Fire Rescue; Rebecca Ryznar, PhD, RVUCOM; Kit Lavell, BA, Strategic Operations; David Ross, DO, FACEP, RVUCOM; Susan Carter, MD, FACOG, FACS, RVUCOM; Andrew Kirkpatrick, CD, MD, MHSc, FRCSC, FACS, University of Calgary; Jessica L. McKee, MSc, University of Calgary; Anthony J. LaPorta, MD, FACS, RVUCOM; Chris Wells, South Metro Fire Rescue. Presented by Alissa Lenz, OMS IV, RVUCOM

#### Research Category: Public Health Research

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Active shooter incidents have been increasing in the United States and have created the need for first responders to shift their tactics. An important concept in active shooter responses is the implementation of a rescue task force in which fire/rescue are teamed up with law enforcement to enter the warm zone, where they could potentially be under fire, and begin treatment of critical patients. In order for a system to be fully prepared for mass casualty incidents (MCI), responders need to be trained in and for the environment that they will be expected to perform. It was hypothesized that multi-agency hyper-realistic training would have a positive effect on team performance and ultimately decrease the amount of time it takes for first responders to produce the first critical patient for transport. South Metro Fire Rescue coordinated 18 hyper-realistic active shooter simulation drills with 904 personnel from multiple agencies. The objective of each event was to take patients from the scene of the MCI, through the emergency department, into surgery if indicated, and then to the appropriate floor at multiple level 1 and 2 trauma hospitals in the South Denver Metro area. Each day of training was recorded and time stamped for tactical benchmarks that were tracked and reviewed. Victim extraction time improved from 42 minutes to 12 minutes. Only after the barriers to success were identified and addressed did the timing of casualty movement improve. Lessons learned from this training were used to save lives at the STEM School shooting in Highlands Ranch, Colorado. Seventy-eight percent of the fire/EMS that were a part of the STEM School shooting response had taken part in the training. Multiple responders commented that the similarities between the training and real-life shooting aided in the success of their response.



## Abstract #80

### A Demographic and Regional Comparison of Opiate Use Within Population Centers in the United States

Jordan Wilkes, OMS III, RVUCOM; Isain Zapata, PhD, RVUCOM; Brian Pringle, OMS II, RVUCOM; Devin Monroe, MS, OMS II, RVUCOM; Jessica Montalban, MS, OMS III, RVUCOM; Adela Miller, DO '20, RVUCOM, Barrow Neurological Institute; David Ross, DO, RVUCOM

#### Research Category: Public Health Research

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The opioid epidemic is a complex national crisis demonstrating a greater than 400% increase in related deaths over the past two decades and continues to be a major problem.

The purpose of our study is to assess which areas of the United States and which size population centers have the highest incidence of opiate use. We anticipated inherent demographic factors, such as age distribution, race, education and income, would have a direct impact on inpatient hospital admissions and/or emergency department visits.

We analyzed a database maintained by the Agency for Healthcare Research and Quality known as the Healthcare Cost and Utilization Project (HCUP) to investigate both the number of opioid-related hospital inpatient stays and opiate related emergency department visits. This data was combined with United States Census Bureau to investigate the incidence of opiate associated visits among different demographics. This analysis was stratified by four different metro population sizes as well as rural areas in 10 regions of the United States.

Our findings suggest opiate use varies among population center sizes depending on the region analyzed. In general, opiate visits in the southwest region were greatest across the majority of population center sizes. Rural usage was greatest in the northeast, southeast, and southwest. Surprisingly, unemployment and diverse ethnicities associated with opiate use visits were more common in the metro areas studied and not seen in rural areas.

The data in our study indicate opiate use remains significant among diverse populations across the United States. Understanding which populations are most affected in each region can help to guide future interventions to fight the opioid crisis. Further research should explore causes of the opiate use variability in population densities we observed in the 10 regions of the United States.



## Abstract #82

### **An Assessment of eHealth & Health Literacy in Digital Health Research Involving Patients with Chronic Disease: A Literature Review**

Shane Hyde, OMS II, RVUCOM; Ryan Henschell, OMS IV, RVUCOM; Dallas Steiner, OMS II, RVUCOM; Nicole Snyder, OMS II, RVUCOM; Jeremy Bergman, OMS II, RVUCOM; Sean Charczenko, OMS II, RVUCOM; Edwin Fundingsland, OMS IV, RVUCOM

**Research Category: Public Health Research**

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Digital health technologies have the potential to augment and improve healthcare services and health outcomes. There is particular interest in using digital health technologies to aid in the management of chronic diseases, given the known need for empowering patients with chronic diseases towards greater engagement in their own care. However, the factors that determine a patient's ability, willingness, and commitment to use digital health technologies are multifactorial and are as yet poorly understood, as are the actual effects of use on health outcomes. One potential target for further investigation is the relationship between a patient's individual health literacy, including eHealth literacy, and their use of digital health interventions. The goal of this literature review is to analyze the manner in which measures of general health literacy and eHealth literacy are currently being used in research investigations involving a variety of digital health tools for patients with chronic diseases. This information in turn can serve as a starting point for analyzing the complex interrelationships between health literacy, digital health tool utilization, and health outcomes in patients with chronic diseases. Following the application of inclusion and exclusion criteria to be described, a total of 7 publications met criteria for systematic evaluation. The usage of health literacy measures turned out to vary considerably between these studies. While several previously studied associations were confirmed-- specifically that superior performance on health literacy assessments is associated with younger age, greater level of education, and greater overall digital utilization; the data remains inconclusive regarding the ability of these digital health technologies to modify health literacy. Further investigation will be needed to accurately portray the inter-relationship between digital health and health literacy, and the implications of this relationship in patient care strategies and technological innovation.



