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ABSTRACT BOOK

Uniting the Heart & Science of Healthcare

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UTAH ABSTRACTS

#1: **Benfotiamine, a vitamin B1 derivative, prevents VEGF-induced angiogenesis**

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Purpose
Several studies have indicated that thiamine, and more specifically its lipid soluble derivative benfotiamine, exerts an anti-oxidative and anti-inflammatory effect on the body. However, its effect in preventing cancer cell proliferation, migration, invasion, and metastasis is not yet clearly understood. It is known that angiogenesis plays a significant role in the growth and spread of many cancers but the role of benfotiamine in neovascularization is also not yet known. Therefore, in this study, we hypothesized that benfotiamine would prevent VEGF-induced angiogenesis in vitro and in vivo.

Methods
We have treated human umbilical vein endothelial cells (HUVECs) with VEGF (Vascular Endothelial Growth Factor; 10 ng/ml) in the absence and presence of benfotiamine (0-100 uM) in a time and dose-dependent manner. We then examined the cell viability by MTT assay, apoptosis by Annexin-V staining and tube formation via in-vitro angiogenesis assay. Lastly, Angiogenesis array was used to determine how benfotiamine modifies VEGF-induced angiogenesis.

Results
Utilizing MTT assay and Annexin-V staining, we found that benfotiamine alone had minimal effect on cell viability, and it prevents VEGF-induced cell proliferation. In vitro angiogenesis assay indicates that benfotiamine prevented the VEGF-induced tube formation of HUVECs. Lastly, benfotiamine regulated the expression of VEGF-induced growth factors such as VEGF, PIGF, IGFBP-1, ECGF, FGF-1 and 2, anti-angiogenic enzymes such as Serpin E1, TIMP-1, MMP-8, TSP-1, PTX3 and uPA and cytokines such as IL-8, Prolactin, ET-1, Endostatin, and CCL3.

Conclusions
Our current results indicate that benfotiamine has anti-angiogenic potential via inhibition of various pro-angiogenic growth factors and promoting anti-angiogenic factors in vitro and in vivo. Thus, our studies demonstrate that benfotiamine could be further developed as a novel therapeutic agent to prevent cancer growth and metastasis. Next, we will examine how benfotiamine prevents in vivo angiogenesis by utilizing a rat Matrigel plug model of angiogenesis in rats. The Matrigel sections will be stained with CD36, vWF, and other angiogenic markers to visualize the effect of benfotiamine on VEGF-induced angiogenesis.

#2: **The role of the KCC2 in substance use and abuse: A systematic review [Protocol]**

Alfred Amendolara;[1] Steven Salazar;[1] Chad Thompson;[1] Hyrum Wright;[1] Andrew Payne[1]

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Purpose

Potassium-Chloride Cotransporter 2 (KCC2) is a neuronal membrane protein specific to the central nervous system. It is responsible for removing Cl- ions from the intracellular space, maintaining a normal Cl- gradient. This is critical to the function of inhibitory synapses. Dysregulation may cause an upward shift in the Cl- reversal potential resulting in a hyperexcitable state of the postsynaptic neuron. Existing literature shows intra-VTA administration of furosemide, a non-selective KCC2 inhibitor, produces effects similar to those found in chronic opioid dependence. This points to a possible link between the hyperexcitability resulting from KCC2 dysregulation and opioid dependence. We hypothesize that KCC2 is implicated in the effects of, use of, abuse of, and/or dependence on opioids, alcohol, and other commonly used drugs. We endeavor to find and synthesize all available evidence illustrating a connection or lack of connection between KCC2 and substances of abuse, including physiologic measures, behaviors related to use (e.g., intoxication, self-administration, etc.), and addiction-like states (e.g., signs of dependence, withdrawal, etc.).

Methods

We aim to identify all relevant literature. Studies will be collected at a future date adhering to the described search criteria. Studies will be rated as "included" or "excluded" by 3-5 independent reviewers with the assistance of AI screening provided by ASReview. Databases searched will include PubMed, MEDLINE, ScienceDirect, ProQuest, SciFinder, Cochrane Library, Web of Science, Wiley Online Library, Nature Journals Online, Springer Online Journals, SAGE Open Access Journals and JSTOR Life Sciences. Aggregate search engines utilized will include Scopus and Ovid. A supplemental search will be conducted using Google Scholar. There will be no restrictions on year of publication or original language of publication. Results from the literature surveyed will be summarized and assessed for quality. This protocol has been registered with OSF Registries DOI: https://doi.org/10.17605/OSF.IO/SGDQX.

Results

The results have not been obtained at this time. We expect to conduct the formal literature search in mid-February 2023.

Conclusions

We hope the results from this review will inform further research of KCC2 as a potential molecule of interest in addiction medicine.

#3: **Anti-diabetic drug, Semaglutide, prevents doxorubicin-induced cardiotoxicity.**

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Purpose
Doxorubicin (Dox) is part of the anthracycline drug family and is known for its broad and effective use as a chemotherapeutic agent. It is commonly used to treat solid tumors and malignancies such as leukemia, breast, lung, and ovarian cancers. Unfortunately, its use in treating advanced cancers is limited due to its cardiotoxic side effects. Therefore, various adjuvant approaches are required to increase Dox's efficacy and reduce unwanted cardiotoxicity. Semaglutide is a glucagon-like peptide-1 (GLP-1) receptor agonist commonly used to treat type 2 diabetes. In this proposed study, the effect of Semaglutide in preventing Dox-induced cardiotoxicity will be investigated.

Methods
We will use Human umbilical vein endothelial cells (HUVEC) to examine the effect of Semaglutide on Dox-induced cytotoxicity. We will use MTT assay to determine cell growth and Annexin-V staining to examine apoptosis. A live cell and death assay kit will be used to identify cell death. A specific apoptosis antibody array system will be used to identify various anti- and pro-apoptotic and inflammatory markers. Reactive oxygen species, caspase-3 activation, and activation of transcription factors will be measured to determine the mechanism of action of this drug. We will confirm our studies using human cardiac myocytes and rodent models of Dox-induced cardiac toxicity.

Results
Our preliminary MTT cell viability data indicate that Semaglutide prevents Dox-induced cell death in HUVEC in a dose- and time-dependent manner. Similarly, live and dead cell staining assay also confirms Semaglutide prevents Dox-induced HUVEC cell death. We are currently determining the effect of Semaglutide in regulating Dox-induced expression of various anti- and pro-apoptotic and inflammatory factors.

Conclusions
So far, based on our current results, we expect that the anti-diabetic drug, Semaglutide, could prevent Dox-induced endothelial cell death indicating that it could prevent Dox-induced cardiac toxicity. Completing the proposed study will help develop this compound as an adjuvant drug to reduce the adverse effects of anthracycline chemotherapeutic drugs.

#4: **Fursultiamine prevents Lung Cancer growth**

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Purpose
Lung cancer is the leading cause of cancer death in men and the second leading cause of cancer death in women worldwide. Cigarette smoke-induced oxidative and inflammatory responses are the major risk factors for the development of lung cancer. Several compounds have been tested for their efficacy in preventing lung cancer. However, very few compounds are gone through clinical studies. We hypothesize that with its potent anti-oxidative and anti-inflammatory actions, fursultiamine, a disulfide lipid-soluble derivative of vitamin B1 (thiamine), could prevent lung cancer growth and spread.

Methods
Non-small cell lung cancer cells (A549 cells) will be used in vitro and in vivo. A549 cells will be treated with EGF without or with varying concentrations of fursultiamine for 24 hours. Cell viability will be determined by MTT assay, apoptosis by Annexin-V staining, and live and cell death assay. Specific antibody arrays will be used to examine the expression of various anti-apoptotic, pro-apoptotic, and pro-inflammatory factors. The expression of various cytokines and chemokines will be examined by Multiplex analysis. The generation of reactive oxygen species and activation of redox-sensitive transcription factors will be examined by specific assay kits. Subsequently, we will inject A549 cells in the athymic nude mice subcutaneously, and the mice will be treated without or with a diet containing fursultiamine. Tumor growth will be recorded regularly for 30 days. We will extract the tumors from nude mice xenografts, cut the sections, and will be analyzed immunohistochemically for the expression of various carcinogenic and inflammatory markers.

Results
Work in progress.

Conclusions
Work in progress.

#5: **Effects Of Post-translational Histone Modifications On Transcription Rate**

Aaron Bohn;[1] Sarah Hodson;[1] Sarah Ricks;[1] David Bates;[2] Steven Johnson[1]

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Purpose

The structural organization of DNA in eukaryotic cells is greatly implicated in the regulation of gene expression and thus cellular properties and behavior. At the most fundamental unit of this organization, ~147 bp of DNA wraps 1.7 times around a histone octamer core, forming a collective unit called the nucleosome. The positioning and occupancy of these nucleosomes around the promoter elements of genes is known to be a strong regulator of transcription in eukaryotic nuclei, and post-translational modifications (PTM's) to the protruding N-terminal tails of histone proteins are known to influence chromatin structure and thus gene expression; however, relatively little is known about the residual effect of histone PTM's on transcription rate.

Methods

Here, we present a novel method for measuring the transcription rate of chromatin with variable histone composition using an engineered DNA construct consisting of C. elegans promoter elements and high-affinity nucleosome positioning sequences followed by the Broccoli aptamer, a more versatile derivative of the Spinach aptamer, which will fluoresce upon completion of RNA transcripts, allowing for the quantification of real-time transcription rates using common qPCR instruments. If successful, the data collected using this technique will offer insights into the effects of PTM's on transcription, ultimately allowing for more precise manipulation of transcriptional output and thus gene expression in living organisms.

Results

NA (experiment currently in progress)

Conclusions

NA (experiment currently in progress)

#6: **RAGE availability lessens the degree of dysfunctional mitochondrial bioenergetics following chronic secondhand smoke exposure**

Kennedy Campbell;[1] Katrina Curtis;[1] Derek Clarke;[1] Erin Saito;[1] Benjamin Bikman;[1] Juan Arroyo;[1] Paul Reynolds[1]

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Purpose
The receptor for advanced glycation end products (RAGE) is an immunoglobulin-type receptor abundantly expressed by lung parenchyma that coordinates inflammatory responses. We have previously described roles for RAGE following exposure to tobacco smoke (both primary and secondhand) and environmental diesel particulate matter. While inflammatory signaling, tissue remodeling, and pulmonary function have each been investigated, mitochondrial fitness that may underpin cellular health has not been characterized in a chronic exposure model.

Methods
The current study assessed mitochondrial bioenergetics in RAGE knock out (RKO) and wild type (WT) mice exposed to 3 months of secondhand smoke (SHS) via a nose-only delivery system (Sireq Scientific, Montreal, Canada) or room air (RA). Select mice were also co-administered SHS and semi-synthetic glycosaminoglycan ethers (SAGEs) that inhibit RAGE/ligand interactions.

Results
We discovered that mitochondrial respiration was significantly decreased in WT+SHS mice compared to WT+RA following the addition of glutamate/malate, ADP, succinate, and FCCP. Each of these sequential substrates revealed less severe mitochondrial respiration compromise in RKO +SHS compared to WT+SHS mice, suggesting the absence of RAGE was sufficient to blunt waning mitochondrial fitness. Importantly, mitochondrial respiration was significantly improved in WT+SHS+SAGEs mice compared to WT+SHS mice.

Conclusions
These results provide a snapshot of mitochondrial fitness following chronic SHS exposure and suggest a role for RAGE signaling in altering cellular bioenergetics during exposure.

#7: **The Effects of Vitamin B1 analogue, Benfotiamine, on the prevention of Non-Small Cell Lung Cancer**

Hannah Christensen;[1] Emely Fernandez;[1] Kota A. Ramana[1]

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Purpose
Benfotiamine is a lipophilic vitamin B1 derivative that has anti-oxidative and anti-inflammatory effects and has been shown to prevent various diabetic, neurological and inflammatory complications. Its effect in preventing cancer cell growth and spread is not well known, specifically, the molecular mechanism through which this compound interacts with lung carcinogenesis has not been explored. Therefore, in this proposed investigation, we will explore our hypothesis regarding benfotiamine's interaction via ROS/PKC/MAPK/NF-kB pathway and its promotion of apoptotic pathways and inhibition of cancer cell growth. To achieve this, human non-small cell lung cancer cells (A549) will be treated with growth factors such as FGF or EGF without or with benfotiamine (0-100 uM) in a time and dose -dependent manner. Cancer cell growth will be examined by MTT cell viability assay. Apoptosis and necrosis promoted by benfotiamine in the cancer cells will be examined by Annenxin-V and propidium iodide staining using flowcytometry. The activation of caspase-3, pro- (Bid, BAX) and anti-apoptotic proteins (BCl-2, BCL-xl) will be examined by specific apoptosis antibody array. The activation of specific protein kinases such as PKC, AKT, cJUN, MAPK and transcription factors such as NF-kB and AP1 will be examined by immunological methods and multiplex analysis to investigate benfotiamine's mechanism of action. Further, to examine the effect of benfotiamine on in vivo tumor growth, A459 cells will be subcutaneously injected into the immunocompromised athymic nude mice followed by feeding the animals with diet containing benfotiamine. We will measure the xenograft tumor growth using electronic calipers and at the end of 30 days, we will dissect out the tumors and create fixed sections. Immunohistochemical analysis will be carried out to examine various carcinogenic and inflammatory markers in these sections. Multiplex analysis will be performed on the tumor tissue homogenate to determine various inflammatory cytokines, chemokines and growth factors. In conclusion, we expect that our results will indicate that benfotiamine acts as a potential anti-carcinogenic agent and that it could be further developed as a novel chemo-preventive agent in the treatment of lung cancer growth and metastasis.

Methods

To achieve this, human non-small cell lung cancer cells (A549) will be treated with growth factors such as FGF or EGF without or with benfotiamine (0-100 uM) in a time and dose -dependent manner. Cancer cell growth will be examined by MTT cell viability assay. Apoptosis and necrosis promoted by benfotiamine in the cancer cells will be examined by Annenxin-V and propidium iodide staining using flowcytometry. The activation of caspase-3, pro- (Bid, BAX) and anti-apoptotic proteins (BCl-2, BCL-xl) will be examined by specific apoptosis antibody array. The activation of specific protein kinases such as PKC, AKT, cJUN, MAPK and transcription factors such as NF-kB and AP1 will be examined by immunological methods and multiplex analysis to investigate benfotiamine's mechanism of action. Further, to examine the effect of benfotiamine on in vivo tumor growth, A459 cells will be subcutaneously injected into the immunocompromised athymic nude mice followed by feeding the animals with diet containing benfotiamine. We will measure the xenograft tumor growth using electronic calipers and at the end of 30 days, we will dissect out the tumors and create fixed sections. Immunohistochemical analysis will be carried out to examine various carcinogenic and inflammatory markers in these sections. Multiplex analysis will be performed on the tumor tissue homogenate to determine various inflammatory cytokines, chemokines and growth factors. In conclusion, we expect that our results will indicate that benfotiamine acts as‾a potential anti-carcinogenic agent and that it could be further developed as a novel chemo-preventive agent in the treatment of lung cancer growth and metastasis.

Results
NA

Conclusions
NA

#8: **Investigating respiratory simplification caused by prenatal RAGE upregulation**

Derek Clarke;[1] Katrina Curtis;[1] Ryan Wendt;[1] Brendan Stapley;[1] Evan Clark;[1] Kennedy Campbell;[1] Joe Black;[1] Nate Hill;[1] Juan Arroyo;[1] Paul Reynolds[1]

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Purpose

Receptors for advanced glycation end-products (RAGE) are multi-ligand cell surface receptors of the immunoglobulin superfamily predominantly expressed by lung epithelium. Previous experiments showed that RAGE upregulation throughout pregnancy caused significant fetal lung hypoplasia via elevated apoptosis and misregulation of the transcription factors thyroid transcription factor 1 (TTF1) and forkhead box protein A2 (Fox-A2). Our current research focused on characterizing the contributors to these abnormalities.

Methods

NA

Results

We confirmed poor development of murine lungs through a time course of RAGE upregulation from conception to sacrifice on embryonic day (E)15.5, E16.5, E17.5, E18.5, and specific upregulation from E15.5 to E18.5 only. H&E staining confirmed significant simplification. We hypothesized that this malformation was in part due to aberrant levels of inflammation and apoptosis. Blotting revealed significantly increased levels of phosphorylated AKT and ERK1/2 in RAGE TG pups which cause NF-kB mediated transcription of inflammatory genes. Due to potential roles for these signaling intermediates, we sought to assess RAGE-mediated impact on mitochondrial efficiency. Oxidative phosphorylation was assessed in lungs from RAGE TG pups and controls by measuring oxygen consumption per unit mass when lungs were exposed to the substrates malate, glutamate, ADP, succinate, and FCCP which activate sequential components of the electron transport chain. We discovered significantly increased levels of oxidative phosphorylation in transgenic pups compared to controls. Levels of ATP and reactive oxidative species (ROS) in relation to altered oxidative phosphorylation and inflammation provided additional mechanistic clarity.

Conclusions

These results support the importance of proper RAGE regulation in the development of lung tissue and elucidate mechanisms possibly causing such damage.

#9: **Inflammatory cytokine elaboration following secondhand smoke exposure is mediated in part by RAGE signaling**

Katrina Curtis;[1] Kyle Homer;[1] Ryan Wendt;[1] Ashley Chang;[1] Pam Van Ry;[1] Juan Arroyo;[1] Paul Reynolds[1]

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Purpose

The receptor for advanced glycation end products (RAGE) is a key contributor to the immune and inflammatory response in a myriad of diseases. RAGE is a transmembrane pattern recognition receptor with special interest in pulmonary anomalies due to its naturally abundant expression in the lungs. Our previous studies demonstrated a role for RAGE in inflammation following acute exposure to secondhand smoke (SHS). However, chronic inflammatory mechanisms associated with RAGE have yet to be fully elucidated.

Methods

In this study, we address the impact of long-term SHS exposure on RAGE signaling. RAGE knockout (RKO) and wild type (WT) mice were exposed to SHS five times weekly via a nose-only delivery system (Scireq Scientific, Montreal, Canada) for six months. SHS animals were compared to mice exposed to room air only. Immunoblot and colorimetric high throughput FACE assays (Active Motif) were used to assess phospho-AKT and NFï «B, respectively. A mouse cytokine antibody array (Abcam) was used to screen secreted cytokines in bronchoalveolar lavage fluid (BALF).

Results

Phospho-AKT was decreased and NFï «B was elevated in both groups of SHS exposed mice, with RKO+SHS mice demonstrating a tempered outcomes for both intermediates compared to WT+SHS exposed mice. BALF contained increased levels of pro-inflammatory cytokines including IFN, IL-13, MIP-1ï and Eotaxin1 in exposed groups and diminished secretion was observed in exposed RKO mice. These results validate a role for RAGE in the mediation of chronic pulmonary inflammatory responses and suggest AKT signaling as a viable pathway of RAGE dependent inflammatory responses.

Conclusions

Additional characterization of RAGE-mediated pulmonary responses to prolonged exposure will provide valuable insight into cellular mechanisms of lung diseases such as chronic obstructive pulmonary disease.

#10: **RAGE inhibition reduces TIMP and decreases cell invasion in cigarette Smoke extract (CSE) treated oral squamous carcinoma cells**

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Purpose
Oral squamous cell carcinoma (OSCC) is a common disease affecting approximately thirty thousand people in the United States each year. One of the major causes of such cancer is exposure to tobacco smoke. Recently our laboratory observed a Receptors for Advanced Glycation End-products (RAGE) dependent regulation of OSCC cells invasion in culture. Furthermore we observed increased expression of Matrix metalloproteinases (MMPs) by smoke environment In these cells. The mechanistic effects of secondhand smoke in the development of gingival carcinoma are limited and warrant more investigation. Our objective was to determine cell invasion regulators during Cigarette Smoke Extract (CSE) in gingival squamous cell carcinoma invasion.

Methods
Ca9-22 cells were cultured in RPMI supplemented with 10% of fetal calf serum. Cells were cultured in the presence or absence of CSE and semi-synthetic glycosaminoglycan ethers (SAGEs), a known inhibitor of RAGE signaling. Real time cell invasions were performed and cultured cells were lysed for western blot analysis.

Results
Treatment of cells with CSE showed: 1)increased RAGE receptor reduced by SAGEs, 2) increased invasion (2-fold; $p<0.05$) reduced by SAGES, 3) Increased metalloproteinases (MMP)-2,9 and 14 expression (1.4-fold, 3.0-fold, 3.4-fold; $p<0.05$) downregulated by SAGEs and 4) Increased TIMP (1.5-fold; $p<0.03$) downregulated by SAGEs.

Conclusions
We conclude that CSE is able to increase invasion of gingival squamous cell carcinoma cells in a RAGE dependent manner. Also, we conclude that SAGEs are sufficient to reduce increased cell invasion in gingival cancer cells induced by CSE. And that the reduction of the increased invasion correlates with the reduction on MMP and TIMP production. These results may prove useful in providing avenues that could explain invasive molecules regulated by second hand smoke in the development of gingival squamous cell carcinoma.

#11: **Potential Application of Nano-hydroxyapatite in Tooth Decay Prevention**

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Purpose
Although preventable, tooth decay remains a chronic disease present in children and around 26% of adults. Oral hygiene, fluoride application, and sealants are among the common treatments for caries prevention. In recent years, nano-hydroxyapatite has gained some attention to be used as a potential caries prevention treatment, as it makes up over 90% of our tooth enamel and is effective at tooth remineralization. This study will examine the effectiveness of using nano-hydroxyapatite to remineralize teeth, its possible side effects, and its clinical applications in dentistry, examining whether nano-hydroxyapatite can be a treatment option to prevent dental caries.

Methods
For this literature review, a range of databases was used such as Google Search, Google Scholars, and PubMed. The search strategy used was a combination of terms such as "Nano-hydroxyapatite", "Toothpaste", "tooth remineralization", "side effect of nano-hydroxyapatite", "Tooth decay and treatment", and "dental caries". Studies selected were published between January 1, 2014, and December 2022. Only English-language articles were considered for this research.

Results
In progress.

Conclusions
In progress.

#12: **Determination of Feasibility and Plausibility of Using Various Biological Samples for Remote Genetic Testing**

Cole Farnsworth;[1] Molly Henley;[1] Walker Kay;[1] Victer Manukyan;[1] Jonathon Reynolds;[1] John Kriak;[1] Kyle Bills;[1] David Sant[1]

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Purpose
Advancements in technology and decreases in sequencing costs have allowed genetic testing to become commonplace. Physicians now have the opportunity send biological samples to large sequencing cores and learn specific genetic information that is relevant for diagnosis or clinical decision making. This information can be used directly for diagnosis, help determine an individual's risk for certain diseases, or guide pharmacological treatment. Outside of the clinic, direct-to-consumer (DTC) genetic testing companies, such as 23andMe and Ancestry.com, allow customers to submit a personal biological   sample for testing without a prescription. One complication of sending biological samples to remote laboratory is stability. Blood generally yields sufficient quantities of high-quality DNA but requires a clinic visit. Saliva and buccal swabs are routinely used by DTC companies, but the DNA quality is notoriously low due to presence of bacteria in the mouth. Additionally, elderly individuals have difficult producing enough saliva for testing, and the tubes contain several milliliters of liquid and shipping requires special considerations. Dried blood spot cards, which serve as an alternative to saliva and buccal swabs, yield high-quality DNA and ship easily. This project aims to determine which biological sample methods can reasonably be obtained from remote individuals, then shipped to Utah for genetic testing.

Methods
Swab and saliva kits from Mauwi, Zymo, and DNA Genotek have been purchased for testing. Filter paper for DBS collections have been purchased from Qiagen and Cytiva. Forty different DNA extraction kits from various companies have been obtained. DNA will be collected from 4 different blood, DBS, saliva, and swab samples for each kit. DNA extracts will be tested for quantity, fragment length, chemical purity, and proportion of DNA obtained that is human.

Results
Completion of dried blood spot cards required more lancet punctures than anticipated, with an average of 7 punctures (range 3-14) per card. No extraction results have yet been obtained.

Conclusions
The results of this study will allow us to determine which biological samples and extraction methods can be used for obtaining DNA samples that can be used for sequencing and competitive genomic hybridization (CGH) arrays.

#13: **Synthetic disulfide derivative of vitamin B1, fursultiamine, prevents VEGF-induced angiogenesis**

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Purpose
Angiogenesis is a process in which new blood vessels are formed from the existing blood vessels required to supply nutrients and oxygen to various tissues. Angiogenesis plays a significant role in the growth and spread of many cancers, and several anti-angiogenic agents act as chemotherapeutic agents. Recent studies have shown that fursultiamine (thiamine tetrahydrofurfuryl disulfide), a lipid-soluble synthetic disulfide derivative of thiamine, possesses viable antineoplastic and antiviral effects. However, its role in preventing angiogenesis is not known. We hypothesize that fursultiamine, with its potent antioxidative actions, prevents VEGF-induced angiogenesis in vitro and in vivo.

Methods
Human umbilical vein endothelial cells (HUVECs) as well as rat model of angiogenesis will be used to achieve our hypothesis. HUVECs were treated with VEGF in the absence and presence of fursultiamine (0-100 uM) in a time and dose-dependent manner. Cell viability was determined by MTT assay and in vitro angiogenesis by tube formation assays. The expression of various pro-angiogenic, anti-angiogenic and inflammatory markers will be determined by specific antibody arrays. Multiplex analysis will be used to analyze the expression of various growth factors, cytokines, and chemokines in endothelial cells. Further, a rat Matrigel plug model of angiogenesis will be utilized to examine the effects of fursultiamine on VEGF-induced angiogenesis in vivo. HUVECs will be mixed with VEGF without or with fursultiamine and will be implanted in the rats subcutaneously. After ten days, the plugs will be extracted, and sections will be made. The sections will be stained with CD36, vWF, and pro- and anti-angiogenic markers.

Results
Our results indicate that fursultiamine prevents VEGF-induced endothelial cell growth and tube formation as determined by MTT and tube formation assays. We are currently determining the effect of fursultiamine in the regulation of VEGF-induced expression of various angiogenic and inflammatory markers.

Conclusions
So far, based on our preliminary data, we expect that fursultiamine could prevent VEGF-induced angiogenesis, and this study's completion will help develop this compound as a potent anti-angiogenic agent that could prevent cancer growth and metastasis.

#14: **The Immunomodulatory Effects of Delta-9 Tetrahydrocannabinol and Cannabidiol in vitro**

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Purpose
The therapeutic potential of cannabinoid-based medicines has led many U.S. states and countries to authorize their clinical use. Delta-9 tetrahydrocannabinol (THC) and cannabidiol (CBD), the biologically active compounds of cannabis, possess a wide range of immune regulatory properties. Macrophages are specialized immune cells that express endocannabinoid receptors which can affect inflammatory phenotypes and phagocytosis. Cultural awareness of cannabis has led to regulatory findings of various aspects of physiological, behavioral, and metabolic function; however, the effects on immunological regulation in the context of infection is less well understood. The purpose of the current study was to test the immunoregulatory effects of various THC and CBD doses in the context of infection. Secondary, THC and CBD temporal and tissue-specific cytotoxic effects were evaluated.

Methods
Macrophages were pre-treated with THC or CBD (0, 2, 5, 10, 15, 25 µg/mL) for 2 or 6 h. Treatment was removed, and cells infected with live Escherichia coli (Migula) for 2 h. Extracellular bacteria were eliminated, macrophage cells lysed, and intracellular bacteria quantified. The cytotoxic effect of THC and CBD was tested with human epithelial cells (A549) and murine macrophage cells (I-13.35).