## Abstract #83

### What To Expect When You're Expecting A Short Term Medical Mission: A Glance At Common Complaints in Rural Guatemala

Kaitlin Zuspan, OMS IV, RVUCOM; Parker Stocking, OMS IV, RVUCOM; Camille Bentley, DO, MPH, FA-COFP, RVUCOM

**Research Category: Public Health Research**

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For some time, Short Term Medical Missions (STMMs) have been increasing in number and popularity among the healthcare community. A common criticism, however, is the lack of research and standardization regarding these philanthropic trips. The purpose of this study was to collect and quantify common health concerns and physical complaints of rural Guatemalans, with the goal of creating a resource for future STMM participants to the western highlands of Guatemala. On an STMM in March of 2019, patient records were completed during three days of clinic which included demographics, vital signs, history of present illness, physical exam, assessment, and treatment. Those documents were collected, de-identified, and the target data was extracted. Inclusion criteria: all patients seen during clinic days that were over the age of 18. All patients under the age of 18 were excluded. Results of the study were as follows: The overwhelming majority of patients seen at the traveling clinics are women between the ages of 18 and 39. Of all the chief complaints collected, abdominal pain, headache, and vision changes were the most common. Top treatments provided were acetaminophen, adult multivitamins, and patient education about proper hydration. Individuals or groups intending to participate in medical outreach in the western highlands of Guatemala can expect to find a largely female patient population with pain as a major component of their chief complaints. We believe that dehydration is a potential aggravating factor for many of the health concerns presented, including abdominal pain, dysuria, and dry eyes. Of note, patient education on numerous topics was needed regarding common preventive health measures.



# RESEARCH COMPETITION AWARDS

RVU student presenters are eligible for the following prizes\*:

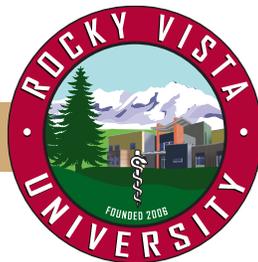
## **Oral Research Presentation:**

- 1st Place Outstanding Performance: \$400
- 2nd Place Outstanding Performance: \$275
- 3rd Place Outstanding Performance: \$150

## **Research Poster:**

- 1st Place Outstanding Performance: \$400
- 2nd Place Outstanding Performance: \$275
- 3rd Place Outstanding Performance: \$150

**Director's Choice Award:** \$250



# RESEARCH COMPETITION JUDGES

**John Brozna, MD, PhD**

Associate Professor of Pathology  
Rocky Vista University College of Osteopathic Medicine

**An Dang, PhD**

Assistant Professor of Clinical Anatomy  
Rocky Vista University College of Osteopathic Medicine

**Jing Gao, MD**

Director of Ultrasound; Associate Professor of Ultrasound  
Rocky Vista University College of Osteopathic Medicine

**Neysa Grider-Potter, PhD**

Post-Doctoral Fellow  
Rocky Vista University College of Osteopathic Medicine

**Ricarda Hallstrand, PhD**

Professor of Microbiology  
Rocky Vista University College of Osteopathic Medicine

**Clyde Jensen, PhD, MS**

Professor of Pharmacology  
Rocky Vista University College of Osteopathic Medicine

**Mike Jorgensen, PhD**

Director of Gross Anatomy; Assistant Professor of Structural Medicine  
Rocky Vista University College of Osteopathic Medicine

**Anthony Laorta, MD, FACS**

Director of Military Medicine; Professor of Clinical Surgery  
Rocky Vista University College of Osteopathic Medicine

**Anthony Pappas, PhD**

Assistant Professor of Gross Anatomy  
Rocky Vista University College of Osteopathic Medicine

**Vickie Roettger, PhD**

Associate Professor of Physiology  
Rocky Vista University College of Osteopathic Medicine

**James Small, MD, PhD, FCAP**

Associate Professor of Pathology  
Rocky Vista University College of Osteopathic Medicine



# RESEARCH COMPETITION JUDGES

**Francina Towne, PhD**

Director of Master of Science in Biomedical Sciences Program; Associate Professor Immunology  
Rocky Vista University College of Osteopathic Medicine

**Amanda Troy, PhD**

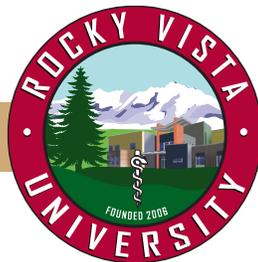
Associate Professor of Gross Anatomy  
Rocky Vista University College of Osteopathic Medicine

**Isain Zapata, PhD**

Assistant Professor of Research and Statistics  
Rocky Vista University College of Osteopathic Medicine

**Qing Zhong, MD, PhD**

Associate Professor of Pharmacology  
Rocky Vista University College of Osteopathic Medicine





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