Results
THC at 5 and 15 µg/mL increased phagocytosis 2-fold compared to CBD at the same dose. Unlike CBD, THC-induced phagocytosis decreased in a dose-dependent manner. CBD-induced phagocytosis inversely increased at 25 µg/mL. THC (15 µg/mL) increased cytotoxicity (~5%) compared to control at 2 and 6 h. CBD 15 µg/mL and 25 µg/mL decreased cytotoxicity ~10% and 13% respectively, compared to controls 2 h post treatment. THC and CBD increased cytotoxicity 2-fold in macrophage cells compared to epithelial cells.

Conclusions
These findings demonstrate the multifaceted interplay between THC and CBD that affect the immunological interaction between host and microbes in the context of infection. Taken together, it is necessary to understand the immunoregulatory underpinnings of phytocannabinoids to maximize therapeutic potential and reduce opportunistic infections.

#15: Comparison of DNA Extraction Methods for Soft Tissue Samples

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Purpose
Although germline variation testing is traditionally performed using DNA obtained from blood or other liquid samples , determining somatic variation in cancer samples requires DNA extraction directly from tissues. Additionally, epigenetic markers, such as 5-methylcytosine (5mC) and 5-hydroxymethylcytosine (5hmC) are tissue-specific and change in selected disease states. Testing for variations in DNA typically requires several cycles of polymerase chain reaction (PCR). However, several substances present in tissues are known to inhibit PCR. These substances include but are not limited to hemoglobin, hormones, fats, bile salts, and polysaccharides. Different tissues contain unique combinations of PCR inhibitors, and different extraction methods may be more or less effective for each compound. For this project, we will assess the quantity and quality of DNA obtained from extractions of various vital organs using 30 different commercially available DNA extraction kits to determine optimal kits for each tissue

Methods
Vital organs, including heart, lungs, liver, spleen, kidneys, adrenal glands, testicles, bone marrow, and skeletal muscle were collected from 48 Sprague-Dawley rats. To reduce animal burden, rats were collected post-mortem from a separate study that investigated the effects of morphine. Twenty-four rats were administered with morphine and another twenty-four rats were treated with saline as a control for a duration of two weeks. Half of the animals in each group were also treated daily with osteopathic manipulation. Organs were homogenized and aliquoted into 10 mg aliquots. Thirty different DNA extraction kits have been purchased for testing. Extracted DNA will be tested for inhibitors using quantitative polymerase chain reaction (qPCR), quantity using a Qubit fluorometer, and fragment length using gel electrophoresis.

Results
No extraction results have yet been obtained, but tissue homogenization has been completed. Softer tissues such as liver and bone marrow were simpler to homogenize than denser tissues . Heart, skeletal muscle, spleen, and kidney tissues were sliced into small pieces and soaked in phosphate-buffered saline for homogenization, followed by centrifugation to remove excess liquid.

Conclusions
The results of this study will allow us to identify the most suitable kits for DNA extraction from various tissues.

#16: **Sulforaphane Pre-treatment Improves Alveolar Macrophage Killing of Intracellular Opportunistic Pathogens After Alcohol Exposure in vitro**

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Purpose
Alcohol is associated with increased mortality and morbidity globally. Upper respiratory infections with opportunistic pathogens can occur in healthy humans; however, binge alcohol intoxication ($\geq 0.08\%$ BAC) is a major risk factor. We have previously shown that a single dose of alcohol comparable to binge alcohol intoxication increases infection by reducing alveolar macrophage function in vivo. The aim of this study was to test the therapeutic potential of the phytonutrient sulforaphane (SFN) given as a pre-treatment, and its ability to mitigate the alcohol-induced effects on phagocytic function in murine and human macrophages in vitro. The primary readout was intracellular phagocytic killing, while a secondary outcome was cytokine expression.

Methods
Dose response curves were conducted by exposing both murine and human macrophages to increasing concentrations of SFN. Cell viability was measured for each concentration at both 2 hour and 24 hour marks, and then the 2 cell lines were compared to one another via statistical analysis. Live infection assays were conducted via exposure to SFN prior to inoculation with alcohol and pathogen. Upon alcohol/pathogen inoculation bacterial survival was measured and phagocytic ability measured based on the ability of pathogen survival.

Results
Results indicate that murine (MH-S) and human (THP-1) cells pre-treated with SFN (5 µM) and challenged with 0.2% (v/v) alcohol for 3 or 8 hours prior to live B. thailandensis or S. epidermidis infection, improved intracellular pathogen killing ~15-fold and ~10-fold respectively, compared to macrophages treated with alcohol alone. Dose response curves show that SFN concentrations less than 20 µM are not cytotoxic in both MH-S and THP-1 cells; the TD50 in THP-1 cells was 90 µM. Furthermore, SFN pre-treatment of MH-S cells challenged with 0.2% (v/v) alcohol for 3 or 8 hours increased protein expression of Nrf2, an important cellular oxidant regulator, ~ 3.5-fold compared to cells treated with alcohol alone.

Conclusions

Taken together, SFN-induced cytoprotection was extended beyond murine cells to include human cells, and different opportunistic pathogens that include gram negative and positive organisms were tested. These data demonstrate that SFN may be an effective pre-treatment option to prevent alcohol-mediated innate immune dysfunction and restore alveolar macrophage phagocytic killing during opportunistic pulmonary infections.

#17: **Postpartum Depression screening tools effectiveness in Immigrant populations**

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Purpose

Immigrant mothers check all the boxes that are significant risk factors for developing or exacerbating Postpartum Depression (PPD). These risk factors include, suffering in solitude, cultural conceptualizations, barriers to help seeking, and a lack of facilitators to help seeking. Despite this very little research has been done to find effective screening methods for this population.The purpose of this research project is to compile the works of those before me to determine whether the Edinburgh Postnatal Depression or the PHQ 9 screening tool is the most effective for immigrant mothers.

Methods

Research determining the effectivity of the two tests has been published. By comparing the two tests together and measuring the data sets I will be able to determine which of the two screening tests are more effective at determining the results of PPD in an immigrant population.

Results

The PHQ test was found to have the widest reach across cultural barriers, while the Edinburgh screening test was facilitated by interpreters present during the screening causing the patient some reluctance in opening to the physician. Effectiveness was shown in multiple studies to come more from the screening method of the physician than the screening tool itself.

Conclusions

Both the pHQ 9 and the Edinburgh screening tools were found to be effective, though the method in which they were used was seen to be the key indicator of a successful screening. Due to the phq 9 test having many culturally appropriate translations, it was seen as the more effective test to determine depression. Overall during the physician screening process most physicians felt that the tools would be ineffective because they were facilitating the tools often through several barriers, cultural and lingual being the foremost.

#18: **Development of an Affordable, Manual Method of DNA Extraction from Bones and Teeth**

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Purpose
DNA extraction is most commonly performed for determining germline variation. For this reason, DNA extraction kits are traditionally developed to work with liquid tissues such as blood, saliva, and swabs, but very few have been proposed to work with solid tissues. Somatic variation in cancers can be important for tumor subtyping and treatment guidance, including for bone cancers such as Ewing Sarcoma. Additionally, epigenetic marks such as 5-methylcytosine (5mC) and 5-hydroxymethylcytosine (5hmC) are tissue specific and change in disease states such as osteoporosis. Epigenetic changes in teeth are relevant to cavities and diabetic tooth weakening. We hypothesize that calcium chelation followed by DNA extraction using commercially available kits will yield high-quality DNA that can be used for both epigenetic measurements and for somatic variant calling.

Methods
Femurs, tibias, and teeth were collected from Sprague-Dawley rats. To reduce the animal burden, rats were collected post-mortem from a separate study testing morphine. Twenty-four rats were treated with morphine and twenty-four rats were treated with saline for two weeks. Half of the animals in each group were also treated with osteopathic manipulation daily. Muscle and connective tissues were removed from bones mechanically, and marrow was removed using phosphate buffered saline pushed through using positive pressure created by a syringe. Bones were stored with or without EDTA at 4°C or room temperature with solvent changes three times per week. Twenty-nine different DNA extraction kits have been purchased for testing.

Results
The EDTA solutions removed after bone soaking were cloudy, indicating that significant amounts of calcium were removed. Room temperature treatment led to a cloudier solution during the first week, followed by clearer solutions the second week while 4°C solutions maintain a consistent cloudiness throughout the two weeks. This suggests that the calcium chelation occurs significantly faster at room temperature and one week of calcium chelation might be sufficient. Quantity and quality of DNA extractions will be reported once extractions are completed.

Conclusions
The cloudiness of the EDTA solutions obtained after soaking in bones indicates that calcium chelation may be sufficient to allow for high-quality DNA extraction from bones and teeth using commercially available DNA extraction kits.

#19: **The immunomodulating effects of morphine dependence and withdrawal in rat lung, liver, spleen, and blood**

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Purpose
The opioid crisis continues to pose a significant health burden, as evidenced by increased opioid overdose reports during the COVID-19 pandemic and the years following. Coinciding with the ongoing opioid epidemic and global pandemic is the increased prevalence of ultra-potent fentanyl, a trend responsible for more than 80,000 overdose deaths in 2021. Opioids can modulate the immune response following acute and chronic administration; however, the effect of opioid withdrawal on immune function is limited, with variable results.

Methods
The present study used enzyme-linked immunosorbent assay (ELISA) to examine the immunomodulatory properties of morphine dependence and withdrawal in the lungs, liver, spleen, and blood tissues. Opioid dependence was established in female Wistar rats by administering escalating doses of morphine (10-40 mg/kg) or saline (control group) twice daily for three days and subsequently maintained by twice-daily injections of 40 mg/kg morphine. Saline was administered on day 7 to the morphine group, followed by the emergence of somatic signs of withdrawal and weight loss. Blood was collected during withdrawal; blood, lung, liver, and spleen were collected on day 14. The primary readout was tumor necrosis factor-alpha (TNF-α), interferon-gamma (IFN-Î³), and immunoglobulin M (IgM) by commercial ELISA.

Results
During withdrawal, weight decreased by ~10% in morphine-dependent rats. IFN-Î³ decreased 3-fold in the blood during withdrawal. TNF-α, IFN-Î³, and IgM remained below control levels in tissues and blood six days after the morphine regimen was continued. These findings indicate that morphine withdrawal alters the immunological function of immune cells, while temporal effects persist for at least seven days.

Conclusions
Similarly, the immunoregulatory effects of opioids may vary between opioid dependence and withdrawal. The implications of immune dysfunction in opioid-dependent persons extend beyond treatment for opioid dependence alone and must include immunosurveillance in the context of infection.

#20: **Developing a Radioimmunotherapy for Synovial Sarcoma**

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Purpose
Synovial sarcoma is a rare form of cancer that occurs in the soft tissue adjacent to bones in adolescents and young adults. This cancer is poorly understood due to limited studies on the disease, resulting in poor prognosis, especially when metastasis has occurred. The current treatment options for this cancer are surgery, radiation, and chemotherapy. Unfortunately by the time the cancer is usually diagnosed metastasis has already occurred, leaving radiation and chemotherapy as the only options and these tend to have severe side effects.In this work, we sought to develop a new noninvasive radioimmunotherapy for the treatment, diagnosis (theranostic), and monitoring of synovial sarcoma with limited side effects by targeting Oncostatin M Receptor (OSMR).Oncostatin M Receptor (OSMR), is a receptor that when activated by its ligand Oncostatin M(OSM), has been shown to be involved in cancer proliferation and migration and to be highly expressed in various cancers including synovial sarcoma. We hypothesized that by targeting OSMR we will be able to develop a noninvasive radioimmunotherapy for synovial sarcoma

Methods
In this work, we conjugated an anti-OSMR antibody with a fluorophore to determine the possibility of using an anti-OSMR radioimmunoconjugate as a therapeutic option for this cancer. We then conjugated the anti-Osmr in two methods, stochastically and site-specifically, in order to determine the best method of conjugation.

Results
An anti-OSMR conjugated to a fluorophore (AFC) was able to bind to OSMR-expressing cell lines. The AFC also targeted OSMR-expressing tumors in a synovial sarcoma mouse model.

Conclusions
An anti-OSMR conjugate can be used in developing radioimmunotherapy for synovial sarcoma and by exploring the two methods of conjugation, we will be able to develop a novel radioimmunoconjugate for synovial sarcoma.

#21: **The Science of Oral Carbapenem Antibiotics**

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Purpose
To review the chemistry, pharmacology, human pharmacokinetics, and the recent development of oral carbapenems.

Methods
The search terms "CP-70,429", "LJC-11,084", "Microbiology," "MIC," "Pharmacodynamics" or "carbapenems", in combinations in PubMed, and "oral carbapenem," and "pharmacokinetics" in Web of Science were used. Eligible studies were identified and evaluated.

Results
Carbapenems are beta-lactam antibiotics known for their broad-spectrum activity against gram-positive, gram-negative, aerobic and anaerobic bacteria with lower minimum inhibitory concentration (MIC) than many similar beta-lactams. The chemical bond arrangement of C1-C2 in the beta-lactam ring and trans configuration of the C5-C6 and 6-hydroxyethyl side chain were proven to show greater stability against a wide range of beta-lactamase enzymes. Studies of potential oral formulations in the United States and several countries are currently being conducted to target bacteria producing extended-spectrum beta-lactamases (ESBL), such as E. coli. Studies performed on oral formulations faropenem, tebipenem, and sulopenem demonstrated similar mechanisms of action compared to current IV formulations, and intrinsic ability to overcome drug-resistance mechanisms by bacteria. The in vitro susceptibility data of faropenem, tebipenem, and sulopenem show MIC range 0.03-4 mg/L against the most common gram-positive and gram-negative bacteria. When tested against ESBL of E. coli, sulopenem demonstrated MIC range of 0.25-4 mg/L against 16 out of 20 beta-lactamases. In early clinical studies, oral faropenem (daloxate ester) has shown bioavailability of 70-80%, sulopenem demonstrated 62% bioavailability when administered with probenecid 500 mg, while tebipenem administered in a prodrug form, tebipenem pivoxil, demonstrated bioavailability of 50%, suggesting a potential use as an oral formulation. Nevertheless, all 3 oral carbapenems have not received FDA-approval for clinical use in the U.S.

Conclusions
Carbapenems are broad-spectrum antibiotics but their use is limited by a lack of oral formulation. Recent development of oral carbapenems have demonstrated a similarity in mechanism of action to the parenteral carbapenems against many common gram-positive and gram-negative bacteria, and could overcome some of the resistance mechanisms in common bacteria, such as ESBL-producing bacteria. Nevertheless clinical trial results leading to drug-approval in the US have yet to materialize despite a favorable pharmacodynamic, pharmacokinetic, and microbiological profile.

#22: **Intellectual Disability Related to De Novo Germline Loss of the Distal End of the P-Arm of Chromosome 17: A Case Report**

Eden Pope;[1] Matthew Huertas;[1] Amar Paul;[1] Braden Cunningham;[1] Matthew Jennings;[1] Ryan Perry;[1] Stephanie Chavez;[1] John Kriak;[1] Kyle Bills;[1] David Sant[1]

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Purpose
In this report we present a case of a 20-year-old female with congenital intellectual disability, stunted growth, and hypothyroidism. Competitive genetic hybridization (CHG) revealed a loss of 17p13.3, and the deletion was not present in either parent. This deletion has not previously been characterized, but mutations on the p-arm of chromosome 17 are responsible for Miller-Dieker Syndrome and Isolated Lissencephaly Sequence, both of which share symptoms in common with the patient.

Methods
Peripheral mononuclear cells (PBMCs) were used for karyotyping and competitive genetic hybridization (CHG). Bioinformatic analysis was carried out using the Genome Data Viewer (ncbi.nlm.nih.gov/genome/gdv).

Results
Karyotype was found to be normal, but CGH revealed a deletion of the tail end of the p-arm of chromosome 17, 17p13.3. At least 134 genes are present in this genomic location, and 35 of them are uncharacterized. Both Miller-Dieker Syndrome (MDS) and Isolated Lissencephaly Sequence (ILS) are characterized by a smooth cerebral cortex and intellectual disability, but the patient's symptoms more closely mirror MDS because muscle tone was normal. The patient was significantly shorter than peers, but growth hormone therapy over the course of several years allowed the patient to reach a normal height, albeit shorter than her siblings and parents. The list of genes deleted will be investigated to determine if a single gene is likely responsible for the phenotype.

Conclusions
Here we present a patient with intellectual disability and a previously uncharacterized deletion on chromosome 17. Similar, though not identical conditions have been previously reported, but not well characterized indicating that the present patient could possibly have one of these conditions. Further directions include investigation of the deleted genes to determine a probable cause for the symptoms exhibited.

#23: **Testing Extraction of DNA from Lipid-Rich Tissues Using Various Reagents and Commercially Available Kits**

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Purpose
DNA extraction from lipid-rich tissue is difficult because of column clogging and retention of lipids in the final product. The presence of lipids in the final product inhibits enzymes used in most downstream processes, including PCR. Lipid-specific DNA extraction kits are rare because the most common need for DNA extraction is genomic sequencing or genotyping. Obtaining DNA from liquid tissues such as blood, saliva, and swabs is less invasive and traditionally yields better quality DNA extracts than any high-lipid tissues. However, somatic variant calling in cancers requires DNA to be extracted directly from tumors to determine the driver mutations and guide treatment. Additionally, studying epigenetic modifications such as DNA methylation and hydroxymethylation requires DNA to be obtained from specific tissues. The tissues of interest in diabetes tend to be lipid-rich, such as epicardial adipose tissue, visceral adipose tissue, pancreases, and sciatic nerves. Neurons from brains are important for studying changes in aging and dementia diseases, as well as brain tumors including glioblastomas and medulloblastomas. Phenol-chloroform extractions can be used to separate lipid layers from DNA, which can subsequently be extracted using commercially available kits.   For this project, three different phenol-chloroform products will be tested in combination with 30 different commercially available DNA extraction kits to determine which combinations can yield sufficient PCR-compatible DNA.

Methods
Brains, visceral adipose tissue, epicardial adipose tissue, pancreases, and sciatic nerves were collected from 48 different rats. Qiazol, Trizol, and Tri Reagent will be tested with 30 different extraction kits. Extracted DNA will be tested for inhibitors using quantitative polymerase chain reaction (qPCR), quantity using a Qubit fluorometer, and fragment length using gel electrophoresis.

Results
No extraction results have yet been obtained, but all tissues were soft enough to homogenize without modifying traditional protocols.

Conclusions
The results of this study will allow us to know which kits can be used for extraction of DNA from lipid-rich tissue.

#24: **Mechanical stimulation prevents chronic morphine-induced changes to ventral tegmental area GABA neurons, accumbal dopamine release, and measures of withdrawal**

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Purpose
Previous research suggests that applied mechanical stimulation (Mstim), like osteopathic or chiropractic manual manipulation, modulates substrates which activate the mesolimbic dopaminergic (DA) pathway between the ventral tegmental area (VTA) and nucleus accumbens (NAc). While this treatment has been explored in rats with alcohol dependency, it has not previously been studied in a context of opioid withdrawal. We aim to determine whether MStim treats the effects of morphine withdrawal as manifested behaviorally and electrophysiologically.

Methods
Forty-eight male Wistar rats (n=24 with MStim treatment) received MStim (80 Hz; 15 min) applied via vibration plate 2 times per day for 2 weeks immediately following morphine administration (1mg/kg; IP). The effects of Mstim were evaluated using single-unit electrophysiological recordings of VTA GABA neurons in withdrawal, elevated plus maze and ultrasonic vocalizations (USV).

Results
Following chronic morphine exposure, a reinstatement dose in naïve versus MStim rats caused alterations to firing of VTA GABA neurons (117.5%baseline versus 32.7%baseline; 2.5mg/kg; $p<0.0001$) and to dopamine release in the nucleus accumbens (20 min: EtOH vs EtOH + MStim, $F(3,24) = 3.4964$, $p=0.0310$; 80 min: $F(3,23) = 9.0058$, EtOH vs EtOH +MStim, $p=0.0004$, EtOH and naïve, $p<0.0001$). Additionally, rats in withdrawal from morphine that underwent MStim treatment spent significantly more time ($p < 0.05$) in open areas of the Elevated Plus maze as compared to naive rats. Treated rats also showed increased pain tolerance (decreased hyperalgesia, $p < 0.05$) and generally exhibited higher USV call frequencies than naive rats ($p < 0.05$).

Conclusions
This study represents a mechanistic look at the effects of targeted mechanoreceptor activation in the context of opioid exposure. It represents preliminary evidence that there is a mechanistic basis for future studies in humans. These data, when taken as a whole, provide a mechanistic rationale for future human studies to explore physical medicine modalities, including manipulative therapeutics and acupuncture as treatment options.

#25: **Development of an LCMS Method to Detect and Quantify Curcumin in a Novel Oral Formulation of Turmeric**

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Purpose
Curcumin is a chemical produced from plants that belong to the Curcuma longa species. It is the main secondary metabolite of turmeric which can be classified under the ginger family(1). With origins in India and China the chemical was originally used to treat abdominal pains, sprains, and swelling. More current research has directed chemical use towards reduction of inflammation(2). The pharmacological activities of curcumin include anti-inflammatory, anti-angiogenic, antioxidant, and anti-cancerous effects(3). ProCaps Laboratories has developed a new formulation of Turmeric, but the oral absorption is not known in humans. To answer this question the formulation should be tested in a Caco-2 model of in-vitro oral absorption followed by a clinical trial in humans. Prior to this work, however, an analytical method is needed to detect Curcumin. Liquid chromatography mass spectrometry (LCMS) is a highly sensitive and selective analytical method that can be used for this purpose.

Methods
Using an established high performance liquid chromatography (HPLC) method, a curcuminoid standard containing curcumin and two of its metabolites, Bisdemethoxycurcumin and Demethoxycurcumin will be run on a Waters Alliance HPLC system (Model 2965) with a photodiode array detector (Model 2998), and though a Waters Acquity QDa Mass Spectrometer. A Waters Nova-Pak C18 column (3.9 x 150mm x 4.0 μm) will be used. Mass detection will be incorporated into the new experimental method. The M/Z ratio of Curcumin will be identified by finding the strongest signal in the mass chromatogram.

Results
NA

Conclusions
NA

#26: **A Ligand-Based Approach to Identifying Commercially Available Inhibitors of Human Galactokinase (GALK)**

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Purpose
The purpose of this project was to find inhibitors of the human galactokinase (GALK) enzyme. GALK is responsible for catalyzing the conversion of galactose to galactose 1-phosphate, the first step in galactose metabolism. Galactose 1-phosphate builds up in the cells of patients with type 1 galactosemia due a genetic disorder. The galactose 1-phosphate buildup is thought to be the main driver of the liver, reproductive, and brain damage that occur in the disease. Patients with galactosemia must strictly avoid dietary sources of galactose, but still face progressive decline due to endogenous galactose-producing processes. It has been proposed that inhibiting galactose 1-phosphate production by GALK may prevent many of the major complications of type 1 galactosemia.

Methods
A ligand-based approach was used for identifying inhibitors, starting from the GALK substrate galactose. In the first round of testing, commercially available galactose derivatives and galactose-bearing natural products were screened for their ability to inhibit recombinant human GALK in vitro using a fluorescent reporter assay. Leads from this round of testing were used as templates to identify structurally similar compounds for the next round of testing. This process continued through four rounds of testing. All compounds were tested at a concentration of 100 micromolar in no more than 1% DMSO.

Results
The most potent compound from the first round of testing was 2"-O-galloylhyperin, a galactose-containing flavonoid. In the second round, the most potent compound was (-)-epicatechin gallate, a natural product known to be a highly promiscuous protein binder with low bioavailability. A screen of conformationally similar, but more drug-like structures in the third round led to identification of celecoxib as the most potent inhibitor. A fourth round of testing with commercially available celecoxib analogues provided a compound that elicited 60% inhibition of GALK at 100 micromolar. Interestingly, a sterically similar compound having an IC50 of 50 nM against GALK was recently reported in the literature.

Conclusions
A ligand-based screen identified commercially available GALK inhibitors with mild affinity for the enzyme. Further derivatization of lead compounds would likely produce more potent inhibitors, as evidenced by similar compounds reported in the literature.

#27: **A Systematic Review: Toxoplasma gondii infection and drugs of abuse**

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Purpose
Toxoplasma gondii (T. gondii) is one of the most common parasites that infect humans. The parasite exists in approximately 40 million people in the United States. Latent infections are frequently associated with tissue cysts of T. gondii in the skeletal muscle and brain tissue that can lead to mental disorders, congenital disorders, and vision dysfunction. Furthermore, self-directed violence, impulsivity, and aggression are associated with T. gondii infection. Dopamine is associated with human behavior including pleasure, aggression, memory, and substance use disorder; however, the result of the studies on the association of T. gondii infection and drugs of abuse are not well understood. The frequency of substance use may be associated with substance-induced modification of dopamine-receptor densities and basal dopaminergic activity. Likewise, T. gondii can directly or indirectly influence dopaminergic activity in infected cells. Based on this hypothesis, the current paper aimed to systematically review all published literature on the association between drugs of abuse and T. gondii infection.

Methods
Systematic review of controlled studies on T. gondii infection and substance use effects in adults were searched on the electronic databases PubMed, Web of Science, Google Scholar, and Scopus till 30 November 2022. Relevant studies were identified using keywords, "T. gondii infection", "Toxoplasmosis", "T. gondii and drug use", "T. gondii infection, dopamine, and drugs of abuse". The quality of the studies and the results were analyzed.

Results
Results indicated that there is a positive association between T. gondii seroprevalence, alcohol consumption, schizophrenia, and personality/behavior disorders. Studies have shown that individuals infected with T. gondii display increased risky behavior, such as excessive alcohol consumption. Furthermore, it was observed that T. gondii seropositive subjects had a reduced likelihood of self-reported substance use compared to T. gondii seronegative subjects.

Conclusions
This study confirms that SUD is a potential risk factor for behavioral and psychiatric complications associated with T. gondii infection. Ultimately T. gondii infection in the context of drug dependence and the development of SUD remain to be elucidated. Therefore, it is necessary to conduct further research characterizing the mechanisms associated with dopamine metabolism of drug dependence and withdrawal in the context of a T. gondii infection, evaluating the role of inflammation, and identifying potential drug-and-sex specific underpinnings of these associations.

#28: **Applications of Platelet-rich Fibrin in Oral and Maxillofacial Surgery**

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Purpose
Platelet-rich fibrin (PRF) is an autologous product that is prepared from a patient's own blood and consists of platelet concentrates rich in cytokines and other growth factors that promote and maintain the healing of wounds. These characteristics have made PRF ideal for use in oral and maxillofacial surgery (OMS) as a therapeutic treatment. The main aim of this study is to examine the applications, efficacy, and benefits of PRF treatment in OMS. Specifically, this study will explore the outcomes of PRF on postoperative discomfort, infection prevention, inflammation, hard and soft tissue healing, and dental implant osseointegration.

Methods
For this literature review, a range of databases was used such as Google Search, PubMed, Web of Science, National Library of Medicine, and ScienceDirect. The search strategy used was a combination of terms such as "Platelet-rich fibrin (PRF)", "PRF in post-operative healing", "PRF in oral and maxillofacial surgery", "PRF in regenerative dentistry", and "PRF and oral pathology". Studies selected were published between January 1, 2017, and February 2022. Only English-language articles were considered for this research.

Results
In progress.

Conclusions
In progress.

#29: **Prevention of Doxorubicin-induced Cardiotoxicity by a Coumestan Analogue: Psoralidin**

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Purpose

Doxorubicin (DOX) is an anthracycline-class anti-cancer drug used to treat various types of cancers, including leukemia, breast, lung, and prostate cancers. However, its cardiotoxic adverse effects have limited its use. Therefore, adjuvant therapeutic approaches are required to reduce DOX-induced cardiotoxicity and increase its efficacy for the treatment of several cancers. We hypothesized that the potent antioxidant psoralidin prevents DOX-induced side effects by inhibiting DOX-induced reactive oxygen species (ROS), activation of caspase-3, and activation of redox-sensitive transcriptional factors.

Methods

The effect of psoralidin on DOX-induced death of human umbilical vascular endothelial cells (HUVEC) was determined using the MTT assay and annexin V staining. Activation of caspase-3, formation of ROS, and activation of transcription factors were determined using specific assay kits. Antibody-based specific arrays were used to examine the expression of various pro- and anti-apoptotic factors. Next, we will examine the effect of psoralidin on DOX-induced cardiac toxicity in a mouse model.

Results

Our cell culture studies indicated that psoralidin prevented DOX-induced HUVEC death in a dose-dependent manner. Furthermore, psoralidin prevents DOX-induced expression of pro-apoptotic factors, such as BID and BAX, and anti-apoptotic factors, such as Bcl-x, in HUVECs. We are currently investigating the mechanism of action of this agent in the prevention of DOX-induced cardiotoxicity.

Conclusions

Psoralidin prevents DOX-induced endothelial dysfunction and could be used as a potential adjuvant therapy to control the cardiotoxicity associated with anthracycline chemotherapy.

#30: **Genetic Modification of NMAD-1 Demethylase in C. elegans to Affect Longevity**

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Purpose
As organisms age, alterations occur in epigenetic marks that control the chromatin state of DNA which exposes formerly protected DNA to genetic instability. A recent study identified 30 previously untested candidate genes in C. elegans (a model organism) that could affect longevity. Among those, a gene previously associated with DNA repair in meiosis, demethylase nmad-1 stands out. While recent research has found that other demethylases in C. elegans impact aging, N6 methylation regulation genes, such as nmad-1, have not been experimentally linked to aging. We hoped to link N6 methylation to lifespan by knocking down nmad-1 expression through RNA interference (RNAi) overexpressing nmad-1.

Methods
Our study is split into two sections: nmad-1 RNAi knockdown, and nmad-1 overexpression. We started by maintaining and growing an N2 wild-type (wt) strain. To prepare the transgenic C. elegans with knocked-down nmad-1, we created transgenic RNAi expressing HT115 E. coli using an L4440 vector ligated with the 4th nmad-1 exon cloned in (which affects both isoforms of nmad-1). For the lifespan analysis, we used three groups of 30 worms each. The negative control N2 (wild-type) worms were fed on HT115 bacteria with an empty L4440 vector. nmad-1 knockdown N2 worms were fed with nmad-1 RNAi-expressing HT115 bacteria. The worms were kept at 20°C and monitored daily. Worms were designated as dead when unresponsive to three light taps with a platinum wire.A log-rank Mantel-Cox test was used to determine statistical significance of gathered lifespan data. Nmad-1 knockdown worms had a significantly shorter lifespan than control worms ($p < 0.05$. Median lifespan was 14 days for nmad-1 knockdown worms as compared to 16.5 days for N2 control worms). We performed qRT-PCR to confirm the efficacy of nmad-1 RNAi.To prepare for overexpressing nmad-1 in C. elegans, we isolated the entire nmad-1 gene using PCR. Then, we cloned nmad-1 into the pSLGCV ubiquitously expressed vector driven by the sur-5 promoter via ligation. After ligating the nmad-1 gene into the pSLGCV (the newly designed vector will be called pBYU54), we will prepare both negative control worms and a nmad-1 overexpressing line. To prepare the nmad-1 overexpression line, we will inject pBYU54 and rol6 as a co-injection marker into the gonads of five young adult worms using microinjection. The negative control worms will be prepared by injecting just rol6 into the gonads of five young adult worms. From each set of worms, 10 F1 L4 worms expressing GFP will be moved onto new petri dishes (one worm per plate), and three sets of 30 F2 worms that most highly express GFP will be selected and fed with OP50. Worms will be assessed the same as with the nmad-1 knockdown worms. All studies are blinded.

Results
Knocking down nmad-1 expression through RNA interference (RNAi) significantly decreased life span ($p=0.001$). We have not yet finished our experiments with overexpressing nomad-1.

Conclusions
NA

#31: **The immunomodulating effects of morphine dependence and withdrawal in a rat model**

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Purpose
The opioid crisis continues to pose a significant health burden, as evidenced by an increase in opioid overdose reports during the COVID-19 pandemic. Coinciding with the ongoing opioid epidemic and global pandemic is the increased prevalence of ultra-potent fentanyl, a trend responsible for more than 80,000 overdose deaths in 2021. Opioids can modulate the immune response following acute and chronic administration; however, the effect of opioid withdrawal on immune function is limited, with variable results.

Methods
The present study used flow cytometry to examine the immunomodulatory properties of morphine dependence and withdrawal. Opioid dependence was established in female Wistar rats by administering escalating doses of morphine (10-40 mg/kg) twice-daily for three days and subsequently maintained by twice-daily injections of 40 mg/kg morphine. Saline was administered on day 7 followed by the emergence of somatic signs of withdrawal and weight loss. Blood was collected during withdrawal; blood, lung, liver, and spleen were collected on day 14. The primary read out was immunotyping whole blood lysed with ammonium chloride 1% (w/v) and twice washed with Attune Isoflow (Na 140mEq/L). Surface antigens CD45, CD3, CD4, CD8, CD19, and CD56, were fixed with red and blue laser fluorochromes for 20 minutes before being washed and suspended in 500 mL of isoflow. Flow cytometric data was analyzed using Thermofischer Attune NxT.

Results
Notably, withdrawn rats demonstrated increasing absolute counts and other relative counts changes of WBCs. These findings indicate that morphine withdrawal alters the total number of cells and immunological profile of circulating leukocytes to a greater extent than the immunological profile during the morphine dependent state.

Conclusions
Opioid withdrawal may vary in onset, duration, and recovery. As such, the implications of immunoregulatory dysfunction in opioid dependent persons extend beyond treatment for opioid dependence along, and must include immunosurveillance in the context of infection.

#32: **Vitamin C contributes to epigenetic regulation of genes related to diabetic retinopathy in retinal endothelial cells.**

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Purpose
Diabetic retinopathy is a complication of diabetes that leads to reduced vision. It is the leading cause of blindness in working-age adults. Vitamin C is a potent reducing agent, most well-known for its function as an antioxidant, but has other functions including acting as a cofactor for many enzymes, such as the ten-eleven translocation (TET) enzymes. The TET enzymes are responsible for active DNA demethylation, and thus decreased vitamin C levels may lead to an imbalance in methylation-demethylation dynamics. Glucose acts as a competitive inhibitor for the transport of vitamin C (ascorbate) across the blood retinal barrier (BRB). Diabetes-induced high glucose levels (e.g., hyperglycemia) inhibit the transport of vitamin C across the BRB, and vitamin C levels in the eyes of diabetics have been shown to be only 10-25% compared to levels in healthy eyes. We hypothesize that impaired function of the TET enzymes leads to changes in transcription in the retina, which contribute to pathologic changes that contribute to diabetic retinopathy.

Methods
Primary, human retinal endothelial cells were cultured in 15.7 mM glucose (283 mg/dL) either in the presence or absence of vitamin C (50 µm) for five days. Immunohistochemistry, whole-transcriptome sequencing, and qPCR were used to determine and verify changes.

Results
After treatment with vitamin C, there was a global increase in hydroxymethylcytosine in microvascular endothelial cells. RNA-seq revealed that 437 genes had upregulated transcription and 308 genes had downregulated transcription. Pathway analysis highlighted changes in several pathways that may elucidate changes that occur in retinal endothelial cells that contribute to the pathogenesis of diabetic retinopathy. Genes related to Insulin-like growth factor 1 (IGF-1) signaling and VEGFA-VEGFR2 signaling exhibited reduced transcription after treatment with vitamin C. Additionally, pathways related to leukocyte adhesion to endothelial cells were downregulated. One main leukocyte adhesion gene, P-selectin (SELP), which has previously been found by GWAS studies and functional studies to be related to diabetic retinopathy pathogenesis, was also downregulated.

Conclusions

These data suggest that local vitamin c deficiencies in the eyes of diabetics affect signaling in the retinal endothelial cells which may contribute to the breakdown of the blood-retinal barrier in diabetic retinopathy.

#33: **Gestational dependent responses to second hand smoke (SHS) in mouse pregnancies**

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Purpose
Exposure to cigarette smoke is known to induce disease during pregnancy. Recent evidence showed that exposure to secondhand smoke (SHS) negatively impacts fetal and placental weights leading to the development of intrauterine growth restriction (IUGR) in mice. Hypertension and proteinuria are two important hallmarks of obstetric pathology leading to the development of preeclampsia (PE). In the present study, we wanted to determine the effects SHS exposure at two different important gestational points during mouse pregnancy.

Methods
C57/Bl6 mice were exposed to SHS via a nose-only delivery system (Scireq) for 4 days (from 14.5 gestational day (dGA) to 17.5 dGA) or for 6 days (from 12.5 dGA to 17.5 dGA). At the time of necropsy (18.5 dGA) placental and fetal weights were recorded. Maternal blood pressure was determined with a tail occlusion cuff (Kent Scientific) and dip stick test for proteinuria was obtained.

Results
Treatment with SHS showed: 1) a significant decrease in placental weight ($p<0.0001$) and fetal weight ($p<0.0002$) following 4 days of exposure, 2) higher systolic ($p<0.02$) and diastolic ($p<0.02$) blood pressure following 6 days of exposure, and 3) increased proteinuria after 6 days of exposure. We conclude that detrimental effects of SHS coincides with the length of maternal exposure.

Conclusions
We confirmed that 4 days of exposure resulted in metrics common to IUGR while 6 days of exposure more closely resembled PE pathology. These results could be beneficial in understanding the long-term effects of SHS exposure and the development of placental diseases.

#34: **Potential role for RAGE in the development of secondhand smoke-induced chronic sinusitis**

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Purpose
Sinonasal inflammation observed in chronic sinusitis (CS) is characterized by the presence of pro-inflammatory exudates, mucus overproduction, and elevated edematous mucosal tissue. According to the National Health Interview Survey of 1996, chronic sinusitis was the second most prevalent chronic health condition, affecting 12.5% of the US population or approximately 31 million patients each year. More recently, it was determined that CS affects approximately one in seven adults and estimates suggest up to 15% of the general U.S. population may be affected. Importantly, CS accounts for over 20% of all office visits to allergy and immunology specialists and there are an estimated 18 million cases and 30 million courses of antibiotics delivered each year. The theme of this research is to delineate molecular mechanisms regulated by RAGE, an inflammatory progression factor we've identified in tissues exposed to secondhand smoke (SHS). Such research may show likely causes of CS and possible identification of molecular targets.

Methods
Wild type and mice that over-express RAGE in sinonasal epithelium (RAGE TG) were maintained in room air or exposed to SHS via a nose-only delivery system (Scireq Scientific, Montreal, Canada) five days a week for 30 days. Sections of sinus epithelium were stained for RAGE or Alcian blue (to characterize mucus) and tissue lysates were assayed by qPCR or immunoblot for caspase 3 (to detect apoptosis), cytokines (to evaluate inflammation) or matrix metalloproteases (MMPs to detect tissue degradation).

Results
We discovered increased sinus RAGE expression following smoke exposure of wild type mice and elevated expression in sinuses from RAGE TG mice. Goblet cell hyperplasia was detected in both smoke-exposed wild type mice and transgenic mice exposed to room air. Cleaved caspase-3, cytokines (Il-1b and TNF-a), and MMP-9/MMP-13 were induced by SHS and in tissues procured from RAGE TG mice.

Conclusions
Together, these results expand the inflammatory role of RAGE signaling, an axis considered a key culprit in lung disease progression observed in smokers. In this relatively unexplored area, enhanced understanding of RAGE signaling during voluntary and involuntary smoking may help to elucidate potential therapeutic targets that may attenuate the progression of smoke-related chronic sinusitis.

#35: **Breast Cancer Subtyping of The Cancer Genome Atlas (TCGA) Samples**

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Purpose
Breast cancer is one of the most common forms of cancer, with over 250,000 cases annually in the United States. Clinically, the disease is heterogeneous, and treatment is guided primarily by tumor subtype. Evaluation of an individual's germline genetic makeup can determine the risk of developing breast cancer. However, each breast cancer subtype is correlated with different germline genetic variants. For instance, germline mutations in BRCA1 correlate with TNBC subtype, while germline mutations in BRCA2 correlate with Luminal A and Luminal B subtypes. The Cancer Genome Atlas (TCGA) project collected primary tumor samples from over 1,000 individuals with breast cancer and performed genetic sequencing to determine both germline and somatic variation. This data has not yet been analyzed to determine germline variation that may predispose to breast cancer, largely because the samples were not subtyped. The goal of this project was to develop a method to subtype the tumors of the TCGA database.

Methods
Gene expression analysis and immunohistochemical (IHC) results were compared against subtyping information for a subset of samples present in the original TCGA breast cancer publication. Hierarchical and K-means clustering were performed using gene expression data from 50 genes (PAM50 gene set) and various cutoffs.

Results
IHC results exhibited high variability and were not consistent with the subtyping originally presented. Hierarchical clustering cleanly separated luminal samples from samples of other subtypes, but several small clusters arose. K-means clustering using 5-means clustered the samples labeled by TCGA into different subgroups. Expression levels of ESR1, PGR, and ERBB2 were used to label the clusters. The sample counts per cluster using this method are: Luminal A - 606 (55%), Luminal B - 220 (20%), TNBC - 210 (19%), and Her2 - 73 (7%). TNBC tumors exhibited high expression in several genes including MIA, EGFR, and SFRP1.

Conclusions
K-Means clustering of genetic expression of 50 genes (PAM50 genes) was used to cluster 1,109 breast cancer tumors. The clusters were then labeled based upon expression of ESR1, PGR, and ERBB2. Burden analysis using logistic regression can now be used to investigate hazard ratios associated with germline variants in individual genes.

#36: **Effects of B4GALNT1 expression on metastatic phenotype and response to treatment in osteosarcoma cell lines**

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Purpose
Osteosarcoma is the most common type of bone tumor that has the highest prevalence in adolescents and young adults. Currently, the standard protocol for osteosarcoma treatment consists of surgery and chemotherapy, but despite the progress that has been made in previous decades, still 30-50% of patients experience recurrence. GD2 is a glycosphingolipid and a member of the ganglioside family that is overexpressed in several tumor tissues such as osteosarcoma and neuroblastoma while having limited expression in most normal tissues.This glycosphingolipid is synthesized by an enzyme called GD2 synthase that is coded by the B4GALNT1 gene. Recent studies have shown that the expression of B4GALNT1 in cancer cells can be related to a more malignant phenotype. In this study, we sought to understand the effects of B4GALNT1 expression on cancer cells' behavior and whether the expression of this gene can cause more metastatic phenotype and resistance to chemotherapy.

Methods
In order to confirm the accuracy of our results and
Conclusions, all steps were performed in two different OS cell lines, HOS and SAOS. We used B4GALNT1 plasmid for overexpression and CRISPR/CAS9 for knocking out the desired gene. The changes in the expression were confirmed using RT-qPCR, comparing them to wild type cell lines. To evaluate the metastatic phenotype we first compared the expression of epithelial and mesenchymal marker (N-cadherin) and transcription factors for epithelial to mesenchymal transition (Twist, Snail, and Slug). In the next step, the migration capability of Knocked out, over-expressed and wild type cell lines was compared using 24 hour wound healing assay. In the last step of the experiment, the sensitivity and resistance of each three types of each osteosarcoma cell line were tested using Cisplatin, Methotrexate, and Doxorubicin.

Results
Our results show that B4GALNT1 has considerable effects on wound healing ability of the osteosarcoma cell lines. Expression of the B4GALNT1 made cell lines more proliferative and resistant to cytotoxic agents.

Conclusions
This study shows that B4GALNT1 has considerable effects on malignant and metastatic phenotype of osteosarcoma cell lines and it can be a potential gene to target in the treatment of metastatic osteosarcoma.

#37: **Prevalence of Class B G Protein Coupled Receptor Mutations in Skin Cancer**

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Purpose
Class B G Protein Coupled Receptors (GPCRs) are a family of receptors and potential targets for different diseases such as cancer. Some of these receptors are mutated and potentially finding some correlation of the mutations of these receptors with their function can help further research in creating drugs to target them for different diseases. In this study, we gathered mutation data from The Cancer Genome Atlas (TGCA) on skin cancer for all the class B GPCRs. We categorized the types of mutations and the locations of these mutations to determine potential changes in receptor activity.

Methods
Mutations associated with all the class B receptors were compiled from the Cancer Genome Atlas (TCGA) and classified according to type, location and prevalence of these mutations.

Results
Overall, we observed that missense mutations were the most common form of mutation found. The VIPR2 receptors demonstrated the most missense mutations. Most mutations are found at the extracellular loop of these receptors, suggesting that there may be an effect on ligand binding of the receptor.

Conclusions
In this study, we queried for mutations of class B GPCRs in skin cancer. We found that missense mutations were the most common form of mutation and that most mutations were found on their extracellular domains. Therefore, this suggests that different degrees of GPCR activation may be occurring in skin cancer, contributing to aberrant activity associated with the cancer cell. This may contribute to cancer initiation and progression.

#38: **Staff at Increased Risk for Computer Vision Syndrome compared to Faculty at an Osteopathic Medical School with an Electronic Content Delivery Model**

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Purpose
To compare the overall prevalence of computer vision syndrome (CVS) between students, faculty, and staff while promoting awareness. CVS is caused by extended screen exposure that can lead to eye discomfort and vision changes which can affect quality of life and educational performance. Our institution is a new Osteopathic medical school that aims to create an innovative approach to medical education delivery via employment of modern technology that is already prevalent. Implementation of pre-recorded lecture materials in the curriculum requires an additional 4-6 hours of electronic screen exposure. Students, faculty, and staff at our institution are potentially at increased risk for CVS, stemming from the new curriculum delivery style and the accelerated use of technology during the COVID-19 Pandemic.

Methods
In this study we disseminated an anonymous online survey comprised of 21 questions related to eye conditions, use of digital devices, symptoms of computer vision syndrome, an open-end comment section, and a demographics section. Information on CVS symptoms and prevention was provided for participants to download. Faculty, staff, and students (classes of 2025 and 2026) were invited to participate. P-values were calculated using chi-squared test.

Results
Eighty-five responses were received: medical students (40%), faculty (27%), and staff (33%). 45 respondents were female (53%) and 40 were male (47%). Of the participants who used a device for more than 1 month, 48% (n=41) reported increased vision fatigue. The presence of CVS was determined by the presence of 6 or more symptoms related to CVS. CVS positive participants were compared between faculty, staff and students. 71% of staff reported having 6 or more symptoms related to CVS, compared to 35% of faculty (p-value= 0.0089). There was no significant difference between students and staff or students and faculty.

Conclusions
This study highlights the prevalence of CVS among faculty, staff, and students, and illustrates the potential impact of outreach. These results suggest higher rates of vision fatigue among staff within our population. Further research may help identify additional causative factors and effective strategies for prevention.

#39: **Reversible Emerging Neuropsychological Pattern in Chronic Intractable Migraine**

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Purpose

Migraine is the most common neurological disorder in the world. It is a multisystemic, multicausal condition characterized by increased neuronal activity in various brain regions including the hypothalamus and trigeminal nerve complex. Conflicting reports related to neurocognitive deficits have proven contentious as most studies have looked at a variety of different migraine classifications. This study attempts to identify a common neurocognitive profile amongst those experiencing chronic intractable migraine specifically.

Methods

We evaluated 36 patients with severe, chronic migraine patient poorly responsive to traditional pharmacotherapy (> 20 headache days/months for >6 months). Each patient was given a neuropsychological evaluation to measure 12 cognitive domains. The same patients were retested following resolution of migraine symptoms (<5 headache days/month for >3 months).

Results

Initial testing revealed a distinct neurocognitive pattern of increased function in Spatial Awareness and Spatial Memory ($p=0.0031$) and Deductive Reasoning ($p=0.0042$) with decreased function in Episodic Memory ($p=0.0194$), Verbal Short-term Memory ($p=0.0027$) and Response Inhibition ($p=0.0130$). Following three months of migraine resolution, Episodic Memory and Response Inhibition deficits resolved entirely with Verbal Short-term Memory remaining low. Additionally, Mental Rotations and Verbal Reasoning were both enhanced above average ($p=0.0015$ and $p=0.0032$ respectively).

Conclusions

This neurocognitive pattern is consistent with long-reported clinician reported observation of chronic migraine patients with high functioning neurocognitive profiles with targeted deficits in effecting memory and emotional affective circuits. These data could provide additional details regarding the role of chronic migraine in neuropsychiatric disorders and possibly provide further insight into prophylaxis and treatment options. However, further research is needed.

#40: **Evaluation of dexamethasone premedication prescribing for docetaxel**

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Purpose

Docetaxel is an antineoplastic agent commonly used to treat various malignancies such as prostate, lung, and breast cancer. Although generally well tolerated, premedicating with corticosteroids such as dexamethasone is recommended to reduce the incidence and severity of fluid retention and hypersensitivity reactions. This project was designed to determine if Intermountain Healthcare's prescribing patterns follow docetaxel's package insert dexamethasone premedication recommendation. Premedicating with dexamethasone can prevent serious complications of edema such as pleural effusions, ascites, and pericardial effusion.

Methods

This project was a retrospective chart review looking from February 1, 2022 to April 30, 2022. Docetaxel doses prescribed in any outpatient regimen with first treatment initiated before February 2022 were included in the analysis. Docetaxel doses that were initiated with first treatment after April 2022 were excluded. Data collection included Utah-based facility locations, indication for treatment, first docetaxel treatment date, whether dexamethasone was prescribed, dexamethasone prescription information (date prescribed, dose, frequency, days of therapy, quantity prescribed), and whether there was rational for not premedicating with corticosteroids. Data was de-identified and stored on a password protected file. Data did not include any patient specific information to mitigate the risk associated with confidentiality. This project was process improvement in nature therefore the institutional review board approval was not deemed necessary.

Results

A total of 77 docetaxel regimens were recorded during this timeline. Forty-five regimens prescribed dexamethasone prior to docetaxel (58.44%) and 30 regimens did not prescribe dexamethasone for their treatment regimen (38.96%) without documented rational. Two docetaxel regimens were prescribed dexamethasone in the middle of the treatment cycles. Treatment indications included mostly breast, prostate, and non-small cell lung cancer. Locations where dexamethasone was most likely prescribed as a premedication to docetaxel was at the Intermountain Medical Center, St. George, Logan, and Cedar City locations.

Conclusions

A majority of docetaxel regimens (58.44%) were prescribed dexamethasone as a premedication per the manufacturer's recommendation. However, there are still Intermountain locations that lack appropriate corticosteroid prescribing prior to docetaxel. Looking further into the prevalence of adverse events with/without dexamethasone and providing education to oncology clinics about premedicating with corticosteroids to reduce fluid retention and prevent serious complications are future considerations for this project.

#41: **Clinical Trial Subject Recruitment: Research Immersion Experience**

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Purpose
Few dental schools teach research as part of their curriculum. Even fewer that teach research to their clinical dental faculty, staff and students during the school year and simultaneously immerse them into real life settings to conduct clinical trials. Clinicians have either no or very limited experience in conducting research including clinical trials; therefore, many challenges and difficulties arose for research team members including recruiting adequate number of qualified and willing participants. The goal of this paper was to report team members' subject recruitment experience clinical knowledge and education, enabling actionable evidence-based dentistry in practice setting..

Methods
Clinical dental faculty, staff, and students in an accredited private dental school in the Western United States participated as a team in a clinical research immersion program to conduct a trial. The principal investigator led the research training to provide theoretical and practical research experience to the team. The team members were a source of peer learning and worked together to develop and carry out subject recruitment strategies to recruit subjects for the trial.

Results
A total of 41 dental faculty, staff and students participated in the research immersion program and conducted the clinical trial in 2021 and 2022. All team members had positive experience in learning how to recruit subjects for the trial. The results demonstrated that all team members increased their knowledge in research subject recruitment as well as ethical and critical thinking skills in research, advertisement, marketing and communication.

Conclusions
The research experience gained by each team member immersing in a clinical trial, in addition to learning and performing subject recruitment, was a rich supplement to their clinical knowledge and education, enabling actionable evidence-based dentistry in practice setting.

#42: **Sulopenem for the Treatment of Complicated and Uncomplicated Bacterial Urinary Tract Infection (UTI)**

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Purpose
To evaluate clinical data supporting the use of sulopenem as the treatment of both complicated and uncomplicated urinary tract infections (UTI) caused by gram negative bacteria.

Methods
Using PubMed, the search terms "Sulopenem" or "CP-70,429"; and "urinary tract infection," "extended spectrum beta-lactamase" and "bacteria" were utilized. Phase 3 clinicals trials for complicated and uncomplicated were identified and analyzed.

Results
In clinical trial NCT03357614, sulopenem IV 1000 mg was given once daily followed by oral sulopenem-etzadroxil 500 mg/probenecid 500mg twice daily, or ertapenem IV 1000 mg daily followed by either oral ciprofloxacin 500 mg or oral amoxicillin-clavulanate (AC) 875mg -125mg twice daily to patients with complicated urinary tract infections (cUTIs) for 7-10 days. AC was reserved for fluoroquinolone resistance. The primary endpoint was an overall response at test of cure, including clinical and microbiological endpoints. Sulopenem achieved the primary endpoint at 67.8%, compared to ertapenem at 73.9%, meeting the pre-specified noninferiority margin and showing similar clinical success (89.4% vs. 88.4%) but not in microbiologic response (71.2% vs. 78.0%). Adverse drug reactions were reported at approximately 15.1% for sulopenem and 16.4% for ertapenem, of which the most common were headache and diarrhea. In the clinical trial NCT03354598, oral sulopenem etzadroxil 500mg/probenecid 500mg was given twice daily for 5 days or oral ciprofloxacin 250mg twice daily for 3 days for uncomplicated UTIs (uUTIs) treatment. The primary endpoint was again an overall response at test of cure including clinical and microbiological endpoints. Sulopenem etzadroxil/probenecid demonstrated superiority (62.6%) to ciprofloxacin (36.0%) in the ciprofloxacin-non-susceptible population, and 66.8% vs 78.6% in the susceptible population at the primary end point. In combined response, sulopenem (65.9%) showed similar clinical success with ciprofloxacin (67.9%). Adverse drug reactions were reported at approximately 25% for sulopenem etzadroxil/probenecid and 14.0% for ciprofloxacin. Nevertheless, the FDA required additional trial results for uUTI.

Conclusions
Sulopenem is an oral carbapenem that has been tested in clinical trials for bacterial cUTIs and uUTI with some success with safety and tolerability to the recipients. The availability of this drug remains to be determined.

#43: **Efficacy of artificial intelligence in the detection of periodontal bone loss andclassification of periodontal diseases - A systematic review**

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Purpose
The present systematic review aims to evaluate the efficacy of artificialintelligence in the detection of periodontal bone loss and classification of periodontaldiseases.

Methods
An electronic search of three databases, including PubMed, Web ofScience, and Scopus, was conducted for articles published until August 2022. Asupplementary manual search of references from these articles was performed toinclude any articles that may have been overlooked in the electronic search. Articlesthat evaluated the efficacy of artificial intelligence in determining periodontal boneloss were included. Case reports, case series, commentaries, letters to the editor,and narrative or systematic reviews were excluded. Articles in languages other thanEnglish were excluded. The articles were assessed against the ROBINS-I tool forNon- Randomised Control Trials (N-RCTs). Grade assessment was followed basedon the Cochrane Handbook for quality assessment. A summary of findings table wasused to present the results.

Results
Eleven articles were identified on an electronic search. Six articles met theinclusion criteria and were included in the present systematic review. The studieswere conducted on healthy partially or completely edentulous patients withperiodontal disease undergoing radiographic imaging. Most of the studies reportedsimilar results for detection of periodontal bone loss and classification of periodontaldisease diagnosis in both groups.

Conclusions
The available evidence suggests that artificial intelligence is equallyeffective in determining periodontal bone loss. However, the evidence must beinterpreted cautiously due to its 'low quality' GRADE assessment.

#44: **Carvacrol regulates endotoxin -induced arachidonic acid metabolism.**

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Purpose
Endotoxemia is the primary cause of inflammatory and vascular complications leading to multiple organ dysfunction and damage in Gram-negative bacterial infections. Although antibiotics prevent bacterial growth, the bacterial debris contains endotoxins such as lipopolysaccharides (LPS) which trigger an overwhelming inflammatory response leading to morbidity and mortality. Arachidonic acid metabolism releases several pro-inflammatory mediators, such as prostaglandins, prostacyclins, and leukotrienes which cause significant inflammation. Carvacrol, a phenolic monoterpenoid found in several plant-derived essential oils, processes antioxidant, antimicrobial, antibacterial, and anticancer properties. However, its role in regulating the arachidonic acid pathway is unknown. Therefore, we aim to investigate if carvacrol is a potential therapeutic agent in preventing endotoxin-induced arachidonic acid metabolism.

Methods
Primary human aortic endothelial cells (HAECs) and a mouse model of endotoxemia will be used to achieve our hypothesis. HAECs cells were treated with carvacrol (50-200 uM) in the absence and presence of LPS in a time and dose-dependent manner. Cell viability was determined by MTT assay. Cell death will be determined by Annexin-V staining by FACS. The levels of prostaglandins, prostacyclins, and leukotrienes will be determined by immunoblot analysis. The expression of cyclooxygenase-2, lipoxygenase, and thromboxygenase will be measured by specific assay kits.

Results
Pending

Conclusions
If our hypothesis is correct, we expect that carvacrol prevents LPS-induced vascular inflammatory response by controlling the arachidonic acid metabolites.

#45: **Sleep Quality of Nurses: A Nationwide and Cross-Sectional Study in Iran**

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Purpose
The quality of sleep of nurses is an important variable related to giving quality patient care and is affected by socio-cultural factors. This study in 2019 aimed to evaluate the sleep quality of Iranian nurses and identify influential factors.

Methods
The method was a cross-sectional study that examined 920 nurses working in hospitals in 7 cities of Iran. A random multi-stage sampling method was used. Instruments used were the Demographic Information Questionnaire and Pittsburgh Sleep Quality Index and SPSS software version 24 was used to analyze the statistical data.

Results
The overall sleep quality score of the nurses was 7.86 ± 3.58 out of a total score of 21. 71.6% of participants had poor sleep quality. The most common problems of the nurses were in the two subscales, "sleep disturbance" and "sleep efficiency, respectively. Sleep quality was positively correlated with "education level" and negatively correlated statistically with "having a second job" ($P<0.05$). Other occupational and demographic variables had no statistically significant relationship with sleep quality ($P>0.05$). Shift work and work in two hospitals were factors predicting a lower quality of nurses' sleep.

Conclusions
The study showed that poor sleep quality is still a significant health issue for nurses, especially of the study population of Iranian nurses. The main reasons for their low sleep quality are low sleep efficiency and high sleep disturbance.

#46: **Eflapegrastim-xnst: A new agent to prevent antineoplastic chemotherapy-induced febrile neutropenia**

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Purpose
To review the clinical efficacy and safety of eflapegrastim-xnst as an alternative granulocyte colony stimulating factor to filgrastim and pegfilgrastim for the prevention of febrile neutropenia.

Methods
The search terms, "eflapegrastim" and "eflapegrastim dosing" were utilized in PubMed, with emphasis on Phase II and III clinical trials.

Results
In a Phase II study, the weight-based dosing demonstrated that 270 mcg/kg of eflapegrastim was superior to pegfilgrastim in reducing the duration of severe neutropenia during the first cycle of chemotherapy. In subsequent Phase III ADVANCE and RECOVER trials, 13.2 mg of eflapegrastim (3.6 mg GCSF) was utilized. The ADVANCE trial compared the safety and efficacy of eflapegrastim and pegfilgrastim in patients with early stage breast cancer. During the first cycle of therapy, patients receiving eflapegrastim had a 34.9% relative risk reduction in severe neutropenia when compared to pegfilgrastim, with a 15.8% vs 24.3% (p=0.034) incidence of days of severe neutropenia (0.2 vs. 0.35 days). The RECOVER trial utilized the same drug regimen as the ADVANCE trial for patients with stages I-IIIA of breast cancer; 20.3% of patients receiving eflapegrastim had severe neutropenia after the first cycle, whereas 23.5% occurred with those receiving pegfilgrastim. The ADVANCED trial reported a higher incidence of adverse effects in the eflapegrastim group than the pegfilgrastim group (83% and 70%, respectively), but drug discontinuation rate was 5%, similar to pegfilgrastim. The RECOVER trial reported similar adverse effects of about 60% in both groups. The most common reported adverse events were bone pain (about 35%) and musculoskeletal pain.

Conclusions
Eflapegrastim has demonstrated noninferiority to pegfilgrastim in terms of safety and efficacy in preventing antineoplastic chemotherapy-induced febrile neutropenia in breast cancer patients. The drug also demonstrated adverse effects incidence comparable to GCSF therapy, though ADRs were not severe. More studies would be required to determine how effective eflapegrastim would be on other forms of chemotherapy regimens for other cancers.

#47: **Heterodyned Whole-Body Vibration Ameliorates Anxiety in Opioid-Use Disorder**

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Purpose
Opioid use disorder (OUD) is a rising problem in the United States and around the world, with pain and stress being major factors for initial drug seeking and relapse. The mesolimbic dopamine (DA) in the striatum is an important nexus for the rewarding properties of opioids and other addictive drugs and is strongly implicated in OUD. This study uses a novel heterodyned whole-body vibration (HWBV) device consisting of two independent vibration sources vibrating at different frequencies to treat anxiety/craving associated with OUD.

Methods
We evaluated 50 patients experiencing anxiety associated with OUD. Twenty-five received HWBV treatment and 25 received a sham treatment. Patients were treated 5 times per week for 10 minutes per day for 4-weeks. Pre- and post-EEG and neuropsychological evaluations were performed. Daily acute anxiety scores were taken, and weekly HAM-A anxiety scales were performed.

Results
HAM-A scores were significantly reduced in the treatment group when compared to sham (-12.06 versus -3.56; n=50; p=0.0018). Additionally, improvements were noted in Mental Rotations, Grammatical Reasoning and Response Inhibition. Finally, significant positive changes were found in frontal alpha balance on EEG.

Conclusions
This neurocognitive pattern is consistent with long-reported clinician reported observation of chronic migraine patients with high functioning neurocognitive profiles with targeted deficits in effecting memory and emotional affective circuits. These data could provide additional details regarding the role of chronic migraine in neuropsychiatric disorders and possibly provide further insight into prophylaxis and treatment options. However, further research is needed.

#48: **Appearance of two distinct clusters of glucose dysregulation in chronic intractable migraine**

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Purpose
Migraine is the most common neurological disorder in the world. It is a multisystemic, multicausal condition characterized by increased neuronal activity in various brain regions including the hypothalamus and trigeminal nerve complex. Reactive hypoglycemia has not been previously characterized as a diagnostically or therapeutically relevant ancillary to chronified migraine. Previous reports have indicated an association between migraine and reduced insulin sensitivity leading to increased average blood glucose levels. Among the possible explanations, are the connections between the ventromedial nucleus of the hypothalamus, migraines, and glucose regulation. This case series presents four chronic migraine patients with co-occurring reactive hypoglycemia.

Methods
We evaluated 34 patients with severe, chronic migraine patient poorly responsive to traditional pharmacotherapy. Each of the patients received a complete blood count with differential, hemoglobin A1C (with estimate average glucose), oral glucose tolerance test (GTT), 10-days of continuous glucose monitoring and a comprehensive metabolic panel.

Results
We have identified two distinct clusters of glucose dysregulation in this population. Cluster one demonstrates a normal initial response to glucose challenge and a severe reactive hypoglycemic drop at between 2-3 hours (53 mg/dL +/- 6 mg/dL). Cluster 2 demonstrates a blunted reaction with no appreciable increase in glucose levels at 1-hour post prandial tolerance exam (82 mg/dL +/- 12 mg/dL).

Conclusions
The mechanistic pathophysiological causes of altered glucose regulation in migraine are poorly understood. There could be various aspects of the glucose profile that should be taken into consideration by the clinician until greater understanding of the extent to which this issue contributes to migraine is further elucidated

#49: **Emergence of Dental Nanomaterials: "Their Role in Performing Endodontic Therapy"**

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Purpose
The use of nanomaterials, such as nanobots and nanoparticles, have shown much promise in the dental specialty of endodontics. Over the past decade, various techniques of maneuvering nanobots, using chemical, acoustic, magnetic, and biohybrid actuation methods, have been developed. The goal of endodontics is the prevention or treatment of apical periodontitis. Endodontists focus on cleaning dentinal tubules with a diameter range of 1-3 µm. However, the maneuvers demonstrated by nanobots in the limited space can be translated to other complex anatomies with larger dimensions as well (mean diameter ranges from 10 to 200 µm). Using nanomaterials within this larger dimensional space demonstrates a more potential widespread use in the dental profession. Nanoparticles such as copper, cadmium and silver have shown to be an efficient strategy in treating biofilms, however, the safety of these particles needs to be addressed. While this "very hot" and upcoming field shows promise in improving treatment strategies in dentistry, more research has to be done. The purpose of this literature review is: (1) to evaluate nanomaterials as a method of disinfection when performing root canal therapy and (2) to evaluate the success rate utilizing this method of treatment.

Methods
Utilizing a PubMed database, articles published between the years 2020-2022 will reviewed.The articles will be selected based on scientific testing of nanomaterials utilized in performing endodontic treatment as well as comparative studies of nanoparticles as a treatment option versus conventional root canal therapy'

Results
In Progress

Conclusions
To be Determine

#50: **Change in Basic Pulmonary Function with Change in Altitude**

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Purpose
This study aims to determine if there is a lasting effect in lung function when an individual relocates from an area of low elevation to an area of high elevation.

Methods
Our proposed study will track changes in pulmonary function over time after moving from a region of low elevation (1,000 feet above sea level or lower) to one of high elevation (4,500 feet above sea level in Provo, Utah). We plan to track incoming students to Noorda College of Osteopathic Medicine that hail from places of elevation lower than 1,000 feet. We will use spirometry to index tidal volume, respiratory rate, forced vital capacity, and peak expiratory flow rate. Initial testing on subjects will be completed within seven days of arriving in Provo and repeat testing will occur monthly over the subsequent 6-10 months to track changes in the above markers. Test values will be noted to a confidential subject number and lung function will be graphed over time.

Results
Expected Results: We expect that when an individual initially arrives at a location of higher elevation, lung function may decline due to the decrease in oxygen availability. However, the longer they stay, it may cause an increase to normal levels and potentially higher than what it was previously. We expect initial difficulty with some participants with regards to shortness of breath and decreased overall muscular and mental function due to the sudden lack of oxygen.

Conclusions
The objective of this study is to increase the knowledge base on the affect elevation has on lung function and how quickly our lungs can adjust to a change in elevation. We hope this data will be useful in preparing individuals relocating to higher elevations for the changes they can expect in their pulmonary function as they adjust to the elevation increase.

#51: **The Current State of Underrepresented Osteopathic Minorities in Competitive Specialities- A Literature Review**

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Purpose
It is well documented that barriers exist for underrepresented minorities to enter the field of medicine and even more competitive residencies. As defined by the NRMP, competitive specialties include but are not limited to Interventional Radiology, Orthopedic Surgery, Plastic Surgery, Radiation Oncology, Vascular Surgery, Neurosurgery, Dermatology, and Otornylogy (NRMP-AMA). A large number of osteopathic medical school graduates have a history of going into primary care specialties because many osteopathic medical schools have a primary care focus (Primary Care- Osteopathic Medicine).The emphasis on primary care, whether intentional or not, can foster a less-than-advantageous environment for underrepresented minority students (URM), pursuing interests in competitive specialties. Furthermore, additional barriers exist for osteopathic medical students to enter these competitive specialties. This Literature review seeks to evaluate the current standings of URM osteopathic medical students in these specialties while providing recommendations to increase representation in these fields.

Methods
Methods- A PubMed, Google Scholar, and NoordaCOM library resources literature review was conducted using the search terms: " Match rates"," URM" "Competitive specialties", "Osteopathic students match rates", "URM match rates", " URM osteopathic students". Sixteen articles were generated during the search. The NRMP 2022 match data the AACOM reports were used.

Results
Firstly, when osteopathic medical students apply to dermatology residencies, sixteen percent (3 of 18) of allopathic residents and 73.68% (14 of 19) of osteopathic residents experienced bias based on their allopathic or osteopathic status ($P < .002$) (Tveteden et al 2022). In that same manner, many minority students stated that when they applied to dermatology residencies, barriers that they faced included but are not limited to a lack of diversity, perceived negative perceptions of minority students by residencies, socioeconomic factors, and lack of mentors, all of which affect the ability for URM's to be accepted into dermatology residencies (Narla et al. 2022).

Conclusions
Potential strategies to address this issue include increasing the number of URM faculty and residents in these specialties, addressing potential biases or systemic barriers, and providing focused support and resources for URM students. In order to increase the number of URM osteopathic medical students in specialties such as dermatology, addressing any potential biases or systemic hurdles in the application and selection process can increase representation (Tveteden et al 2022).

#52: **Diode Laser Effectiveness on Red-Complex Bacteria**

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Purpose

This systematic review examined diode lasers irradiation effectiveness in reducing red-complex bacteria levels and clinical periodontal parameters of pocket depth and clinical attachment level.

Methods

Scopus, Embase, Medline, and Web of Science databases were electronically searched according to specific inclusion and exclusion criteria in July 2022. Randomised control trials that evaluated reduction of red-complex bacteria using diode lasers in patients with periodontitis were included. The primary outcome was the reduction in the microbial count of the red-complex bacteria. The secondary outcomes were clinical periodontal parameters of probing depth and attachment level. Articles in languages other than English were excluded. Study quality was assessed based on the Cochrane Handbook for Systematic Reviews of Interventions and the ROB2 tool.

Results

A total of eight studies that examined 210 subjects were included in the review. The average age group of the study population was 30-60 years. The eight studies lacked consensus on the antimicrobial effect of diode lasers. Four studies reported no significant difference in the levels of red-complex bacteria before and after laser application. Three studies reported significantly lower levels of red-complex bacteria in the intergroup comparison. One study reported that laser had no significant effect on intergroup bacterial levels. Four studies showed a high risk of bias, three studies had a rating of some concerns, and only one study had a low risk of bias. Overall, the combination of diode laser irradiation with scaling reduced the count of red-complex bacteria and improved the clinical parameters, although not significantly.

Conclusions

Based on limited evidence, adjunctive use of diode lasers to scaling and root planning may provide additional benefits in reducing red-complex bacterial count and clinical parameters. Further well-designed trials adhering to reporting guidelines and using objective measures are necessary before outlining universal guidelines for best practice.

#53: **Comparison of Radiographic Exposure During RCT Under Endodontist vs General Dentist Supervision: A Retrospective Study**

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Purpose
Background: Regarding RCT radiographs in a dental school clinic, existing studies examine common radiographic errors and assess quality of radiographs. However, no existing studies examine the quantity and quality of radiographs taken by dental students when supervised by a general dentist or an endodontist. Objective: To review patients' radiographic exposure and radiographic errors during root canal treatment performed in a general dentistry education model versus in an endodontic specialty clinic.

Methods
A retrospective study of endodontic cases completed by undergraduate dental students at Roseman CODM. Charts were analyzed which had CDT - Endodontic procedure codes 3310and 3320 completed. Number of Cases to be analyzed: 50-100 cases from 4th floor clinic and 50-100 cases from Old Endodontic Clinic. 50-100 patient cases from both the 4th Floor General Dentistry Clinic and in the Old Endodontic Clinic will be reviewed for quantity as well as graded for the quality, and errors at the different radiographs taken during RCT, including Diagnostic Radiograph, Working Length, Master Cone, and Final Radiograph. Radiographs will be graded for common errors (Cone Cut, Foreshortened, Elongated, Closed Contacts, Missing Root Apex, Poor Contrast, Image Blurring)and by the following general scale: Grade 1 - Excellent: no errors, Grade 2 - Acceptable: some errors, Grade 3 - Unacceptable: diagnostically useless.

Results
Results are pending. Retrospective review of charts has not yet started. IRB was just approved on December 8, 2022.

Conclusions
To be determined.

#54: **Prediction of migraine status from cervical radiographs using a machine learning model**

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Purpose
This study aims to investigate whether it is possible to predict migraine and/or chronic migraine status entirely from analysis of cervical radiographs using a machine learning model.

Methods
We have collected large x-ray datasets from two clinics including a set of images from patients diagnosed with migraines and a set from the general population. Using machine learning and artificial intelligence techniques, we will train and test a model on this data to determine if it is possible to predict migraines with a statistically significant level of accuracy by identifying cervical pathology on x-rays.

Results
Research is ongoing.

Conclusions
The end goal of this research is to establish an initial correlative relationship between specific cervical pathology and migraines and provide a non-invasive and cost-effective means of migraine diagnosis. We hope to lay a framework for further studies to define a causal relationship and novel treatments.

#55: **Porcelain Fused to Zirconia Wing Bridge: A Clinical Trial**

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Purpose
With the rising popularity of zirconia as a dental restorative material, we evaluated a bonded zirconia framework with a porcelain facing for replacing a single anterior tooth. Prior in-vitro testing of the porcelain fused to zirconia wing bridge was previously performed. This research demonstrated that this type of bridge had the potential to be a long-lasting, durable, conservative and esthetic treatment option. Our purpose was to perform a clinical trial to further determine the strengths, limitations, indications and contraindications of this type of bridge and technique.

Methods
Patients participating in this study were drawn from the patient pool at Roseman University of Health Sciences College of Dental Medicine. Patients participating in this study were required to have a missing central or lateral incisors with intact proximal abutment teeth. Preparation and bonding of bridges was completed under faculty supervision by students at Roseman's CODM. Bridges were fabricated with a zirconia framework and a fused porcelain veneered pontic. Subsequent bonding of fixed appliances was accomplished utilizing micro hybrid composite. Follow-up surveys were completed at recall appointments or via phone interviews for patients unable to return to the university in person.

Results
So far, there have been eight patients (four males, three females) that have had nine bridges which have been fabricated and bonded. Results showed that for the most part the bridges have good durability, reasonable esthetics and good retention. Complications have included wing fracture prior to bonding, (a result of the lab not using monolithic zirconia) porcelain chipping, and one bridge de-bonding, which was attributed to moisture contamination upon bonding.

Conclusions
This study demonstrates that when porcelain fused to zirconia wing bridges are indicated and are fabricated and bonded according to specifications, they can be a predictable and favorable option. Further research needs to be conducted to determine the longevity and ultimate strength of these bridges.

#56: **Serdexmethylphenidate/d-methylphenidate - A Potentially Promising Treatment Option for Childhood Attention Deficit Hyperactivity Disorder (ADHD)**

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Purpose
To review the phase 2 and phase 3 clinical trials of Serdexmethylphenidate and d-Methylphenidate (SDX/d-MPH) in the treatment of Attention Deficit/Hyperactivity disorder (ADHD) in children.

Methods
Search terms "serdexmethylphenidate," "d-methylphenidate", and "attention deficit/hyperactivity disorder" in PubMed were used, with a focus on clinical trials that further identified a Phase 2 and a Phase 3 clinical trial.

Results
Psychostimulants, such as methylphenidate/amphetamine salts, have long been established as efficacious and safe for controlling the symptoms of childhood ADHD, but are classified as controlled substance class II (CII). Serdexmethylphenidate (SDX) is a novel prodrug of d-methylphenidate (d-MPH), and they are co-formulated with a long-acting release for once daily dosing. SDX and d-MPH have different pharmacokinetic (PK) parameters; a PK, multi-dose study using a crossover design with healthy volunteers and equivalent doses of 20, 30, and 40 mg of d-MPH demonstrated linear kinetics behavior. d-MPH reached steady state before the third dose, and SDX after the first dose. In the Phase 3 NCT03292952 trial, children from ages 6-12 (n=149) with ADHD were initially treated with 39.2 mg/7.8 mg/day (30 mg daily equivalent) of SDX/d-MPH, followed by weekly titration to an optimal dose (limiting at the maximum dose of 52.3/10.4mg (40 mg equivalent) or matching placebo. The efficacy was measured in the laboratory classroom 7 days later utilizing the SKAMP and PERMP rating scales. The SDX/d-MPH group showed significant improvement over placebo, with onset at 0.5 hours and the duration of effects lasting approximately 13 hours. No serious adverse drug reactions (ADR) were reported, and ADRs were reported in 2/3 subjects, most notably insomnia and decreased appetite. No published head-to-head comparison to other psychostimulants or study in adults is available at this time.

Conclusions
SDX/d-MPH exhibited linear PK behaviors, allowing for accurate prediction and dosing considerations. Children ages 6-12 who received SDX/d-MPH at appropriate doses in a phase 3 clinical trial demonstrated significant improvement in ADHD symptoms compared with placebo, along with minimal or similar ADRs to those with other stimulant treatments. SDX/d-MPH could be a viable addition to the current ADHD management in children.

#57: **Assessment of Nutrition Care Needs in the Management of Pediatric Patients with Rare Disease**

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Purpose
Over 1,200 diseases are listed in the National Organization for Rare Disorders database. According to the Government Accountability Office, about 30 million people in the U.S. - half of them children - have rare diseases. Many of these diseases affecting pediatric patients can be attributed to inborn errors of metabolism. The biomechanical pathways underlying these errors are complex, but typically involve genetic aberrations causing deficiency of key enzymes responsible for maintaining metabolic homeostasis. Consequently, patients diagnosed with such syndromes can have increased and/or unique nutritional needs, reduced quality of life, and poor prognoses. Our research seeks to formulate best practices for patients with rare diseases. Starting with a literature review and a survey of clinical nutritionists, we aim to collect information about significant challenges of clinical practice. Case studies demonstrate complications and barriers in obtaining nutritional requirements for patients with rare diseases, possibly due to the limited availability of existing research for practitioners to reference. Additional challenges include the daily limitations of a caregiver to a rare disease patient. Because of the many variables involved in treating these patients, definitive guidelines do not exist thus far.

Methods
In this study, we first conducted a literature review using PubMed to find peer-reviewed publications pertaining to the nutrition care needs of pediatric patients with rare diseases. More specifically, we performed searches using terms such as "nutrition" + "rare disease" + "pediatric patients." We then analyzed the literature to discover what the current practices are and to identify the gaps that still exist in this realm. Using this information, we created an online survey ("needs assessment") consisting of informed consent and 22 questions, which we plan to disseminate to a variety of healthcare professionals and clinical nutritionists.

Results
This study is still in progress. Our efforts to collect these data will ultimately aid the patients, parents, and clinicians in the rare disease community. Additional research can be targeted to support the development of clinical care guidelines to improve the quality of life for this patient clientele.

Conclusions
We have yet to gather conclusions as this research is still in progress. Currently, our survey has been created and we plan to disseminate it to our target population in the near future.

#58: **Vital Pulp Therapy: "What's New When Visiting An Old Friend"?**

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Purpose

"Vital Pulp Therapy (VPT)" techniques are a means of preserving the vitality and function of the dental pulp after injury resulting from trauma, caries, or restorative procedures." The American Association of Endodontists indicates that traditionally, VPT procedures have only included indirect or direct pulp capping, and partial or complete pulpotomy and that the focus of VPT procedures for many years was solely on the preservation of the radicular pulp in immature adult teeth to assist in the completion of root formation (apexogenesis). The AAE now states that VPT is acceptable for permanent teeth with mature roots. This is a paradigm shift in the field of endodontics.The purpose of the poster is to discuss the scientific rationale for the treatment and management of an exposure of a vital pulp / inflamed pulp in permanent teeth with mature roots.

Methods

DIAGNOSIS: Determining an initial accurate pulpal diagnosis as well as an initial accurate apical diagnosis is of paramount importance. Pulpal diagnoses may include reversible pulpitis, symptomatic irreversible pulpitis, or asymptomatic irreversible pulpitis. The apical diagnosis, however, must be normal apical tissue.CLINICAL PROCREDURE: Upon deep decay removal - Treatment and management of an inflamed pulp will be discussed if pin-point pulpal exposure, and bleeding stops (or does not stop) versus if larger pulp exposure, after decay removal, bleeding should stop on its own accord (or if it does not).ADVANCES IN DENTAL BIOMATERIALS: Importance of the use of bioceramic materials are discussed.

Results

A flow chart describing the interrelationship between the pulpal diagnosis and apical diagnosis for VPT will be depicted.A step-by-step technique for various methods of performing VPT will be outlined.The scientific rationale behind the treatment and management of an inflamed pulp will be discussed. Photographs of clinical case completed at Roseman CODM will be displayed.

Conclusions

Vital Pulp Therapy is a clinically acceptable technique in treating and managing inflamed pulps in permanent teeth with mature roots. The clinical success rate at five years is 95%.

#59: **Proposed Obstetric Ultrasound Training Model for Medical Students using CAEVimedix Catherine Female Manikin**

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Purpose
This study aims to (1) assess the effectiveness of the CAEVimedix Catherine Female Manikin as an educational resource in training medical students to perform obstetric ultrasounds within the first and second-trimester pregnancy and (2) develop a proposed obstetric ultrasound training model for medical students.

Methods
Medical students at the Noorda College of Osteopathic Medicine will participate in hands-on ultrasound training under the supervision of a trained OB/GYN physician using the CAEVimedix Catherine Female Manikin. The training will be targeted on learning the ultrasound techniques for gestational weeks 8, 12, and 24. The number of training hours, identification of key structures pertinent to each week, and length of time to identify each key structure per student will be collected. Statistical analysis will be performed to observe trends amongst the trained medical students regarding identification and speed of finding specific milestones in each week. Each student's progress and proficiency will be tracked week-to-week to determine the optimal duration of training on the CAEVimedix Catherine Female Manikin for effectiveness in performing first-and second-trimester OB/GYN ultrasounds. The study will be separated into three phases. Phase 1: Simulated ultrasound training using CAEVimedix Catherine Female Manikin for first-trimester ultrasoundsPhase 2: Simulated ultrasound training using CAEVimedix Catherine Female Manikin for second-trimester ultrasoundsPhase 3: Performing ultrasounds on actual patients

Results
We hypothesize that this proposed model using the CAEVimedix Catherine Female Manikin will be an effective ultrasound training module for medical students.

Conclusions
Simulation training provides a safe learning environment for medical students to familiarize themselves with ultrasound equipment, establish motor and cognitive skills to perform ultrasound, and identify crucial aspects of obstetric ultrasounds based on gestational age.

#60: **Oral Sulopenem and Tebipenem for Complicated Urinary Tract Infection and Pyelonephritis in patients with Extended-Spectrum Beta-Lactamase (ESBL)-producing Gram Negative, Susceptible Bacteria**

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Purpose
To review the phase 3 clinical trials of intravenous-oral sulopenem and oral tebipenem in the treatment of complicated urinary tract infection (cUTI) and pyelonephritis with or without extended spectrum beta-lactamase (ESBL)-producing susceptible bacteria.

Methods
Using the search terms "sulopenem" or "tebipenem" and "urinary tract infection" in PubMed, studies were identified. Further selection of primary literature (e.g. clinical trials) focused the analysis using Phase 3 trials.

Results
One phase 3 trial for sulopenem and one for tebipenem for complicated UTI were identified. In the NCT03357614 trial, sulopenem 1000 mg daily was given intravenously, followed by oral sulopenem etzadroxil 500 mg with probenecid 500 mg every 12 hours to patients with cUTI, 25% of whom had ESBL-producing isolates. The overall response, defined as a composite of clinical and microbiologic outcomes, were compared against IV ertapenem 1000 mg daily, followed by ertapenem continuation, oral ciprofloxacin 500 mg or Amoxicillin-clavulanate (AC) 875-125 mg twice daily. AC was reserved for fluoroquinolone-nonsusceptible strains. The NCT03788967 trial was conducted testing oral tebipenem pivoxil hydrobromide at a dose of 600 mg every 8 hours against IV ertapenem 1000 mg daily, using a similar clinical-microbiologic composite endpoint. Both studies were conducted mostly outside of the U.S., most being Caucasians with similar distribution of genders. Approximately 2/3 (67.8%) of the subjects in the sulopenem group, and 73.9% of IV ertapenem group achieved the composite endpoint, whereas in the latter trial, only 58.8% and 61.6% did so in the tebipenem and the ertapenem groups, respectively. Success in clinical outcomes and microbiologic outcomes were similar, but microbiologic endpoints were consistently inferior to the clinical endpoints. Sulopenem demonstrated marginally better outcomes (7.2%) than ertapenem in ciprofloxacin nonsusceptible isolates. Adverse drug reactions were reported at approximate 15% for sulopenem and 25% for tebipenem, most notably diarrhea and headache.

Conclusions
Sulopenem and tebipenem are both oral carbapenems that have been tested in clinical trials for cUTI and pyelonephritis. Both demonstrated some success in safety and tolerability for recipients, but their clinical roles and utility in the U.S. remain to be determined upon their regulatory approval and commercial availability.

#61: **Lipomatosis of Nerve**

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Purpose
This case study describes lipomatosis of the nerve in a rare location in order to increase the probability of correct diagnosis and intervention of this condition in the future. Lipomatosis of nerve is a benign lesion with increased fibrofatty tissue infiltrating and surrounding the nerves, usually occurring as a slowly progressing swelling/mass, which can clinically mimic a tumor or malignancy. Here we report a 59-year-old man who presented with pain in his right foot and a mass that had been mostly stable for years but seemed to have grown slightly lately, clinically suspicious for ganglion cyst. The MRI revealed a fatty mass concerning for lipoma or atypical lipomatous tumor. Therefore, patient underwent excisional biopsy. The H&E sections showed mature adipose and fibrous tissue infiltrating the nerve, consistent with lipomatosis of nerve. Lipomatosis of nerve, though most common in upper extremities, can occur in a variety of locations, and providers should be aware of potentially rare presentations like this one, to prevent unnecessary surgery and prevent potential nerve damage.

Methods
MRI was used for imaging this growth, and H&E staining was used after complete excision of the mass. Although complete excision of lipomatoses is normally not recommended, because this mass was not correctly identified initially, complete excision occurred. This highlights the need for consideration of this diagnosis, even when it presents in novel locations.

Results
NA

Conclusions
Because of the unusual location of the lipomatosis in this patient, lipomatosis of the nerve was not the most obvious diagnosis for this patient. However, in light of evidence suggesting that the anatomical reach of these masses might be greater than previously thought, lipomatosis of the nerve should be considered as a potential diagnosis when signs present in unusual anatomical locations. More research needs to be done to determine if some lipomatosis diagnoses are missed when masses are found in other areas of the body, to determine if these growths may have a distinct symptom profile when they occur in uncommon areas, and to determine if fatty masses in other areas of the body are misdiagnosed as other types of growths.

#62: **Myolipoma of the Eye associate with Giant Fornix Syndrome**

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Purpose
: Myolipoma is described as a benign soft tissue neoplasm, a rare variant of lipoma marked by the proliferation of mature fat and mature smooth-muscle tissue. Myolipoma cases most commonly present in women during the fifth and sixth decades of life. Myolipoma is most often found in the retroperitoneum, abdomen, pelvis, inguinal region, or abdominal wall; therefore a case of orbital myolipoma is exceedingly rare. The rarity of a case is demonstrated by the lack of published medical literature, worldwide, on this topic with only two other similar cases reported. Here we report the third case, a 94-year-old female presenting with giant fornix syndrome and recurrent orbit infections who underwent fornix reconstruction and excisional biopsy of the mass. Because orbital myolipoma is so rare and the specifics of diagnosis still unknown, we hope to synthesize and present relevant data with the hope of brining awareness and interest to the topic.

Methods
Simple light microscopic inspection was used to make the identification of spindle-shaped cells, which is a key indicator of the presence of adipocytes and smooth muscle cells. MRI (magnetic resonance imaging) was used to confirm the protuberance into the orbital area. Through this process the classification made was a myolipoma.

Results
The H&E sections show a fairly well-circumscribed lesion composed of morphologically bland spindle cells, smooth muscle immunoreactivity and adipose tissue, consistent with myolipoma. This case demonstrates the third case of myolipoma of eyelid and the patient ultimately underwent fornix reconstruction and excisional biopsy of the mass.

Conclusions
It is important to note that the exact origin of myolipoma's is still unknown. This case is currently ongoing and conclusions will be drawn when more testing and data is obtained. Unique and rare cases such as this one are complex and can be daunting, yet these are the exact sort of cases that pose difficult questions and push medical knowledge forward in meaningful ways if paid proper attention.

#63: **Intraosseous Hibernoma: Case Study and Review of Current Literature**

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Purpose

The purpose of this case study is to present a case of a rare presentation of hibernoma in the setting of intraosseous hibernoma. Currently there are less than 40 cases of intraosseous hibernomas documented worldwide. The addition of this case to the limited number of cases documented in literature, will provide clinicians with further insight to improve and normalize standards of diagnosis and treatment.

Methods

A thorough literature review of all documented cases of intraosseous hibernoma was done, taking note of the age, sex, location, context of diagnosis, initial imaging differentials, and subsequent treatment. With consent of the patient, treatment facility, and pathology department, data of the case was collected and presented.

Results

Here we describe a case of intraosseous hibernoma which was diagnosed in a 46-year-old woman with history of stage III C melanoma, who presented with high-PET avid sacral masses in her screening tests. Imaging studies were concerning for metastasis thus biopsy was pursued. The bone biopsy revealed morphologically bland eosinophilic and pale, polygonal, multivacuolated, granular, brown fat cells, consistent with hibernoma. The diagnosis subsequently led to conservative treatment.

Conclusions

Even though intraosseous hibernomas are extremely rare compared to their soft tissue counterparts and benign, it is important to not be mistaken with a metastatic neoplasm and prevent unnecessary treatments. As such, imaging with clinical correlation alone should not be the sole diagnostic criteria. Based off imaging presentation alone and our current protocols, differential diagnoses to this date have not included hibernomas. Therefore, definitive diagnosis should include histological analysis by bone biopsy. Furthermore, surgical pathologists must treat specimens with scrutiny, as it may still present with similarities to liposarcomas, requiring a largely different and often more invasive treatment modality. With more cases, including the one presented, future direction of studies can include meta-analysis into correlations into risk factors, root causes, treatment outcomes, and diagnostic patterns.

#64: **Presentation of Paired P- and Q-Arm Deletions on Chromosome 18 Associated with Neuropsychiatric Symptoms**

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Purpose
In this report we present a case of an 18-year-old male with a history of ADHD, anxiety, and autism, as well as unresponsive episodes wherein the patient experiences a breath-holding muscle spasm that have been unresponsive to anticonvulsants. He displays muscle weakness, hypotonia, joint hyperlaxity. Although he does not struggle intellectually, the patient displays both social and physical deficits. The patient has historically received assistance from occupational therapy as well from speech and language pathology services provided by his school. Here we report genetic findings that correlate with the symptoms.

Methods
A buccal swab was collected and used for chromosomal genetic hybridization (CGH) array analysis. Bioinformatic analysis was carried out using the Genome Data Viewer (ncbi.nlm.nih.gov/genome/gdv).

Results
CGH revealed a deletion of the distal end of both the p-arm and the q-arm of chromosome 18. Interestingly, areas in the center of the chromosome appeared normal on both p- and q-arms. The density of reads suggested the deletion to be mosaic, indicating that not all the cells contain a deletion. This technology does not allow for determination of whether the two deletions occur in the same cells. These regions contain at least 197 annotated genes. Genes of interest in these regions include GNAL, which is associated with dystonia of teenage onset and AFG3L2, associated with progressive ataxic-like movements and loss of voluntary movement.

Conclusions
Here we present a patient with a distinct set of neuropsychological phenotypes not like other well-characterized disorders. Chromosomal microarray testing revealed a mosaic loss of portions of both the p- and q-arms of chromosome 18 in buccal skin cells. Further directions include karyotyping, investigating the mosaicism in peripheral blood mononuclear cells and fluorescent in situ hybridization (FISH) to determine if the mosaic deletions are present in cells outside of skin cells and if both deletions are present in the same cells. Investigation of the deleted genes may also help determine the cause of the presented symptoms and guide treatment options.

#65: **Therapeutic use of amyloid-beta and inflammasome-inhibitors to prevent the development of neuropathology in Alzheimer's disease**

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Purpose

Alzheimer's disease (AD) is a neurodegenerative condition and a growing global threat to healthcare in the aging population. In the USA alone, it is estimated that one in nine persons over the age of 65 years is living with AD. The pathology is marked by the deposition of extracellular amyloid-beta (Aβ) plaques composed of Aβ1-40 and Aβ1-42 and intracellular neurofibrillary tangles (NFT) in the brain, which is further enhanced by the neuroinflammatory process. The inflammasome is a multiprotein complex that mediates the activation of caspase-1, which promotes the secretion of the proinflammatory cytokines interleukin 1β (IL-1β) and IL-18, as well as apoptosis of the affected cells. Our recent study suggests that NLRP3-mediated neuroinflammation plays a major role in the neuronal cell death and development of AD pathology. Based on these observations, we hypothesize that the NLRP3-inflammasome pathway plays a major role in the development of AD pathology and the use of NLRP3 and Caspase-1 inhibitors will have a translational significance in the treatment of AD.

Methods

In this study, we have utilized Withaferin A (an active moiety of the plant Withania somnifera) to inhibit the amyloid beta excessive secretion from amyloid overexpressing neuronal cells. Further, we studied the molecular mechanism of interaction of WA with Aβ protein by in-silico molecular dynamics simulations. In addition, we have used a small molecule drug INF 4E to inhibit the NLRP3-mediated neuroinflammation in these amyloid-overexpressing neuronal cells.

Results

We have observed that Withania somnifera can significantly inhibit amyloid overexpression. We have also demonstrated that WA binds to the middle region of the Aβ-protein and the amino acid motif involved was FAEDVGS highlighting the mid-region Aβ capture by WA. Three Hydrogen bonds were formed between WA and the amino acids, ASN17, GLY15, and SER16. Further, we have observed that INF 4E inhibits the NLRP3-mediated neuroinflammation in these amyloid-overexpressing neuronal cells.

Conclusions

Our study indicates that WA is a potent neuroprotectant against amyloid-induced neurotoxicity while INF 4E serves as an inflammasome inhibitor in preventing the development of neuropathology in Alzheimer's disease patients.

#66: **Clinical effects of Lactobacillus reuteri probiotic in the treatment of chronicperiodontitis: A systematic review of randomized controlled trialsRunning title: Lactobacillus reuteri effects in the treatment of chronic periodontitis.**

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Purpose
Objective: This systematic review examines the effectiveness of Lactobacillus reuteri as an adjunct to scaling and root planning in the treatment of chronic periodontitis.

Methods
Scopus, Embase, Medline, and Web of Science databases were searched according to specific inclusion and exclusion criteria in October 2022. Data extraction and quality assessment were performed independently by two authors, with a third author consulted when needed. Randomized control trials that evaluated the effects of the probiotic Lactobacillus reuteri in patients with periodontitis were included. The primary outcome was the pocket depth and clinical attachment levels while the secondary outcome considered was bleeding on probing and microbial levels. Articles in languages other than English were excluded. Study quality was assessed based on the Cochrane Handbook for Systematic Reviews of Interventions Handbook guidelines and the ROB2 tool.

Results
A total of eleven studies that examined 369 subjects were included in the review. Adults in the age group of 18-70 years of age suffering from chronic periodontitis were evaluated. The studies lacked a consensus on the effect of lactobacillus reuteri on periodontitis. Eight out of the eleven studies reported statistically significant improvement in the intergroup pocket depths whereas seven studies showed a statistically significant reduction in the clinical attachment levels in the probiotic group as compared to the controls. Three studies showed no significant improvement in the pocket depth levels in the probiotic group as compared to the controls. Four studies showed no significant reduction in the clinical attachment levels between the two groups. The overall risk of bias was high in four studies while seven studies reported some concerns with the risk of bias.

Conclusions
Based on the limited evidence available, the adjunctive use of Lactobacillus reuteri to scaling and root planning may provide some additional benefit in terms of improvement of periodontal parameters. Further well-designed trials adhering to reporting guidelines and using objective measures are necessary before outlining universal guidelines for best practice.

#67: **Primary Osteosarcoma of the Breast: A Case Report**

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Purpose

We introduce a case report of a 54-year-old woman who presented with a left breast mass found to have a primary breast osteosarcoma. Due to the limited number of reported cases of primary osteosarcomas of the breast, there is no standardized treatment for these patients.Sarcomas of the breast make up less than 1% of total breast cancers and the incidence of primary osteosarcomas of the breast remains even more rare. Indeed, cases reported are often initially diagnosed as carcinoma of the breast and then treated as such. Our purpose in reporting this case is to bring to light the specific diagnosis of primary osteosarcoma of the breast and the need for additional research and awareness, perhaps especially for involved clinicians and pathologists.

Methods

Mammography and subsequent MRI of the patient's left breast showed a heterogeneously dense mass with irregular margins. The ultrasound guided needle core biopsy from the mass showed atypical spindle cells admixed with multinucleated osteoclast-like giant cells and hemosiderin pigments without any bone formation on the biopsy material. Patient underwent left breast partial mastectomy with axillary sentinel lymphadenectomy and seed localization with unilateral plastic closure, and right breast reduction mammoplasty for symmetry. The histologic examination of the entire excised mass revealed foci of malignant bone production without any evidence of epithelial differentiation or carcinoma.

Results

Diagnosis of extraskeletal breast osteosarcoma. The patient underwent adjuvant chemotherapy with Doxorubicin and Cisplatin. The patient did not show any sign of recurrence of metastatic disease after 3 years of surveillance.

Conclusions

As this case of osteosarcoma of the breast is a very rare occurrence, it is crucial to clearly distinguish an accurate diagnosis as to avoid unnecessary and ineffective treatments in future patients. Further research is needed to elucidate the pathophysiology of primary breast osteosarcoma.

#68: **Prevention of Doxorubicin-induced Cardiotoxicity by Benfotiamine**

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Purpose
Anthracyclines such as daunorubicin and doxorubicin (DOX) are currently used as chemotherapeutic agents in the prevention of various cancers including breast cancer, lung cancer, leukemia, and lymphoma. Although, anthracyclines are successful in controlling various cancers growth, the major drawback is the unwanted cardiotoxicity. Specifically, high doses of DOX used for the therapy of advanced cancers could cause life threating conditions. Therefore, specific interventions are required to decrease the cardiac toxicity associated with the DOX. Benfotiamine, a lipid soluble vitamin B1 derivative has shown be a potent anti-oxidant and anti-inflammatory agent. However, the efficacy of benfotiamine in the prevention of cardiotoxicity associated with the anthracyclines is not known.

Methods
. In this study, we examined the effect of benfotiamine in the prevention of DOX-induced cytotoxicity in the human umbilical vascular endothelial cells (HUVECs). This has been done by use of cell-culture practices including: MTT cell viability, caspase 3 assay, human apoptosis assay, annexin 5 staining, live/dead cell fluorescence studies, and mitochondrial ROS assay.

Results
Treatment of HUVECs with DOX caused significant endothelial cells death and benfotiamine in a concentration-dependent manner prevented the dox-induced endothelial cell death. Further, benfotiamine prevents the DOX-induced apoptosis in endothelial cells by preventing the activation of caspase-3. Benfotiamine also prevents DOX-induced reactive oxygen species generation. Our results also indicate that benfotiamine regulates DOX-induced expression of pro-apoptotic mediators such as BAD, phosphor-P53, and pro-caspase-3, and anti-apoptotic mediators such as BCL-2, BCL-x, IAPs, and HSP and others such as FADD, DR5, and SMAC/diablo.

Conclusions
We plan to further explore how benfotiamine prevents DOX-induced cardiotoxicity using human cardiac myocytes and mouse models. Thus, based on our cell culture studies, benfotiamine through its potent anti-oxidative property could prevent endothelial cytotoxicity and suggests that it could be further developed as adjuvant therapy in controlling cardiotoxicity associated with the anthracycline chemotherapy.

#69: **Pharmacy law: pharmacists awareness of licensure regulations, the MPJE and NABP - a state-wide study**

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Purpose

The objective of this study was to examine awareness of Utah licensed pharmacists regarding licensure requirements.

Methods

The survey of 15 questions was created and sent via online Qualtrics to 4154 pharmacists who held an active license in the state of Utah on 8/22/2022 after exempt approval status by the Roseman University IRB committee. Of the 15 questions, five questions specifically targeted aspects of pharmacy law with predetermined responses of "Yes," "No," or "Unsure:" 1) Are you aware that other healthcare professions (nurses and physicians) have licensure compacts for their professions? 2) Are you aware that the National Association of Boards of Pharmacy has a verification program for pharmacists licensed in multiple states known as NABP-Verify? 3) Are you aware of the National Association of Boards of Pharmacy Electronic Transfer Program (e-LTP)? 4) Are you in favor of requiring the MPJE or other law exam for pharmacist licensure? 5) Do current restrictions on licensure portability for pharmacists impact your ability to practice in multiple states? An additional question allowed for free text box responses: "What are your perceptions of states having variations in intern hours, renewal periods, and continuing education requirements for pharmacist licensure?" 974 responses were collected with a completion rate of 94% when the survey closed 9/22/2022. Data was analyzed using descriptive statistics.

Results

The survey response rate was 23% and the completion rate was 94% as 972 pharmacists of 4154 completed the survey. In response to "Are you aware that other healthcare professions (nurses and physicians) have licensure compacts for their professions?" results indicated lack of consensus as 383 (40.83%) of respondents answered "Yes", 381 (40.62%) answered "No", and 174 (18.55%) answered "Unsure." In response to "Are you aware that the National Association of Boards of Pharmacy has a verification program for pharmacists licensed in multiple states known as NABP-Verify?" the majority of respondents answered "Yes" (55.80%), followed by "No" (38.02%), and "Unsure" (6.18%). To "Are you aware of the National Association of Boards of Pharmacy Electronic Transfer Program (e-LTP)?", 332 (35.43%) pharmacists responded "Yes", 526 (56.14%) responded "No", and 79 (8.43%) "Unsure." The majority of respondents (56.72%) indicated favor of requiring the MPJE law exam. Feedback was mixed with 44.21% indicating "Yes" restrictions on licensure portability for pharmacists impacted their ability to practice in multiple states, 42.36% said "No" and 13.43% "Unsure." A total of 36.73% of respondents, provided 357 qualitative concerns about pharmacist licensure.

Conclusions

Strengths of the study include provision of baseline quantitative and qualitative data on a topic that is missing in existing literature. Results illustrated high completion rates, a diversity of demographics including balanced age ranges, years in practice, and a large number of text responses. Limitations of the study were that participants were restricted to pharmacists licensed in the state of Utah and data was collected for one month. Expansion of this study to pharmacists nationwide would provide greater insight on the attitudes and awareness of pharmacist licensure and the MPJE.

#70: **Dental Student Perceptions of the Benefits, Necessity and Ethics of Student-to-Student Injections**

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Purpose
For decades, dental students have practiced injecting each other with local anesthesia aspart of their preclinical training. This study examines student perceptions regarding the benefits,necessity and ethics of students performing student-to-student (STS) injections.

Methods
Surveys were sent to the D1 and D2 students immediately following the D1 class participatingin STS injections. The D2 class did not participate in STS injections as part of their preclinical localanesthesia training. Survey questions asked students level of agreement regarding performing andreceiving STS injections as well as the benefits, necessity, and ethics of STS injections.

Results
There were 62 out of 100 D1 students and 42 out of 100 D2 students for a sample size of n =104. There were no significant correlations between gender and student perceptions. There were nosignificant correlations between age and student perceptions except in the question regarding thebenefits of performing STS injections. The class of 2025 showed significantly higher levels of agreementfrom the class of 2024 in questions regarding the benefits and ethics of performing and receiving STSinjections and the necessity of performing STS injections, but there was no significant differenceregarding the necessity of receiving STS injections.

Conclusions
Students perceptions regarding the benefits, necessity and ethics are varied. Students whoparticipated in STS injections rated the benefits, necessity, and ethics of STS injections higher thanstudents who did not participate in them.

#71: **Exercise & Depression Amongst Osteopathic Medical Students**

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Purpose
Our school integrates wellness in the curriculum. The rigorous preclinical curriculum, examinations, and strive for performing well can be stressful for students. A 2016 systematic review estimated that 27% of allopathic medical students had depressive symptoms and 11% had suicidal ideation (Dyrbye LN. Acad Med. 2006). These studies did not include osteopathic medical students. The osteopathic principles advocate a balance "between the body and mind." There is not much in the literature regarding how exercise and osteopathic tenets play a role in students' mental health. We hypothesize that osteopathic students may have a better mental health profile compared to allopathic students and want to determine: 1) The prevalence of depression amongst osteopathic medical students, 2) The correlation of exercise with the degree of depression, and 3) Whether the application of the osteopathic principles and tenets play a role in their mental health and correlate with their level of physical activity.

Methods
Voluntary and anonymous paper surveys are distributed to the 1st and 2nd year students. The survey is comprised of: the Beck Depression Inventory (BDI-ii). Morgenstern Exercise Survey (MES), osteopathic tenets questions, and demographics. The BDI-ii is shown to correlate with clinicians' ratings of depression (Beck A, et al. Clin Psychol Rev. 1988). The prevalence of no (score 1-10), light (score 11-20), moderate (score 21-30), and severe (score >31) levels of depression are obtained. Participants are provided a list of wellness resources, where they are encouraged to seek advice. The MES is a physical activity survey that captures types and levels of exercise which are applied to medical students' lifestyles. The osteopathic tenet-related questions: 1) "Do you feel that your values towards mental health and exercise align with an osteopathic mindset?" and 2) "Do you feel that your values towards mental health and exercise played a factor in applying to osteopathic medical school?"

Results
Preliminary results: Response rate: 26% (58/225). Levels of depression: None-65% (21Male;16Female), Light-31% (10Male; 8Female), Moderate-2% (1Male), Severe-2% (1Male). Exercise hours: Up to 5hrs/week: Light 76%, Moderate 71%, and Vigorous 74%. 6-19hrs/week: Light 17%, Moderate 22%, and Vigorous 19%. Osteopathic alignment: 86% strongly agree/agree that their values align with an osteopathic mindset and 60% strongly agree/agree that their mental health and exercise were a factor in osteopathic medical school application.

Conclusions

The research is ongoing and awaiting further statistical analysis. The issue with students and levels of depression (majority have light level) needs to be addressed. Students spend up to 5hr/week with combinations of light, moderate, and vigorous exercise. Our campus environment and the alignment of osteopathic tenets may contribute to decreased prevalence of depression amongst our students.

#72: **Exercise and Depression Amongst Osteopathic Medical Students**

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Purpose
It is well known that the academically rigorous environment of medical school can be a cause of stress for students. However, not much literature exists regarding the role of exercise and osteopathic tenets on medical students' mental health. The purpose of this study is to evaluate the prevalence of depression among osteopathic medical students, the correlation between exercise and degree of depression, and whether the application of osteopathic tenets correlates with the level of exercise and overall mental health.

Methods
Paper surveys were distributed to first and second-year students at Noorda-COM. The survey consisted of the Beck Depression Inventory (BDI-ii), Morgenstern Exercise Survey (MES), and questions regarding osteopathic tenets and demographic information. The respondents BDI-ii scores of normal (0-10), mild (11-16), borderline (17-20), moderate (21-30), severe (21-30), and extreme (31-40) levels of depression were recorded. The MES measured the frequency and intensity of respondents' physical activity. The questions regarding osteopathic tenets were: 1.) "Do you feel that your values toward mental health and exercise align with an osteopathic mindset?" and 2.) Do you feel that your values towards mental health and exercise played a factor in applying to osteopathic medical school?" A list of wellness resources was provided at the end of the survey.

Results
The total response rate was 38.7% (87/225). Levels of depression were as follows: minimal-66.7%, mild-25.3%, borderline-3.45%, moderate-3.45%, severe-0% and extreme-1.15%. Hours and intensity of exercise were as follows: up to 5 hrs/week -78.2% light, 87.4% moderate,73.6% vigorous. 6-19 hrs/week - 16.1% light, 5.75% moderate, and 20.7% vigorous. Osteopathic alignment was as follows: 87.4% agree/strongly agree that their values align with an osteopathic mindset. 65.5% agree/ strongly agree that their mental health and exercise were a factor in applying to osteopathic medical school.

Conclusions
The research is still ongoing and final conclusions have yet to be reached.

#73: **Examining Current Resources Available for Stroke Caregivers**
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Purpose
There are more than 140,000 deaths due to strokes in the U.S. each year "Stroke Facts". In 2017 to 2018, the direct and indirect cost of strokes in the U.S. was $52.8 billion with Home Health Care accounting for 7.4 billion of the total cost (Tsao, 2022). In Utah, stroke was the sixth leading cause of death in 2020, with 916 deaths due to strokes "Health Indicator Report of Stroke Deaths". Worldwide, 25% to 74% of stroke survivors require some assistance or are fully dependent on caregivers for activities of daily living (Miller, 2010). The unexpected onset of a stroke can often leave caregivers with a myriad of unmet needs. A majority of these needs center around lack of education, training, and support in taking care of a stroke patient (Cobley, 2013). In a qualitative study caregivers reported the most frequent unmet needs were delays in home rehabilitation and lack of communication from hospital clinicians (Ski & O'Connell, 2007). The purpose of this study is to explore current discharge instructions given in the state of Utah and caregiver satisfaction with the discharge instructions.

Methods
A web search was used to find the electronic stroke discharge instructions given to caregivers at Intermountain Healthcare, MountainStar Healthcare, Steward, and University of Utah Healthcare. In the future, I plan to meet in person with medical personnel from these Healthcare systems to find what physical discharge instructions are given to caregivers. Additionally, I plan to use survey research methods with a variety of questionnaires and interviews with caregivers to assess the level of satisfaction with discharge instructions.

Results
During the web search, no educational materials were found that targeted stroke caregivers. The educational material available targeted recognizing a stroke, and targeting major risk factors of strokes. This was a preliminary finding of online materials that will be added to with physical visits to healthcare systems to compare electronic educational materials with physical educational materials.

Conclusions
The preliminary finding of no educational materials available for stroke caregivers raises more questions as to what materials are available for stroke caregivers. Future studies will examine physical educational materials, surveys to gauge satisfaction with educational materials, and interviews to assess what can be added to ensure caregivers have the resources they need.

#74: **Obesity and Oral Health Status in Schoolchildren**

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Purpose
Obesity and oral diseases among children are growing worldwide public health problems due to their adverse impact on the growth and development of children. The objective of this study was to determine the correlation between obesity and oral health in schoolchildren.

Methods
Data from the National Health and Nutrition Examination Survey 2017-2018 was used for this study. Based on WHO criteria, the body mass index (BMI) was classified into underweight, normal weight, overweight, and obesity groups. The oral health outcomes were also dichotomized as being either satisfactory or unsatisfactory. First, descriptive statistics for thesample were calculated. Next, we used the Chi-square test to compare proportions of groups. All analyses were performed with SPSS v28 and statistical significance was set at $p < 0.05$.

Results
The total sample was 28,872,606 children of age group 6 to 12 years with an average age of 9.07 years (SD=1.96). There was approximately equal distribution of males and females. Respondents were primarily non-Hispanic white (49%) and came from low-middle income families (49.2%). The prevalence of underweight, normal, overweight, and obesity for all was 56%, 33.4%, 7.7%, and 3%, respectively. More boys were skinny (58.9% vs. 52.9%) and overweight (8.2% vs. 7.1%) than girls. In comparison, obesity was slightly higher in girls than boys (3.6% vs. 2.3%). The overall prevalence of unsatisfactory oral health was 11.6%, with a lower prevalence among girls than boys (8.7% vs. 14.3%, $P < 0.05$). Unsatisfactory oral health of children belonged to underweight, normal, overweight, and obesity was 9.9%, 14.7%, 13.9%, and 8.8%, respectively. With increasing BMI levels, the prevalence of unsatisfactory oral health decreased ($P<0.05$).

Conclusions
Obesity is negatively correlated with poor oral health among schoolchildren. It is necessary to further investigate how diet and oral hygiene habits influence the association between BMI and oral health.

#75: **Association of Asthma with Oral Health in Different Age Groups**

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Purpose

A growing public health problem, asthma affects over 300 million people worldwide. The association of asthma with oral conditions has been the subject of debate among dental practitioners. This study examines how asthma affects oral health among different age groups in the U.S.

Methods

Data from the National Health and Nutrition Examination Survey 2017-2018 was used for this current research study. Study participants were classified into ever and never asthmatics based on their asthma-status. The oral health outcomes were dichotomized as being either satisfactory or unsatisfactory. Weighted prevalence estimates for the participants' demographic characteristics, the asthma, and the oral health outcome were calculated. Next, chi-square tests and logistic regressions were performed to examine the association of asthma with oral health. The results for the regression models were reported as odd ratios along with their respective 95% confidence intervals.

Results

According to the study, 69.9 million children aged 1 to 17 years (mean=9.13 years), 198.7 million adults aged 18-64 years (mean=41 years), and 48.4 million older adults aged 65+ (mean=73 years) participated in the study. In children and adults, males and females were roughly equally distributed, while the most of older adults (55.2%) were female. Respondents in all age ranges were primarily non-Hispanic white. Most of the sample had satisfactory oral health and no history of asthma. Additionally, asthma was associated with an increased risk of unsatisfactory oral health in children and adults ($p<0.05$), but not in older adults.

Conclusions

Asthmatic patients may be at a higher risk of developing dental diseases. This study points to the importance of developing preventive oral health programs for individuals with asthma for both dental and medical personnel.

#76: **Meeting the Needs of Our Communities, the CVS Health Spanish Pathway Program**

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Purpose
There is a disproportionate number of Spanish-speaking pharmacists to meet the needs of the growing Hispanic/Latino population in the United States. The CVS Health Spanish Pathway Program (SPP) aspires to increase the number of qualified pharmacy talent who speak Spanish and are devoted to providing healthcare services to Hispanic/Latino communities.

Methods
Since 2018, RUHS has partnered with CVS Health to introduce Spanish-speaking students to pharmacy careers and recruit and retain these students. Students selected for the SPP are placed at predominately Spanish-speaking CVS Health pharmacies for their introductory pharmacy practice experiences and receive special opportunities to network with local, regional, and national CVS Health leaders. SPP students receive additional quarterly student mentoring and complete a medical Spanish certification course. Movimiento Estudiantil Roseman (MER), a University student organization, provides SPP students service activities to meet the healthcare needs of local Spanish-speaking communities. The SPP offers students opportunities in leadership and self-development with coaching from SPP faculty members.

Results
To date, there have been 27 students enrolled in the SPP across three classes and two campuses. 86% of SPP graduates have been employed at predominately Spanish-speaking CVS Health pharmacies. In addition, the SPP has impacted the University and College of Pharmacy with an increased student MER membership and the enrollment of over 200 students in our medical Spanish elective in the last two years.

Conclusions
RUHS and the CVS Health SPP has successfully met the needs of our communities by graduating Spanish-speaking pharmacists who work in Spanish-speaking community pharmacies.

#77: **Efficacy of Osteoporosis Education in Rural Populations**

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Purpose
The geriatric population has historically been poorly educated on how to navigate the medical system in the United States. The aim of this study is to educate the geriatric population in rural Utah about osteoporosis and resources available for managing the disease.

Methods
Under the supervision of a board-certified Geriatrician, a curriculum for osteoporosis education will be created and presented to geriatric populations in rural Utah during group-based education sessions. The curriculum will include information about osteoporosis and will cover associated risk factors, diagnosis, treatment, and prevention of the disease. An emphasis will be placed on prevention, incorporating weight bearing exercises, common barriers to participating in these exercises, and how to overcome these barriers. To assess the effectiveness of this curriculum and educational session, participants will be asked to complete a quiz that will evaluate their understanding of osteoporosis before and after the education session. Pre-education knowledge will be assessed immediately before delivery of the curriculum. Post-education knowledge will be assessed immediately following the education session, and one month after the education session to evaluate knowledge retention. Pre-education and post-education quiz scores will be compared to determine the efficacy of the osteoporosis curriculum. Statistical significance will be evaluated using a Chi-squared test.

Results
Pending.

Conclusions
Health education is a notable method of improving health outcomes. The objective of this study is to enhance the lives of the geriatric population in rural Utah by expanding their knowledge of osteoporosis.

#78: **Discovering the Barriers to Prenatal Visits in Hopes to Reduce Infant Mortality Rates in Utah**

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Purpose

Infant mortality (IM) rates, defined as the death of a person under the age of 1 years old. According to the Center for Disease Control and Prevention the national IM rate in 2020 was at 5.43 deaths per 1,000 births. According to the Utah department of Health, the 2020 Utah rate of IM was also at 5.4 deaths per 1,000 births2. The national rates for IM have decreased since the 1990's with its largest decline between 1990 and 19991. However, the State of Utah has seen their trends plateauing3. While there are a wide variety of factors that impact IM rates across the nation, the number of prenatal visits seemed to correlate with IM rates4. Our goal is to identify the barriers for women needing these visits and by so doing we will be able to create programs or petition for policy change in order to continue to reduce the IM rate in the State of Utah.

Methods

To assess potential barriers we plan to utilize an online survey in hopes to receive greater than 100 participants responses. This survey will include demographic information such as age, race, number of previous pregnancies, socioeconomic status (SES), urbanization level, and education level. Our survey will also include questions regarding type of insurance, was the pregnancy planned or unplanned, time of pregnancy known to first prenatal visit, total number of prenatal visits, results of pregnancy, scheduling issues, and a section for other comments on barriers they have experienced not listed. We plan to distribute our surveys to local community, religious, and educational entities at first. Then we will take that information and review and revise our survey as necessary and approach a wide variety of medical institutions in a variety of settings about partnering with us to sample their patient populations.

Results

In Progress

Conclusions

While we anticipate there would be different barriers for the rural population in Utah, our initial survey will primarily focus on Salt Lake and Utah counties. We expect over time to further expand into rural areas to develop valuable data and reach valid conclusions.

#79: **Increasing student confidence in higher education material through mentoring programs**

Bryce Gardner;[1] Jake Schvaneveldt;[1] Edward Yeates;[1] Rachel Novak[1]

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Purpose
The purpose for this study is to determine whether peer tutoring increases student confidence in graduate level material and reduces test anxiety.

Methods
All dental students at Roseman University were asked to participate in a general survey about their perception of peer mentoring and the effectiveness in increasing confidence in higher education material and reducing test anxiety. Students being tutored in the peer mentor program will be asked to participate in a pre and post exam survey with questions including confidence in material, test anxiety, and perception of mentor program before and after exams.

Results
Results collected from 36 Roseman dental students in a survey sent schoolwide. 61% of students reported feeling some level of stress pre-examination. 54% of students reported that tutoring would help them to feel less stressed for an exam, while 66% reported that they would feel more prepared for exams with tutoring.

Conclusions
Most graduate students feel some level of stress pre-examination. Based on student perception, there is potential to increase student confidence and decrease student anxiety with the implementation of a peer tutoring program. More research to be conducted to assess the effectiveness of tutoring at a graduate level.

#80: **COVID-19 Impacts on Mental Health Status of Dental Students and Perceptions of SARS-CoV-2 Vaccines**

Nicole Hablitzel;[1] Sharon Su;[1] Amir Mohajeri;[1] Man Hung[1]

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Purpose
The COVID-19 pandemic has disturbed all aspects of life. Dental education was no exception, as many dental schools had to manage lockdowns and restrictions by adjusting both didactic and clinical curriculums. Such changes impacted dental students and the rise in vaccinations could lead to further changes. Thus, this study evaluated the impact of COVID-19 on dental students' mental health and perceptions about the SARS-CoV2 vaccine.

Methods
An anonymous online survey was administered to professional dental students at Roseman University. The survey focused on students' health, experiences, and perceptions related to COVID-19 and consisted of questions ranging from demographics, mental health, and vaccinations. Descriptive statistics were utilized to examine the impacts of COVID-19 on mental health and perceptions about SARS-CoV2 vaccines.

Results
In light of COVID-19, 56.8% of students were concerned about their emotional health, with 82.1% feeling stressed, 60.6% depressed, and 52.1% lonely. Nearly 80% of students found it difficult to find motivation to study. At the time of this study, 81.9% of respondents had received a SARS-CoV2 vaccine. 75.5% believed the vaccine is effective and 55.3% believed that the school should require students and faculty to receive the vaccine.

Conclusions
Our findings indicate that the COVID-19 pandemic has negatively impacted the emotional health of dental students with many experiencing more stress, depression, loneliness, and less motivation, highlighting the need for mental health support by institutions. While most students were vaccinated and believed the vaccine was effective, not as many believed schools should require vaccinations for students, faculty, or staff. Further research could focus on responses by class and reasonings behind sentiments.

#81: **A Systematic Review: Rural Health Disparities During the COVID-19 Pandemic in the United States**

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Purpose
The purpose of the current study was to conduct a systematic review of the literature to evaluate the effect of the COVID-19 pandemic on rural populations both at the individual and community level.

Methods
A PubMed literature review was conducted using the search terms: "COVID-19", "Rural", "Preventative Measures", "Heart Disease", "Diabetes", "Substance Abuse Use", "Access to Healthcare", "Telehealth", "Mental Health" and "Vaccines". An excess of thirty articles were generated; the quality of the studies and the results were analyzed.

Results
Rural health disparities increased both at the population and system-wide levels as a direct result of the pandemic. On the population level, higher rates of COVID-19 susceptibility were seen in African American, Native American and Hispanic communities. While African Americans make up only 13.4% of the nation, they contributed to 18.2% of COVID-19 cases and 20.9% of COVID-19 related deaths. On the system level, budget cuts significantly affected the infrastructure of rural hospitals resulting in them being unequipped to handle such high volumes of COVID-19 cases. Rural hospitals had an average of 1.7 ICU beds per 10,000 people in comparison to 2.8 ICU beds in urban areas. The lack of infectious disease specialists, access to larger medical centers with substantial numbers of ICU beds and ventilators, and an overall lack of preparedness overwhelmed rural communities. Although comorbidities such as diabetes and heart disease were associated with poorer health outcomes for a multitude of reasons, the lack of clinic and physician availability for routine care during the pandemic further exacerbated the clinical link from COVID-19 positivity to comorbidities. Furthermore, mental health deteriorated as substance use increased to a greater extent in rural communities compared to urban, during the pandemic.

Conclusions
This study shows that key indicators such as geographic isolation, health literacy, broadband access, mental health, substance use, socioeconomic status, and chronic disease should be considered for improving healthcare in rural communities. Future studies should seek to identify the underpinnings that disproportionately affected rural communities in comparison to their urban counterparts during the pandemic. Identifying gaps in rural health resources will improve the lives of millions of Americans now and during the next pandemic.

#82: **Utah pharmacists' qualitative feedback regarding licensure standards.**

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Purpose

Historically, licensure standards within pharmacy have been on a state-by-state model. In recent years, there has been an increasing push towards universal licensure for pharmacists. The purpose of this study was to examine the attitudes and perceptions of licensed Utah pharmacists regarding pharmacist licensure.

Methods

A survey of 15 questions was sent via Qualtrics XM online software to 4154 pharmacists licensed in the state of Utah in August 2022. Survey responses were collected for a period of one month. Only completed survey responses were utilized for data analysis. The survey instrument collected demographic information, attitudes and awareness questions, and qualitative feedback using open-ended free-text boxes at the end of the survey. The combined study was submitted to Roseman University Institutional Research Board and was approved with exempt status. The qualitative feedback was gathered in the form of responses to the final two questions: "What concerns do you have or comments would you like to share about pharmacist licensure in the state of Utah?" and "What are your perceptions of states having variations in intern hours, renewal periods, and continuing education requirements for pharmacist licensure?" Qualitative feedback was compiled and themes were identified and recorded via multiple study researchers to ensure reliability and continuity of themes found. All data was analyzed via descriptive statistics. Quantitative survey data was analyzed and reported separately.

Results

Surveys were completed by 972 pharmacists, 23% of all Utah licensed pharmacists. The survey instrument recorded 824 responses for both qualitative feedback questions. Feedback identified for both questions included those respondents with concerns around licensure (60.3%), and those without (39.7%). Respondent's concerns/perceptions included themes of desire for national standards (26%), Continuing Education (CE) (15%), renewal periods (7.6%), MPJE/law (5.3%), and costs (4.9%). Sub-categories within themes differed for each question and some qualitative feedback included multiple themes or sub-categories. One licensee reported: "We manage anticoagulation for patients that have their healthcare providers at a Utah health-system, but live in a rural area of nearby states. We are unsure if we need to get licensed in these other states, and the easiest path to do so," illustrating concerns of rural pharmacists. Desire for increased awareness of licensure requirements, confusion and variations in requirements for pharmacists licensed in multiple states was also noted. Many respondents expressed a desire for more uniform standards: "I wish the state boards of pharmacy could coordinate and require the same CE's across multiple states," or "the differences make it hard to keep CE requirement[s] in multiple states."

Conclusions

Existing literature was void of qualitative data from pharmacists about licensure standards. This project considered qualitative feedback from Utah pharmacists with concerns about pharmacist licensure in Utah, and perceptions regarding variations between states' licensure requirements. Qualitative feedback showed that 60.3% of respondents had concerns/perceptions about licensing standards versus 39.7% with no concerns/perceptions. This project's main limitation was only including commentary from pharmacists licensed to practice in Utah. Future expansion of data collection nationwide would lend strength to the trends established by this study, and provide a basis for a national conversation on licensing standards.

#83: **Focus Group Interview Experience of A University Clinician Research Team**

Kade Janes;[1] Joseph Cheever;[1] Konstantinia Almpani;[1] Mohajeri Amir;[1] Bao Thao;[1] Brooklyn Janes;[1] David Stewart;[1] Frank Licari;[1] Man Hung[1]

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Purpose
Interviews are often used as part of qualitative clinical research data collection. A double-blinded randomized control clinical trial on the effect of an oral probiotic intervention was carried out at a dental school in the United States and was approved by an institutional review board. The aim of this study was to report the experience that the study team members acquired during those interviews.

Methods
The study design included a combination of semi-structured groups, as well as individual, in-person interviews. The participants were randomly selected within the study cohort, and two interview series were conducted in the beginning and toward the end of the clinical trial, including participants from all different study groups. All interviews were conducted by the principal investigator of the study, who had substantial experience in the conduct of both individual and group interviews. The script was composed of twelve open-ended questions. Follow-up questions were also asked by the interviewer and interaction between participants was encouraged. The interviews were audio recorded and participants remained anonymous. Study team members were closely involved in the process through scheduling, assisting during the interviews by taking notes, transcribing the recordings and, eventually, extracting and assisting in the analysis of the interview data.

Results
Valuable information was collected based on the responses of the participants regarding their experience of the intervention. Study members who helped coordinate the interviews acquired valuable skills on how to organize and conduct interviews, as well as knowledge on qualitative data extraction, organization, analysis and interpretation.

Conclusions
The interviews done on this study were excellent and experience gained from this study was educative for all dental faculty, staff and student team members.

#84: **Early Marriage and Reproductive Health Outcomes Among Women in South Asia: A Rapid Review**

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Purpose
Child marriage affects girls all around the world. South Asia has the highest prevalence of child marriage and can be attributed to causes like patriarchal norms, family coercion, notions of family honor, economic status, educational status, non-enforcement of the law, etc. Early marriage is associated with several mental and physical health risks for young girls, especially on the girls' reproductive health. In order to better understand the ways to prevent adverse reproductive health outcomes, a thorough knowledge of the main reproductive health outcomes associated with child marriage is needed.

Methods
PubMed and CINAHL were used to identify 3220 articles and after the removal of duplicates, screening based on title and abstract, and exclusion based on eligibility criteria, a total of 17 articles were included in the rapid review. The outcomes of interest included Pregnancy and Childbirth Complications, Unintended/ Unplanned Pregnancy, Early Childbirth, Miscarriage, Pregnancy Termination, Eclampsia, and Sexually transmitted diseases/ infection (STD/STI) and Reproductively transmitted infection (RTI).

Results
The findings showed that overall, girls who got married before the age of 18 demonstrated a higher prevalence of pregnancy and childbirth complications, unintended/ unplanned pregnancies, early childbirth, miscarriage, pregnancy termination, and STIs & RTIs.

Conclusions
These findings indicate a need for policies and programs to support laws that ban child marriage by addressing the drivers of child marriage. Education regarding puberty, sex and safe-sex practices, pregnancy, fertility, contraceptive methods is needed for both girls and boys. The provision of modern contraceptive methods, safe abortion services, safe delivery and post-delivery care should further help.

#85: **Pre-participation Dental Screening Examinations: Athletes' Misconceptions concerning Restorative Needs**

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Purpose

A major league baseball organization (MLBO) was innovative by incorporating pre-participation dental screening examinations as part of their spring training physicals among their minor league professional baseball players (MLPBP's). The administration of the MLBO recruited a dentist to come down to perform dental screening examinations in Spring Training. The purpose of this study is to assess the MLPBPs' awareness of the need for restorative treatment.

Methods

Prior to the dental screening, each MLPBP was asked to complete a survey question anonymously and voluntarily. The question was: "Do you have any cavities, lost fillings, broken fillings, or broken teeth?". Dental screening examinations were performed in the athletic training room by direct clinical visual examination utilizing high intensity light, mouth mirror and tongue blades. Teeth were categorized as requiring restorative care based on: (1) carious lesions (2) lost restorations (3) fractured restorations, and (4) broken teeth. Caries lesions were identified classified via the International Caries Detection and Assessment System.

Results

59 MLPBPs were examined. 38% of the players indicated that they had: (1) no carious lesions (2) no lost restorations (3) no fractured restorations, and / or (4) no broken teeth. The results of the dental screening examinations revealed that 90% of the players they had: (1) carious lesions (2) lost restorations (3) fractured restorations, and / or (4) broken teeth. Thus, 62% of the MLPBPs were not aware of their oral health restorative needs.

Conclusions

The majority of the MLBPs were unaware of their carious lesions, lost restorations, fractured restorations, and / or broken teeth. Providing dental screening examinations during spring training can possibly identify existing problems and prevent the exacerbation of underlying dental conditions and untimely dental emergencies.

#86: **Millenials vs Generation Z: Perceptions of Oral Health and Clinical Outcomes**

Kylee Lin;[1] Vincent DiGiallonardo;[1] Maddy Tucker;[1] Man Hung;[1] Amir Mohajeri;[1] Ryan Moffat[1]

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Purpose

A patient's perception of the importance of oral health begins with information received in childhood and will influence their oral health as an adult. With the rapid changes in technology, including the internet and social media, the rising generation has greater and more rapid access to information including information about oral health. The purpose of this study is to examine the difference in perceptions of oral health and oral health outcomes between Millennials (born 1981-1996) and Generation Z (born 1997-2015).

Methods

This study intends to utilize the data from NHANES 2017 -2018 with statistical analysis. We are comparing the populations of Millennials (born 1981-1996) and Generation Z (born 1997-20145) using the 2017/2018 NHANES Examination Data on oral health recommendations of care data set and 2017-2018 NHANES Questionnaire Data on oral health. The perception of oral health will be studied using the variables of Expected dental problems to go away (OHQ780J), Last year embarrassed because of mouth (OHQ680), Do you think you have gum disease? (OHQ835), Rate the health of your teeth and gums (OHQ845). To analyze the clinical outcomes of oral health, we will use the decayed teeth (OHAROCDT) and oral hygiene (OHAROCOH).

Results

It is anticipated that analysis of the data will show a difference in oral health perceptions and clinical outcomes between Millennials and Generation Z. Generation Z will be more highly informed of oral health, more conscious of their own health, and will have better oral health outcomes than Millennials.

Conclusions

Understanding the differences in the knowledge and behavior between these two generational groups will allow dental practitioners and organized dentistry to customize the dissemination of important oral health information and research to meet the oral health needs of rising generations.

#87: **Opioid Misuse and Mental Health Treatment in A National Cohort of Adults**

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Purpose
Opioid misuse is an epidemic in the United States. In light of the growing misuse of opioids and the increase in mental health disorders, this study examines the association between opioid misuse and mental healthtreatment in a large, nationally representative sample.

Methods
Data from the National Survey on Drug Use and Health 2002-2019 was used for this current research study. Opioid misuse was defined as the use of either heroin or prescription-strength pain relievers outside of thedirections of a prescribing physician. Weighted descriptive statistics for the study sample were generated and analyzed. Next, associations betweenmental health treatment and opioid misuse were estimated using binarylogistic regression, and the results were expressed as adjusted odds ratios with 95% confidence intervals.

Results
The total sample size for this study was 68,537,159 participants, of whom 45.5% were older than 50 years old. Males and females were approximately equally distributed, and most participants were married.Participants generally had an annual household income of $75,000 or higher (38.3%) and were not insured (82.2%). The sample was predominantly White(63.9%) and included Black (11.9%), Asian (5.6%), Hispanic (16%), and Other (2.6%) racial and ethnic groups. The prevalence of opioid misuse was4.2%. 14.9 percent of adults received mental health treatment. The analyses also showed that the odds of opioid misuse was more than 2 times higher among adults with mental health treatment than among those without.

Conclusions
Our study found significant associations between mental health treatment and opioid misuse. Improving pain management among adults who have mental health disorders is critical to reduce opioid dependency at the national level.

#88: **Opioids In Endodontics: A Systematic Review and Meta analysis**

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Purpose

In dentistry, when over the counter pain relief isn't adequate for post operative pain management, opioid analgesics may be used as an alternative.Dentists rank among some of the top opioid prescribers similar to internal medicine and family medicine.Around 20% of patients receiving endodontic treatment report moderate to severe pain requiring opioid analgesics. In this study we specifically look into opioid use following endodontic procedures.

Methods

This systematic review and meta analysis was conducted using PRISMA guidelines.Exclusion Criteria-After removing duplicates, first screening was performed via title and abstract - no literature reviews and no papers written in non English text.Second screening was performed - no editorials, abstracts, conference papers, projects, not-related to Endodontics, and no review articles.Data Sources-There were 6 data sources used: PubMed, Cochrane Library, Ebsco, Sciencedirect Health Sciences, Web of Science, and Wiley Online Library.Data Extraction-The data will be extracted for baseline characteristics, including year of publication, geographical location of where the study was performed, age range and number of participants, disease or condition under investigation.

Results

The search strategy identified 139 articles initially, and 11 studies met the inclusion/exclusion criteria (Figure 1).The included studies will be grouped into subcategories of opioid use and endodontics. Additionally, the results will be reported based on the following items: Opioid use by Endodontics subcategories Opioid use by age and sample sizeOpioid use by world regionType of opioid use

Conclusions

In this review, we consolidate the existing evidence of opioid use in endodontics.To the best of our knowledge this is the first comprehensive review on the use of opioid in endodontics across the world over time.We only included studies that were published in the English language, and studies published in other languages were not included. Data extraction did not consider study methodology because it was beyond the scope of this review.

#89: **Development of a Census Driven Equation to predict Non-billable "Cross-cover" Work Done During Nocturnist shifts, to predict staffing**

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Purpose
Cross-covering patients overnight is part of standard hospitalist practice, however there is little understanding of the workload contribution. Much of the current literature for hospitalist productivity focuses on wRVU, day census, or number of admits per shift. These metrics are not applicable to cross cover since it is largely non-billable work. A cross sectional, web-based national survey study demonstrated hospitalist providers were less likely to agree they could provide safe care if they had more than 5 admissions per night. Currently there is no standard to objectively measure workload for night shifts. The objective of this study is to determine the time cross-cover contributes to nocturnist workload.

Methods
The Salt Lake Valley Hospitalist service at Intermountain Medical Center (IMC) was chosen as the site for several reasons: patients are all Med-Surg status at a large trauma center, high total team patient census, and the primary mode of communication from outside callers to hospitalist is via one communication modality with reliable record of page counts (Physicians Answering Service). The project was phased, with initial review of all transcribed Physician Answering Service pages on 48 randomly chosen dates between March 2021 to March 2022 during the hours of 6PM - 6AM. The number of pages per night were counted, excluding admits and consult pages. Next, medical student volunteers observed nocturnists work for eight 6-hr shifts during which they timed every cross-cover encounter with a stopwatch. Along with the duration of each cross-cover encounter, they also collected other data: bedside visits, orders placed, documentation on cross-cover in the chart, and any interruptions on a current admission or interruption of another cross-cover encounter. Using these data elements, we created a linear regression model based on AM census to predict total cross-cover workload in terms of time.

Results
The average number of pages per night shift was 32.2. With the observation data, we found the time required to complete a cross-cover encounter was highly variable with a max of 185 minutes and a minimum of 1 minute. The average time per cross-cover encounter was 11 minutes. Based on our observational data and using our operations census dashboard, a linear regression equation was created as an estimation tool for cross-cover time: $y = 2.4877x + 198.73$ (x= total AM census and y= total minutes for cross-cover).

Conclusions

The estimation tool was created with the aim of understanding cross-cover as a necessary component of nocturnist work. We have demonstrated that cross-cover is a quantifiable workload. This important clinical work should be taken into consideration when determining appropriate staffing needs. For example, using the tool, we can estimate the total cross-cover minutes per night shift at IMC for an AM census of 111 would be 7.9 hours. Annualized this would represent 2,885 hours, which is equivalent to 1.4 FTE. It is critical that we continue work to fully assess hospitalist efficiency. This work will allow hospitalist team models to evolve with the goal to provide high quality, safe, cost-effective options to address non-billable work, in addition to overall nocturnist workload.

#90: **Role of Vitamin D in Cardiovascular Disease**

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Purpose

Many studies have investigated the association between vitamin D and cardiovascular disease (CVD), but literature has shown various results. The aim of this study was to investigate the role of vitamin D in CVD.

Methods

The data were obtained from the 2015-2018 National Health and Nutrition Examination Survey database and included adults aged 20 years and older with a history of CVD. Descriptive statistics for participants' demographics, vitamin D levels, CVD status, and risk factors were reported. Chi-square tests and t-tests were performed to examine differences in participant characteristics among those who had CVD and did not have CVD. Regression models were used to explore the association between vitamin D levels and CVD.

Results

A total of 9,825 participants took part in this study with an average age of 50.28 years. Majority were female (52.1%) and Non-Hispanic White (34%). Most had normal vitamin D levels (64.8%) and had never been told that they had CVD (89.5%). Individuals with vitamin D deficiency or insufficiency had a higher likelihood of having CVD than those with normal vitamin D levels.

Conclusions

Both vitamin D deficiency and insufficiency were associated with an increased risk of CVD. Healthcare professionals may consider recommending the intake of vitamin D supplements to improve and prevent cardiovascular health in adults.

#91: **Adherence of COVID-19 Vaccination among University Students**

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Purpose
With the release of COVID-19 vaccine, many took a breath of relief. However, some individuals were reluctant to get inoculated. In this study, we examined university students' rates of vaccination, vaccine hesitancy or refusal, and psychological health both before and after vaccine for COVID-19 was available.

Methods
Data were collected from a private university in the intermountain west and a public west-coast university in the United States. Students were invited via emails, classroom visits, and professor permission to participate in a 50-item survey examining their experiences, attitudes, and opinions on the COVID-19 pandemic and vaccination. Eligible participants were at least 18 years old and enrolled in a university at the time of the study.

Results
The sample consisted of 770 students, nearly 95% were aged 18-25 years old. Majority of students were vaccinated against COVID-19, with only 7.4% unvaccinated. Among commonly picked reasons for vaccination were wanting life to return to normal (75.28%) and to protect themselves and loved ones (72.87%). Trusting medical experts (62.22%) and research (61.93%) were also among the highest picked reasons and were much higher than trusting political experts (15.91%). Wanting to make a political statement (5.4%) had the lowest selection. Of those who were unvaccinated, most had no plans to vaccinate in the future, and the three most commonly selected reasons were being young (80%), being worried about potential side effects (70%), and not trusting research (53.33%).

Conclusions
Many non-adherent students cited worry about side effects and quality of research in the development of the vaccine. This suggests that it is essential to address questions about side effects and the rigor of research done on vaccines. The most frequently selected reason, however, for non-adherence was feeling invulnerable to the virus. This implies that education (including dental education) is needed about the virus.

#92: **Review of Literature Regarding Ethnic Disparities and Minority Student Mental Health and Wellness**

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Purpose
Underrepresented patients suffer from negative health outcomes due to factors such as race and socioeconomic status. Previous literature has evaluated healthcare disparities; however, overall health outcomes have not improved for these populations. It is known that increasing representation can minimize cultural gaps, however with feelings of isolation, lack of resources and cultural competency skills of colleagues, Underrepresented minority students are disproportionately subjected to psychosocial stressors in academia. The purpose of this study is to review the literature as it relates to the mental and physical wellness of minority students.

Methods
Literature search was conducted September 2022 utilizing the PubMed database. Search terms were "ethic disparities and students." Returned literature included 1,273 results, which were narrowed by text availability including full text and free full text. Of the returned 630 articles, results were further narrowed by publication dates between January 2010 and September 2022. Five hundred and sixty-three articles were returned and final inclusion criteria considered literature with evidence on mental and physiological wellness of underrepresented minority students, evidence of diversity, equity, and inclusion initiatives to minimize cultural gaps in healthcare, and disparities in healthcare education.

Results
Final analysis included articles from 19 academic journals, including 22 articles. Eleven cross-sectional studies were evaluated, all of which were consistent with negative outcomes of ethnic students. Two observational studies, six commentaries, a retrospective, and a prospective study were also included in the final evaluation. Consistent with inclusion criteria, seven articles evaluated the negative mental and physiological stressors that are prevalent in underrepresented groups, with four articles directly evaluating factors contributing to negative wellness outcomes. Five articles addressed disparities in healthcare education and the impact of cultural competency training, or lack thereof. Six articles provided guidelines or evaluated specific diversity, equity, and inclusion initiatives aimed to improve healthcare outcomes for underrepresented populations by increasing representation. Although literature investigated different outcomes, most study populations were students in higher education, with an exception of literature evaluating initiatives and mental health outcomes for minorities, which possibly included students in secondary schooling or non-student underrepresented populations.Study limitations included the lack of research publications evaluating the wellness of ethnic students. Also, some literature investigated for specific ethnicities, whereas others reported results including all underrepresented minorities, such as African-American, Latino and/or Native American students.

Conclusions

With the prevalence of healthcare disparities and growing population diversity, healthcare institutions should commit to preparing culturally competent providers to serve patients of all backgrounds. As ethnic minority students are actively trying to improve representation in healthcare, research shows health disparities remain both within and outside of the classroom.Mental and physiological outcomes were negative for ethnic students from the literature review conducted and this may relate to the prevalence of health disparities. Future studies should investigate the impact of diversity, equity, and inclusion initiatives within academia, specifically as it relates to the impact on minority student health and wellness.

#93: **Physicians' knowledge and attitudes towards psychedelics**

Arazoo Shwany;[1] Jackson Nielsen;[1] Amar Paul;[1] Arren Hill;[1] Laura Minor;[1] Mary Seamons;[1] Matthew Whitlock;[1] Paige Moore;[1] Varos Manukyan;[1] John A. Kriak[1]

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Purpose
On March 22, 2022, Utah governor, Spencer Cox, signed H.B.167 into law, creating a task force to "provide evidence-based recommendations on any psychotherapy drug that the task force determines may enhance psychotherapy when treating a mental illness," including psychedelics such as psilocybin and 3,4-Methylenedioxymethamphetamine (MDMA). While these compounds were researched and utilized in clinical practice in the 1950s and 1960s, the Controlled Substances Act of 1970 placed a moratorium on psychedelic research for decades. However, in the last several years, there has been a resurgence of clinical research on psychedelics that suggests these compounds may be effective in treating psychiatric conditions and as an adjunct in palliative care. In October 2022, the Utah task force produced a report recognizing the growing body of evidence supporting the therapeutic use of psilocybin and MDMA. The task force advised the state to wait until the Food and Drug Administration (FDA) rules on these compounds, which are presently under fast-track review and projected to be approved in the next few years. This decision was primarily based on ensuring safe access for the state's citizens and cost, while indicating that these studies will be forthcoming. In the same month that Utah signed H.B.167, Johns Hopkins University, Yale University, and New York University announced they were collaborating to create a one-to-two-year postdoctoral psychedelics curriculum for psychiatrists. As state legislatures and top academic institutions lean into psychedelic-assisted therapies, assessing the knowledge and attitudes of practicing medical professionals, who may be able to administer such compounds very soon, has never been so relevant yet limited by the present literature.

Methods
In this forthcoming study, we will administer brief questionnaires to physicians across specialties in the state of Utah to understand their baseline of knowledge and opinions toward the clinical use of psychedelics and their interest in learning more.

Results
N/A

Conclusions
N/A

#94: **The COVID-19 pandemic had disparately affected New York City populations of different socioeconomic strata. We discovered that the baseline rates of COVID-19 infections in higher-income neighborhoods were higher than those in lower-income neighborhoods.**

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Purpose
Provide empirical evidence of the differences in experience and outcome for COVID-19 in New York City population as a result of socioeconomic status.

Methods
Socioeconomic status was based on partitioning the US Census Bureau's Median Income Data for 2009-2020 by New York City zip codes. Socioeconomic status was binned into 'High', 'Middle', and 'Low' based on the upper, middle, and lower thirds of descending median income respectively. Infection, Hospitalization, and Death rate data was obtained via NYCHealth for the period of August 8, 2020 to April 23, 2022 stratified by weeks and months. Statistical testing was performed using MATLAB.

Results
Statistically, significant differences in experiences were found in a vast majority of time period groupings. While infection rates were highest among low socioeconomic regions during 'COVID Waves', baseline transmission among high socioeconomic region were higher during 'non-COVID Waves' - which can also be referred to as baseline. In regards to hospitalization and death rates, statistically significant differences were found in nearly all three socioeconomic status groups - with the low socioeconomic group experiencing the most hospitalizations and deaths and the high socioeconomic group experiencing the highest.

Conclusions

We found that hospitalization and death rates were highest among lower-income residents, which is counterintuitive to our finding for infections. Infection was not uniformly higher for low socioeconomic groups in all time periods. They only surpass the high socioeconomic groups during 'COVID Waves'. However, for nearly all time periods, low socioeconomic groups still experienced more hospitalizations and deaths. This leads us to believe 1) lower income-associated zip codes were subjected to more financial harm and health burden and 2) higher income-associated zip codes played some sort of factor in transmission due to their paradoxically high baseline infection rate.

#95: **Relationship Between Student Stress and INBDE Pass Rates: A Study Among Three Dental Schools**

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Purpose
Dental education has a reputation for being stressful and demanding. Many people believe that professional school programs must be filled with excessive levels of adversity. Using the Dental Environment Stress Questionnaire as the framework, this study will examine the relationship between the stress levels students experience during their preclinical education and pass rates on the Integrated National Board Dental Examination (INBDE).

Methods
Upperclassmen dental students at Roseman University (n=100), Lake Erie College of Osteopathic Medicine, School of Dental Medicine (n=105), and the University of New England, College of Dental Medicine (n=64) were invited to take an anonymous survey based on the Dental Environment Stress Questionnaire to examine the relationship between student stress during their predoctoral education and pass rates on the INBDE. The study was approved by the institutional review board of each school.

Results
Awaiting data analysis in winter 2022

Conclusions
Awaiting data analysis in winter 2022

#96: **COVID-19 Safety Protocol Communication from School: Dental Students' Experience**

Daniel Yevseyevich;[1] Nicole Hablitzel;[1] Sharon Su;[1] Amir Mohajeri;[1] Man Hung[1]

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Purpose
Globally, the Coronavirus (COVID-19) pandemic has become a challenging situation for healthcare providersThe aim of this study was to evaluate the impact of dental school's COVID-19 protocol communication on dental students' experience.

Methods
Data were gathered from an online survey conducted by dental faculty and students. The window for survey completion ran 16 weeks (from April 26, 2021, to August 25, 2021) Descriptive statistics were used to assess dental students' demographic characteristics. Chi-square test and z-test were used to compare student experience between students who believed their dental school has clearly communicated the COVID-19 safety protocol versus those who did not.

Results
There was 99 participants in the surveyThe demographic characteristics consist of 49(50%) male, and 49(50%) female.We used the Chi-square test and the z-test to compare group differences in concerns related to COVID-19.

Conclusions
The survey showed that clearly communicated protocols made less students anxious about contracting it from their peers, and less dental students' felt concerned about contracting covid-19 while working with patients. This could be a result of better communication between the faculty and students, and more information available on the institutional website.

#97: **Association of Prescription Opioids with Oral Health**

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Purpose
Opioids are often prescribed by physicians and dentists to aid in pain relief. However, there is a lack of literature regarding prescription opioid use on oral health. The goal of this study was to determine the association between prescription opioid use and oral health in the United States.

Methods
Data from the National Health and Nutritional Examination Survey 2017 to pre-pandemic 2020 was used for analysis. Prescription opioids were defined as narcotic analgesics or narcotic analgesic combinations. Individuals who reported taking prescription opioids were included in this study. Overall oral health satisfaction was the outcome variable. The association of prescription opioid use with oral health outcome measure was analyzed by using binary logistic regression. Various models were run on both the unadjusted and adjusted for covariates.

Results
The total sample size for this study was 318,318,849 participants, of whom 50.2% have used prescription opioids in the past month and 76.6% reported their oral health as satisfactory. The majority of the sample was female (51.1%), under 18 years of age(22.2%), and non-Hispanic White (59.4%). Participants who used prescription opioids were significantly more likely to have unsatisfactory oral health ($p < 0.05$).

Conclusions
Those who used prescription opioids were at higher odds of not being satisfied with their oral health. Although research in this jurisdiction is limited, it is important to further delve into this topic to not only reduce the use of opioids but the ramifications it has on the oral cavity.

#98: **Vitamin D Normative Values in Various Disease Conditions**

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Purpose
Vitamin D is an evitable nutrient and affects a wide range of cellular processes. However, the normative values of vitamin D in various health conditions were less known. This study sought to establish the normative values of vitamin D in individuals with diabetes, heart problems, oral disease, and chronic conditions.

Methods
This study used data collected from the 2017-2018 National Health and Nutrition Examination Survey . Demographic characteristics such as age, gender, race, and family income level were reported. Minimum, maximum, mean and median of vitamin D were evaluated in individuals with diabetes, heart problems, oral disease, chronic conditions (meaning with one or more chronic diseases). Vitamin D was measured in nmol/L.

Results
The sample size of this study was 9,254 participants, of whom 11.6% had heart conditions, 10% had diabetes, 29.4% had oral disease, and 47.9% had one or more chronic diseases. The distribution of males and females were roughly equal. The majority of the respondents were non-Hispanic White (34%). The mean value of vitamin D in people with oral health disease was 72.2 nmol/L, 77.4 nmol/L for heart conditions, 75.5 nmol/L for diabetes, and 73.9 nmol/L for one or more chronic diseases.

Conclusions
The mean value of vitamin D was higher in people with heart conditions and lower in people with oral health diseases. These normative values provide a reference point for health care providers to track treatment outcomes.

#99: **Pharmacist Licensure- Demographics, Awareness, and Perceptions in Utah**

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Purpose
Despite variation in licensure requirements and models for pharmacy practice nationwide there is little concrete information regarding pharmacists' perceptions and awareness of licensing models within the United States of America. In Utah and nationally, there have been recent conversations about moving towards national licensing standards. Before implementing such a resolution, this study aimed to gather demographic data of Utah pharmacists to identify awareness and discover attitudes toward current and prospective licensure models.

Methods
The data was evaluated by three individuals, and this study will focus on the general summation of the quantitative information. A fifteen-question survey was created and disseminated online via Qualtrics to evaluate the demographics, awareness of licensure models, and perceptions about the current pharmacist licensing models. The survey was sent to the Utah Board of Pharmacy for feedback from board members after presenting the initial study that compared the pharmacist licensure model to other medical professions. Feedback was also given by pharmacists at the NABP national conference. The study was evaluated by the Roseman University Institutional Review Board and given an exempt status. The five demographic items collected were age, number of years practiced, practice setting, primary state of licensure, and states/territories licensed. Three awareness question items were focused on licensing models amongst other medical professions (e.g. physicians and nurses), and programs to aid in license portability (NABP verify, e-LPT). Four perception survey items collected responses regarding continued education, license renewal, intern hours, MPJE, and license portability. Two open-ended questions were included for qualitative comments. A total of 4,154 pharmacists licensed in the state of Utah (as identified by the Utah Division of Occupational and Professional Licensing) were emailed the survey link on August 22 and responses collected through September 22, 2022. Quantitative and qualitative data analysis allowed for descriptive statistics and thematic identification.

Results

A total of 972 responses were collected for a response rate of 23% and a completion rate of 94%. Respondents self-identified 36 practice areas. Distribution of years in practice was balanced: 19.88% in years 0-5, 21.44% in years 6-10, 26.01% in years 11-20, and 32.67% in more than 20 years. Representation from age groups: 20-24 (0.21%), 25-29 (5.56%), 30-34 (15.09%), 35-39 (20.23%), 40-44 (18.76%), 45-49 (10.9%), 50-54 (8.81%), 55-59 (5.45%), 60-64 (6.81%), 65+ (8.18%) was collected. Eighty percent of respondents' primary state of licensure was Utah, with additional licensure including representation from all 50 states and Guam. The survey showed a variation in awareness regarding other healthcare professional licensing models with 40.83% "aware," 40.62% "unaware," and 18.55% "unsure". Majority of responses showed awareness of the NABP Verify program(55.8%), but unawareness of the e-LTP program (56.14%). Respondents agreed with increased license portability for medically underserved and rural areas (71.79%) and preference for having the MPJE or similar law exam (56.72%). Pharmacists reported no concerns regarding lapse in license renewal, fees, or continuing education requirements (57.81%).

Conclusions

Evaluating the demographics, general awareness, and perceptions of pharmacists regarding licensure models determines how to start the conversation of improving the current licensure model. This study, alongside national measures such as NABP Resolution No. 118-3-22, provide tools to explore a more universal approach to licensing for pharmacists. Licensure conversations aid pharmacists in practicing to the full extent of the profession and provide patients with the best care possible. The survey was developed to be replicable for other states for further data collection. Future studies should expand nationwide to identify trends regarding demographics, awareness, perceptions, and continual evaluation of pharmacist licensing models.

#100: **Comparison of Radiographic Exposure During RCT Using Wall Mounted Units vs Nomad Mobile Units: A Retrospective Study**

Mason Smith;[1] Mitchell Hogue;[1] Ben Ricks;[1] John Wisniewski;[1] Amir Mohajeri[1]

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Purpose

When taking radiographs, only one study has been conducted comparing wall-mounted units vs hand-held units regarding number of radiographs taken as well as the quality of these radiographs. We will review patients' radiographic exposures and radiographic errors when radiographs were taken during Endodontic procedures utilizing a wall-mounted unit vs a hand-held unit.

Methods

A retrospective study of endodontic cases completed by undergraduate dental students at Roseman CODM. Charts were analyzed which had CDT - Endodontic procedure codes 3310and 3320 completed. 50-100 patient cases were reviewed noting when radiographs were taken during Endodontic procedures utilizing a wall-mounted unit vs a hand-held unit.Patients were treated in the 4th Floor General Dentistry Clinic and in the Old Endodontic Clinic. 50-100 patient cases were reviewed noting when radiographs were taken during Endodontic procedures utilizing a wall-mounted unit vs a hand-held unit. Charts will be reviewed regarding number of radiographic exposures as well as graded for the quality, and errors at the different radiographs taken during RCT, including Diagnostic Radiograph, Working Length, Master Cone, and Final Radiograph. Radiographs will be graded for common errors (Cone Cut, Foreshortened, Elongated, Closed Contacts, Missing Root Apex, Poor Contrast, Image Blurring)and by the following general scale: Grade 1 - Excellent: no errors, Grade 2 - Acceptable: some errors, Grade 3 - Unacceptable: diagnostically useless.

Results

Results are pending. Retrospective review of charts has not yet started. IRB was just approved on December 8, 2022.

Conclusions

To be determined.

#101: Evaluation of the 2021 Roseman Basics Leveling Course - Survey and Focus Group Results

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Purpose
As an accelerated program, Roseman is very fast paced and thus having a solid educational foundation will help students keep up with the courses. Therefore, assessing the effectiveness of the leveling course, Roseman Basics, is important as it develops a solid foundation that can help them thrive in the program. By collecting information from students who have previously taken the course, we are able to evaluate and analyze key concepts that students find useful. Additionally, we can improve the delivery method of the materials to give a more enjoyable experience for the students doing the modules. In this study, we convey some of the results attained from the 2022 Roseman Basics student survey and 2022 Roseman Basics student focus group on the 2021 version of Roseman Basics.

Methods
The survey was given to P1 students on both campuses February 2022, asking questions concerning the 2021 Roseman Basics. The survey asked questions such as the usefulness of each module and the ease of using it. Subsequently, a focus group was put together from the P1 classes on both campuses and carried out in April 2022. Comments and design ideas were collected.

Results
Overall, according to the survey, student opinions on topics such as usefulness and organization were positive but further improvements were suggested. From the focus group, suggestions were made for improvement but certain positives were mentioned such as it gave an idea of what the professor will be teaching. A weakness mentioned was not retaining the information when the topic arrives during didactic curriculum, among others.

Conclusions
This study details feedback from students concerning the 2021 version of Roseman Basics administered to the incoming P1 class of 2021. This information is helpful for the further development of Roseman Basics. For future course development, survey and focus group results would be compared between the incoming P1 classes to ensure that proper improvements have been made. This would potentially help solidify student knowledge prior to the start of the P1 didactic curriculum.

#102: **Use of Mouthguards in Sports: Friend or Foe when it comes to Oral Health?**

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Purpose
Sports are a commonality, beginning in childhood, throughout the entire world. Unfortunately playing sports do put athletes at risk for a variety of injuries with the most common being dental-related. The primary purpose of this study is to evaluate how mouthguards decrease the risk of dental injury, perceptions of athletes on mouthguard use, and compare future directions to increase the use of mouthguards in sports.

Methods
For this literature review, a range of databases was used such as Google Search, PubMed, EBSCOhost, and Web of Science. The search strategy used was a combination of terms such as "mouthguard safety", mouthguard side effects in oral health", "injury prevention", "athlete", "sports" and "oral health". Studies selected were published between October 2017, and February 2022. Only English-language articles were considered for this research.

Results
In progress

Conclusions
In progress

#103: **The Use of Art History in the Study of Histology Images by Medical Students**

Madeleine Karpiuk;[1] Tipsuda Bahri;[1] Esther Nuebel[1]

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Purpose
The education of medical students in the United States has only recently begun to mirror the innovation seen in the medical field. While the use of small learning groups and technology are slowly replacing the big lecture halls there are other avenues to explore when it comes to teaching some of the more visual disciplines, such as histology. It has been shown that exposing medical students to art historical training in their first year of medical education leads to increased observation skills in the clinic. Our research takes the different learning environment of art history, the gallery, and the juxtaposition of familiar works of art with histology slides and tests if the "unusual" manner of presentation increases confidence with later identifying the material.

Methods
Twenty-five histological images will be selected and paired with a famous historical artwork and displayed in a gallery setting. The images will be presented with identification and explanation of the art historical significance of the artwork and how the two images are connected. Students will participate in a survey assessing their own confidence with identifying histological images before and after visiting the gallery and again in one months' time. Survey results will be analyzed with statistical analysis such as ANOVA, t-tests, and correlation analysis.

Results
This study is in preparation and the gallery exhibit and questionnaires will be conducted in the Fall of 2023.

Conclusions
Conclusions cannot be drawn yet, however, based on previous literature we expect impactful information. The findings will inform the future of medical education particularly for visual teaching disciplines, such as histology.

#104: **Comparison of Confidence Levels from Dental Student-to-Student Injections**

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Purpose
Many US dental schools have utilized student-to-student (STS) dental anesthesia injections as part of students' local anesthesia pre-clinical training. This study compares the student confidence levels for four types of block injections between one class who did not perform STS injections and a subsequent class who did perform STS injections.

Methods
After adjusting for students who had prior experience with injections and those who did not participate in STS injections, there were 43 out of 100 D1 students and 35 out of 100 D2 students who completed a survey following the preclinical local anesthesia training for the D1 students. Survey questions asked about age, gender, experience, confidence levels with the IA, GP, PSA, and LB nerve block injections, and perceptions.

Results
There was no significant correlation between age and confidence. Overall, males rated themselves having higher confidence than females. There was a significant increase in confidence in all the injections for D1 students compared from after only the didactic portion of the course to after completing the STS injections. There was a significant correlation for D2 students between their experience administering the injections and their confidence levels. The D1's had a significant difference in confidence levels after the STS injections compared to the D2's for the PSA (p = .001) and the GP (p = .001), but there was no statistical significance for the IA (p = .685) and the LB (p = .628). This is where the statistic comparing the confidence levels of the class of 2025 to the class of 2024 after one year of clinical experience.

Conclusions
D1 Students participating in supervised STS injections had significantly higher confidence in the PSA and the GP than D2 students who did not participate in student-to-student but had a year of clinical experience, suggesting the effectiveness of STS injections in building confidence.

#105: **Influence of International Service Learning on Development of Cultural Competence Among Undergraduate Nursing Students**

Tracey Long[1]

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Purpose

The objective of increasing nurses who are culturally competent must begin with nursing education at the student nurse level. Since 1986, teaching cultural competence in the delivery of nursing care is an expectation of accreditation and approval boards for schools of nursing, yet how to teach cultural competence effectively has yet to be determined. This study examined the effectiveness of international service learning on undergraduate nursing students as a strategy to teach cultural competence.

Methods

One method of gaining knowledge, skills and experience with different cultures for nurses and nursing students is through an international immersion experience with training in language, culture and community nursing. This study is a qualitative and quantitative measurement of the influence of a two-week service learning medical experience on a student-nursing group who traveled abroad to Belize, Central America.

Results

With the strong emphasis on evidence based research to validate and direct nursing practice, and nursing education, nurse educators need to be aware of the current teaching strategies for cultural competence for nursing students, and which ones are producing more effective outcomes. Implications for practice include awareness of the variety of teaching strategies available.

Conclusions

The use of clinical experiences, standardized patients and immersion experiences have produced the most favorable results, which increase student awareness, knowledge and confidence in working with ethnically diverse patients.

#106: **The Influence of a Nurse's Physical Appearance on the Patient's Perception of Nurse Competence**

Tracey Long[1]

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Purpose

Statement of the Problem: The image of the professional nurse has changed throughout history. The general public regards nurses as the most trusted profession. With the growing obesity trends in the US, nurses may not represent a healthy role model. Background: The study seeks to know if a nurse's physical appearance influences a patient's perception about the nurse's competence. purpose: To identify any bias towards or against a nurse due to physical condition of overweight or obesity, facial piercing or tattoos.

Methods

A phenomenological qualitative survey with patient populations in Central and South America and the United States. A simple survey was provided to patients in clinic settings with English-Spanish translations measuring patient perceptions with a Likert scale.

Results

There is a generational and cultural effect on the perception of the image of a nurse as a healthy role model. Central and South Americans didn't view obesity as a negative feature in their nurse but did view facial piercings and tattoos as distracting. Americans were less trusting of an obese nurse but not negatively impacted by a nurse with facial piercings or tattoos. The older generation in any country perceived nurses as more competent if they were of an ideal weight and didn't have facial piercing or tattoos. All surveyed preferred a nurse who didn't smoke.

Conclusions

Nurses need to be aware of their physical appearance and the influence it may have on their perceived competence in the eyes of their patient. This data can influence change and improvements in the health of nursing professionals and with them, for the nation as they serve as better role models of health.

#107: **Immunology Education Using Tactile Gamification**

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Purpose
Immunology is an extensive area of study which is often difficult for medical students to grasp. Our study hypothesized that the use of board game mechanics could provide an engaging and effective way for medical students to gain a functional understanding of foundational immunology concepts.

Methods
We first identified the board game mechanics that would most accurately match the core immunological concept we wanted to be taught. After many design iterations, rounds of playtesting, and IRB approval, the game was ready for its first trial. Twenty-four medical students composed of both first and second years volunteered to participate in our study lasting ninety minutes. During the study, participants took a pre-game quiz that consisted of twelve questions testing their knowledge of the foundations of immunology. Participants were taught the game and then playing the game with 1-3 other participants. Participants finished the study by taking a post-game quiz with the same twelve questions to identify if scores had improved. The post-game quiz also included a survey for further demographic and qualitative data analysis.

Results
Data analysis demonstrated an average increase of 30% between the pre-game and post-game quizzes for the cohort with a p-value of 0.000119. The post-game survey indicated that 90% of participants felt that they learned something while playing and that 87% of participants agreed that they enjoyed playing the game and would play it again.

Conclusions
The study demonstrated a statistically significant increase in comprehension of immunological concepts after playing the game. This data paired with the survey data concludes that the board game can be an effective modality in teaching medical students core concepts of immunology.

#108: **Building More Inclusive and Psychologically Safe Spaces in Dental Education**

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Purpose
Dental schools are experiencing greater diversity in patients, students, and employees, yet continue to struggle to make the environment more psychologically safe and inclusive for these individuals, who can be the target of microaggressions and overt bias. When people feel psychologically safe, they feel like they belong. This study examines the impact of a one-day interactive workshop on students' understanding of creating inclusive environments for each other and their patients.

Methods
The workshop was developed using a template created by the Office of Medical Education at UCSF and a needs assessment identified room for creating a more psychologically safe and inclusive environment. The following learning outcomes were developed: 1. Identify examples of microaggressions and overt bias in dentistry and dental education. 2. Explain how learning/working environment can impact learner/worker performance. 3. Explain the benefits and challenges of learning and working with people who have difference perspectives than ourselves. 4. Identify methods to improve teamwork in your institution. After the workshop, students were invited to complete an anonymous, online survey rating the impact. The survey had six items with a 5-point Likert scale and four open-ended questions. 71 students participated in the workshop; 48 gave informed consent and completed the survey. This study has IRB Approval, IRB2022-004.

Results
69% of participants rated their learning experience as positive, 17% rated it as neutral, and 14% rated it as negative. 72% of participants said at the conclusion of the session they understood diversity, equity, inclusion, and belonging (DEIB) much better than they did at the beginning of the session. One theme discovered in the free-text responses was that students, regardless of how they rated the session, reported that having the opportunity to share experiences and listen to their peers speak was powerful and important.

Conclusions
In today's polarized society, where federal, state, and local governments, as well as university donors and boards of directors, have strong views when discussing issues such as bias and diversity, it is important to create space for dialogue among community members to nurture psychologically safe environments. Most respondents felt that attending this workshop increased their understanding of creating an environment of inclusiveness and belonging.

#109: **A Standardized Approach to Blood Pressure Training in First-Year Medical Students**

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Purpose

Accurate blood pressure is an important marker of patient's health. Despite this, training in blood pressure assessment is not standardized across medical schools. The current study seeks to assess the effectiveness of the American Medical Association (AMA) blood pressure module in training and longitudinal mastery of blood pressure measurement in first-year medical students.

Methods

The AMA module uses the latest evidence-based techniques for blood pressure measurement. NoordaCOM medical students will complete this module at the beginning of first year. Students will take a 10-item pre-test and post-test to measure mastery of the module. The assessment will be repeated at the end of the first year to measure longitudinal mastery and module effectiveness.

Results

Data have been collected at two timepoints for the class of NoordaCOM 2025 (N=65 pre-test, N=45 post-test) and at one of two timepoints the NoordaCOM class of 2026 (N=113 pre-test, N=94 post-test). There was no significant difference between the pre-test scores of class of 2025 (M=4.52, SD=1.72) and 2026 (M=4.58, SD=1.98) or post-test scores of class of 2025 (M=7.49, SD=1.96) and 2026 (M=8.01, SD=1.43), so the data for both cohorts were analyzed together. Assessment scores were significantly different between timepoints $F_{(2,37)}= 30.23$, p<.001), with higher post-test scores (M=8.01, SD=1.43) and higher longitudinal post-test scores (M=5.72, SD=1.45), compared to pre-test scores (M=4.59, SD=1.98) indicating that the modules significantly improved understanding. Although longitudinal scores indicate some lack of retention, they are significantly higher than pretest scores, indicating improvement from baseline. Retention assessment will be performed for the class of 2026 after they take the longitudinal post-test in 2023.

Conclusions

The current study provides evidence that the AMA blood pressure module is an effective training tool for blood pressure assessment in first-year medical students. Despite decreased retention after 8 months, students still showed better understanding of the material compared to baseline. Based on these findings, we recommend the standardized use of the AMA module as a blood pressure training tool for medical schools with the inclusion of a refresher course as knowledge wanes over time. Data will be collected for future cohorts to further assess the effectiveness of the AMA blood pressure modules.

#110: **The Effect of Augmented Reality Feature in Complete Anatomy Application on Educational Outcomes in Students with Autism Spectrum Disorder**

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Purpose

Autism spectrum disorder (ASD) is one of the earliest appearing neurological disorders characterized by social communication deficits and repetitive sensorimotor behaviors (Lord et al, 2018). Children with ASD understand the world around them with unique perspectives and therefore it is essential that they receive a modified curriculum to better suit their learning styles and goals. One such curricular modification is the introduction of Augmented Reality (AR) technology. A study utilized AR for Global Reading Methods in preschool children on the Autism Spectrum and demonstrated increased effectiveness of the educational process (ĐšĐ¾Đ»Đ¾Đ¼Đ¾Ñ''Ñ†ÑŒ, Đ¢. & ĐšĐ°Ñ Ñ Ñ–Đ¼, 2018). Additionally, Jamali et. al. conveyed better understanding of anatomy when comparing pre- and post- questionnaire results after students used the Human Anatomy Mobile Augmented Reality (HuMAR) software. Similarly, the current study intends to use AR to reform conventional teaching methods to incorporate learning styles compatible with children with ASD. Although various studies have shown the benefits of including AR and VR in school curriculum, the current study focuses on its advantage for ASD students in Human Anatomy education. This study aims to determine the differences in outcomes when a group of students uses AR interventions in addition to traditional lectures in comparison to students who do not. We hypothesize that students receiving AR interventions will score higher on the post-intervention questionnaire than students who do not. The results of this study will be beneficial for educators devising lesson plans for children with ASD interested in studying Human Anatomy and Physiology.

Methods

This study will take place at a high school in Provo, Utah. Participants, consisting of sixteen students diagnosed with ASD, are randomly divided into control and intervention groups. The control group will receive a 30-minute lecture about upper extremity muscles using Microsoft PowerPoint, while the intervention group will receive the lecture along with the AR feature of the Complete Anatomy iPad application. Both groups will complete and submit a pre- and post-intervention questionnaire of 10 multiple choice questions each. Quizzes will be scored out of 10 and plotted on bar and line graphs in Microsoft Excel for analysis.

Results

N/A

Conclusions

N/A

#111: **Stem Cell Usage in Dentistry**
Kristina Vu;[1] Daniel Yevseyevich;[2] Steven Park;[2] Justin Nguyen;[2] Amir Mohajeri;[2] Man Hung[2]

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Purpose
Stem cells are unspecialized cells (pluripotent) that can be specialize into any type of cell in the body.Recently, stem cell research and usage has been increasing as the application in the healthcare field has been expanding. The aim for this study is to identify and further understand the various uses of stem cells in dentistry and within the different specialties.

Methods
This review will be conducted using PRISMA guidelines (Figure 1). Exclusion Criteria- First screening will exclude articles not written in English and review papers.Second screening will exclude editorials, abstracts, conference papers, projects, and articles not-related to stem cell or dentistry.Data Sources- Data will be sourced from PubMed, Scopus, and Google Scholar.Data Extraction-Full-text review and data extraction will be performed by 4 reviewers working in pairs.The data will be extracted for baseline characteristics, including year of publication, location, age range, sample size, types of stem cell, and dental specialties.Data Synthesis- We will perform a descriptive synthesis and will categorize the published studies into each dental specialty.

Results
The search strategy will identify studies that meet the inclusion/exclusion criteria.We will group the included studies among different dental specialties.Additionally, the results will be reported based on the following items:Stem cell by dental specialtiesStem cell by age and sample sizeStem cell by world regionType of stem cells

Conclusions
In this review, we summarize the existing evidence of stem cell usage in dentistry.To the best of our knowledge this is the first comprehensive review on the use of stem cell in dentistry across the world over time.Limitation- We only consider studies published in the English language, and studies published in other languages are not included.

Fit assessment of soft milled Co-Cr and zirconia fixed dental prosthesis compared to cast Co-Cr

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Purpose
The precision of soft metal processing technologies is poorly documented.This study compared marginal and internal fit of presintered cobalt-chromium (Co-Cr)and zirconia three-unit fixed dental prostheses (FDPs) to cast Co-Cr.

Methods
Three-unit FDPswere prepared onmetal dies (N=60) fromtypodont preparations of the maxillary right first premolar and molar. A standardizedpreparation of a metal-ceramic restoration was done on abutment teeth. The dies (N= 60) were scanned and divided into three groups (n = 20/group) to receive theFDP made of presintered Co-Cr (Ceramill Si), presintered zirconia (Ceramill Zi),and cast Co-Cr (Girobond NB). Each framework was seated on its specific cast. Areplica technique was used for marginal and internal discrepancies measurements inmesiodistal and buccolingual planes. Data were analyzed using the Levene test, t-test,and analysis of variance ($\alpha = 0.05$).

Results
When the overall mean discrepancy valueswere compared in the mesiodistalplane, a significant difference was found between Ceramill Sintron and Ceramill Zigroups ($p = 0.026$). No significant difference was detected between Girobond NBand Ceramill Sintron groups and between Girobond NB and Ceramill Zi groups ($p =0.537$ and $p = 0.569$, respectively). In the buccolingual plane, there was no significantdifference in the overall mean discrepancy between the three groups: CS/CZ ($p =1.000$), GI/CS ($p = 0.51$), and GI/CZ ($p = 0.87$). Significant differences at severalmeasurement points were found at the inter or intramaterial level. The increase indiscrepancy values between marginal and occlusal measurements was evident for thethree groups.

Conclusions
Presintered three-unit FDPs fabricated from zirconia and Co-Cr exhibitedinternal and marginal discrepancy values similar to cast Co-Cr. A significantdifference was reported between CS and CZ in mesiodistal planes. The axial andmarginal differences in values for the three tested groups were below or around the120 Î¼m clinically acceptable threshold except for the occlusal area. When comparingfirst premolar to first molar, the internal and marginal discrepancies were similar withno apparent distortion of the framework after the sintering process.

Literature Review of Athletic Oral Health Examinations: Development of a Pre-Participation Dental Screening Examination Form

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Purpose
The purpose of the study is to highlight the various methods used to document dental caries among athletes and develop a standardized pre-participation dental screening form for dental examiners.

Methods
Studies which focused on pre-participation screening of athletes were analyzed to determine how the oral health and diseases were recorded among the athletes.

Results
Five studies choose to simply identify the percentage of athletes that have caries. Two studies choose to use a DMFT (decayed, missing, filled teeth) score. One study chooses to use ICDAS (International Caries Detection and Assessment System). Studies that use DMFT as the method for caries assessment do not convey an accurate picture of the athletes' current state of active caries or urgency of need for treatment. Studies that use a "percent of athletes with caries" as the method for caries assessment do not convey an accurate picture of the athletes' current severity of caries and the urgency of need for treatment. The best method for recording caries is the ICDAS (International Caries Detection and Assessment System). This system allows the assessing dentist to record not only caries prevalence, but the extent of the caries progression.

Conclusions
A standardized pre-participation dental screening form is needed utilizing the ICDAS.

NEVADA ABSTRACTS

#1: **Monoaminergic and glutamatergic properties of the rapid-acting antidepressant RO-25-6981 and its analogs**

Courtney Dawes;[1] Nikki Ghazimorad;[2] Jessica Wirtz;[2] Danielle Valls;[2] Jacob Newby;[2] Julius Janson;[2] Visanou Klaharn;[2] Robert Kirsh;[3] Christopher So;[2] David Rawlins;[2] Jeffery Talbot;[1]

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Purpose
Rational design of lead compounds targeting serotonergic and glutamatergic systems is critical to developing novel therapeutics for treating psychiatric disorders. The ketamine-like glutamatergic antagonist RO-25-6981 exerts both rapid and sustained antidepressant-like activity. The purpose of the current study is to develop RO-25-6981 analogs that delineate antidepressant-like mechanisms of NR2B-selective NMDA receptor antagonism and monoaminergic reuptake transporter inhibition in behavioral models.

Methods
Wild-type C57BL/6J mice and heterozygous transgenic mice deficient in NR2b subunit expression of the NMDA receptor (Grin2btm1.1(Grin2a)Bjha)) were utilized in the study. To assess antidepressant-like behaviors, the tail suspension test (TST) and locomotor activity (LA) tests were performed using RO-25-6981 and its analogs with traditional antidepressant drugs, including the serotonin selective reuptake inhibitor fluoxetine and the tricyclic antidepressant desipramine, as positive controls for monoaminergic reuptake activity.

Results
In the TST, six RO-25-6981 analogs (TR-2, TR-4, TR-5, TR-6, TR-13, and TR-17) were found to exhibit antidepressant-like activity in wild-type mice following acute administration (i.p., 30 min) compared to vehicle-treated controls, with varying potency but similar efficacy comparable to RO-25-6981 and the traditional monoaminergic antidepressants fluoxetine and desipramine. Other TR analogs tested showed no antidepressant-like activity, despite possessing reported NMDA receptor antagonist activity via mid- to low-nanomolar binding affinity at the NR2B subunit. In contrast, increasing serotonin reuptake transporter inhibition via the addition of a tertiary amine increased antidepressant-like activity of TR-17. Interestingly, RO-25-6981, TR-5 and TR-17 exhibited similar antidepressant-like activity in wild-type and NR2B-deficient mice. Unlike RO-25-6981, all TR compounds profoundly limited motor activity suggesting independent psychotropic vs. generalized locomotor effects.

Conclusions

Taken together, these data suggest that the antidepressant-like activity of RO-25-6981 and its analogs does not correlate with the degree of NMDA receptor antagonism. Furthermore, these data point to serotonergic reuptake inhibition contributing to the overall antidepressant-like activity of RO-25-6981 in animal models of mood.

#2: **Development of a Method for Detecting and Quantifying Epicatechin in Cinnamon Extract Supplement Capsules**

Danielle Valls;[1] Gilbert Castañeda;[2] David B. Rawlins;[3] Traci Carranza;[2] Jeff Dorsett;[2] Mohammed Khalid;[2] Brandon Renninger;[1] Casey L. Sayre[1]

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Purpose
Cinnamon has a long history of use as a medicinal plant. Polyphenolic type-a polymers present in cinnamon are believed to have an insulin-potentiating effect, which may be beneficial in diabetes. Currently, there are no published HPLC methods to identify and quantify type-A polymers in Cinnamon 400™ capsules. An analytical method is necessary to evaluate Cinnamon 400™ for the concentration of its beneficial components. Since it occurs in the structure of all type-A polymers, epicatechin was selected as the initial analyte.

Methods
Dissolution testing of Cinnamon 400™ was performed in multiple solvent combinations. 500mg of the extract powder was added to 2.5mL of the solution. After vortexing and centrifugation, the supernatant was filtered using a 0.45 µm PTFE syringe filter. Utilizing a C18 column on the HPLC, a reversed-phase gradient elution was developed; beginning with a mobile phase consisting of (A) 92% 0.1% formic acid in water and (B) 8% acetonitrile for 20 minutes. At 20 minutes it transitioned to 75% (A). At 30 minutes it transitioned to 10% (A) and remained for 5 minutes. At 37 minutes, there was an 8-minute transition back to 92% A. The maximum UV absorbance was at 280nm and the flow rate was 1.8 mL/minute.

Results
Testing showed that a 1:1 solution of acetonitrile and 0.1% formic acid in water was optimal for the dissolution of Cinnamon 400™ extract powder. Epicatechin standard calibration curves exhibited observed linearity with coefficients of correlation of 0.99. Epicatechin separation occurred at 8.245 minutes. No co-interfering peaks were seen during the elution window of epicatechin, indicating specificity of the assay.

Conclusions
A sensitive, accurate and reproducible assay was developed for the detection and quantification of epicatechin using HPLC with UV detection. The method will be applied to the content analysis of epicatechin in Cinnamon 400™ capsules. Further work is needed to achieve the comprehensive quantification of type-a polymers in Cinnamon 400™ extract.

#3: **Inhibition of pathogenic homologs of glycogen synthase kinase (GSK)**

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Purpose
New treatments and targets are needed for protozoal neglected diseases, such as leishmaniasis, where resources for drug discovery are low. Similarly, new treatments could help combat drug resistance against opportunistic fungal diseases, such as aspergillosis. In eukaryotic pathogens like Leishmania donovani and Aspergillus fumigatus, protein kinases represent upwards of 1.5% of the predicted proteome with varying homology with human protein kinases. To explore repurposing of previously discovered molecules against such pathogens, we tested known inhibitors of human glycogen synthase kinase (GSK) against recombinant L. donovani GSK and A. fumigatus GSK.

Methods
Kinase assays were adapted from a commercial kit utilizing product accumulation (generation of ADP) from GSK-catalyzed reactions of ATP and peptide substrate in vitro. Enzyme kinetics and characterization were performed on recombinant LdGSK and AfGSK, and known human GSK inhibitors were screened for bioactivity. Molecular mechanisms of action of this small panel of inhibitors were conducted by varying substrate concentration and incubation times of substrates and inhibitors.

Results
Michaelis Menten constants (Kms) for ATP were found to be approximately 40 μM and 30 μM for LdGSK and AfGSK, respectively. The small panel of known human GSK inhibitors had variable activity between the two pathogenic GSKs, as well as compared to literature values for human GSK. Small molecule tideglusib was found to have time-dependent action.

Conclusions
Differences in bioactivity from pathogenic protein kinases versus human homologs gives promise to efforts to repurpose known inhibitors. Future directions will include screening larger panels of molecules and testing active molecules against pathogen cultures.

#4: **Development of Bacteriophage Therapy for Novel Treatment of Bacterial Infections**

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Purpose

Bacteriophages have been used to treat bacterial infections for over 100 years in some parts of the world, but their use in the West was discontinued as antibiotics were discovered. The use of antibiotics since the 1950s has resulted in multidrug resistance genes in many bacterial pathogens. The objective of this research project is to develop novel bacteriophage therapies against human pathogenic bacteria which are becoming difficult to treat using conventional antibacterial drug regimens.

Methods

Bacteriophages will be enriched from wastewater samples or environmental water samples, amplified on pathogen broth cultures, isolated by plaque assay, and individual phage plaques harvested. Phage stocks are prepared and cryopreserved. The phage stocks will be characterized by molecular techniques to determine genome type, size, and sequence.

Results

Preliminary results show that the supplemented broth medium we developed will enable us to isolate phages from environmental water obtained from the Bird Preserve located in Las Vegas, NV. We show that we were able to isolate phage specific against our chosen positive control bacteria, Escherichia coli. Plaque forming units (PFU) were quantified at $2.7 \times 10e10$ PFU/mL in one pond location, and $4.5 \times 10e10$ PFU/mL in a second pond location.

Conclusions

A selected number of phage plaques will be harvested and enriched on the Escherichia coli host used in the initial amplification to use as positive controls. Such phage stocks will be useful in developing phage cocktails for treatment against other bacterial pathogens, such as Neisseria gonorrhoeae, Streptococcus pneumoniae and Micrococcus luteus.

#5: **Exploring the Influence of Dopamine Using Caenorhabditis Elegans as an Experimental Model**

Mehri Dolati;[1] Ashley Hernandez;[1] Leyah Nguyen;[1] Christopher So[1]

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Purpose
Dopamine is related to several diseases such as Parkinson's Disease. Understanding the effects dopamine has on certain receptors can help us better understand how these diseases work and how to better treat them. The effects of multiple different G-protein-coupled receptor kinases (GRKs) on dopamine functions are also unclear. This is important to understand since these protein kinases control dopamine receptor activity. In this study, we use the model organism Caenorhabditis (C.) elegans lacking either GRK1 or GRK2 and explore the effects of dopamine on their locomotion and egg laying. This will help determine what functions they control within the nervous system and beyond.

Methods
C. elegans were treated with dopamine and the decrease in egg laying and locomotion was studied. Briefly, C. elegans were treated for 0, 30 min, 1 hour or 1 day with various concentrations of dopamine. Then their egg laying was counted and their locomotion (measured by "flicks" per minute) was measured. Data was analyzed by graphpad prism.

Results
In this study, GRK-null animals demonstrated a different reaction compared to the wild type animals. Preliminarily, all animals demonstrated a loss of egg laying when treated with high dopamine concentrations overnight. However, dopamine appeared to be more effective in inhibiting locomotion behavior in C. elegans without GRK1 or GRK2.

Conclusions
In this study, C. elegans with or without various GRKs were treated with dopamine in order to understand how these protein kinases can control dopamine receptor effects.. In particular, C. elegans lacking GRKs demonstrated decreased locomotion in response to dopamine. This suggests that GRKs control dopamine effects and their variations in the human brain observed in certain diseases may be important in altering normal dopamine activities. In turn, this may help treat diseases associated with dopamine dysfunction.

#6: **Exploring the Effects of Doxorubicin on Osteosarcoma U2OS Cells without G protein Coupled Receptor Kinase 5: Recovery and Colony Formation**

Sirada Durso;[1] Tien Le;[1] Christopher So;[1] Kevin Nguyen[1]

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Purpose
Potential mechanisms of resistance to cancer treatment in osteosarcomas are important to study because these may prevent apoptosis usually caused by select drug regimens. One such class of protein kinases that may contribute to the progression of cancer are the G protein coupled receptor kinases (GRKs). In particular, GRK5 may act as an oncogenic factor. In this study, the recovery and subsequent colonization of control and GRK5 knockout osteosarcoma U2OS cells was tested after doxorubicin treatment.

Methods
Osteosarcoma U2OS cells, stably transfected with either control or GRK5 shRNA, were treated with doxorubicin for 24 hours. Cells were then replated in fresh growth media. Then cell recovery after 3 days or 1 week was counted. For colony formation, cells were fixed by methanol, stained and number of cells per colony was counted.

Results
Overall, the effect of doxorubicin on recovery and colony formation was the same between the 2 cell lines. Doxorubicin did reduce the recovery of cells with or without GRK5. Furthermore, smaller colonies were formed when either cell line was treated with doxorubicin.

Conclusions
In this study, we tested the effect of doxorubicin on recovery and colony formation of U2OS cells with or without GRK5. We found that doxorubicin was equally effective in inhibiting either activity in cells with or without GRK5. It is unclear, however, if the combination of doxorubicin with other drugs may demonstrate the similar effect considering doxorubicin is combined with other drugs for treatment of osteosarcoma. Furthermore, it is unclear if other cancer cell activities could be affected by the combination of the loss of GRK5 and doxorubicin treatment.

#7: **Exploring the Effect of G Protein Coupled Receptor Kinase 5 in the Migration of Osteosarcoma U2OS Cells Post-Doxorubicin Treatment**

John Powers;[1] Mira Hanna;[1] Kevin Nguyen;[1] Christopher So[1]

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Purpose
Previously, it was shown that G protein coupled receptor kinase 5 (GRK5) has an ability to modify chemotherapeutic responses of cancer cells. In this study, we will test the ability of GRK5 to modify the effect of doxorubicin on cancer cell migration in osteosarcoma U2OS cells with or without GRK5. This is important since determining how this kinase affects metastasis post-doxorubicin treatment can help us determine to what degree the cancer cells will migrate and ultimately metastasize.

Methods
Osteosarcoma U2OS cells, stably transfected with either control or GRK5 shRNA, were treated for 24 hours with doxorubicin. Then the cells were replated onto boyden chambers and allowed to migrate for 48 hours towards the lower chamber containing 20% growth serum. The chamber was then collected, cells fixed and stained. Number of cells that has migrated was subsequently counted.

Results
Preliminarily, there was more migration observed for doxorubicin- treated GRK5 shRNA U2OS cells compared to control shRNA U2OS cells. This may relate to the increased viability of GRK5 shRNA cells observed previously after 72 hours of doxorubicin treatment.

Conclusions
In this study, we aimed to test the effect of GRK5 on osteosarcoma cell migration post doxorubicin treatment. Preliminarily, this study showed that doxorubicin-treated GRK5 shRNA cells migrated more than control shRNA cells. This suggests that certain cancer cell function post doxorubicin treatment may be partially retained in GRK5 shRNA cells. Whether other functions, such as invasion, are retained as well is unclear. Overall, this implies that there may be a role of GRK5 in U2OS cancer cell activity.

#8: **Ophthalmic Drug Delivery Using 3D-Printed Hydrogels Containing Covalently-Bound Drugs**

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Purpose
The delivery of ophthalmic medications presents many challenges, especially when using topical eye drops where a precise dose is often hard to achieve. This leads to variable therapeutic efficacy. Current glaucoma pharmaceuticals are formulated as eye drops and are most effective when administered during the night. One potential way to provide a more precise dose would be to use a hydrogel layer, similar to a contact lens, to deliver the medication. With the ability to print hydrogels on a 3D printer, we have been exploring the possibility of printing hydrogel layers that contain defined concentrations of ophthalmic drugs.

Methods
We are using a Elegoo Mars 2 Pro stereolithography (SLA) 3D printer to create hydrogels which incorporate small molecule drugs into biocompatible acrylate layers. Commercial resins are not suitable for ocular administration, so we have been creating our own resins using a variety of monomers, cross-linkers, and photoinitiators. Various ratios of monomers in the resin have been explored to determine the optimal mixture for printing clear, flexible layers. The incorporation of a small molecule drug was simulated using the fluorescent dansyl group covalently bound to 2-hydroxyethyl methacrylate monomer. Varied amounts of the dansyl monomer were incorporated into printed layers and fluorescence spectroscopy was used to analyze the degree of incorporation.

Results
Various ratios of monomers and cross linkers were explored until a clear, flexible layer was produced. While exploring these different mixtures, we observed that they required exposure to light for a longer period of time than commercial resins. When we added the dansyl monomer into the mixture, we were able to show incorporation of fluorescence into the layer in a concentration-dependent manner.

Conclusions
By varying the concentrations of the monomers and the exposure to light, we have been able to make resins that print with the SLA 3D printer and form clear, flexible layers. We have also demonstrated the feasibility of incorporating small molecule drugs into the layer by using a fluorescent marker. Current efforts are focused on producing layers that allow for more infiltration of water into the layer, as well as exploration of drug linkers. This work is ongoing.

#9: **Exploring the Effects of G Protein Coupled Receptor Kinase 5 on Osteosarcoma Cell Adhesion**

<u>Raven Reyes</u>;[1] Alea Avila;[1] Kevin Nguyen;[1] Christopher So[1]

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Purpose

Osteosarcoma is the most common cancer to affect children and many of these tumors have already metastasized upon diagnosis, most commonly to the lungs. Metastatic osteosarcoma has a poor prognosis, with 20-30% of patients surviving long term. Figuring out the mechanism of the movement of osteosarcoma cells can help us to find drugs that will keep the cancer localized or even eliminate the cancer from the body, thus improving survival rates. Doxorubicin and other potential medications may have the potential to slow or even inhibit the spread of osteosarcoma cells. G protein coupled receptor kinases are involved in cell signaling and cell functions that can lead to cancer cell progression, proliferation and growth. The purpose of this study is to test if the presence or absence of GRK5 and treatment with or without doxorubicin affects the spreading or adhesion of osteosarcoma U2OS cells.

Methods

In this study, osteosarcoma U2OS cells, stably transfected with control or GRK5 shRNA, were treated with doxorubicin. Subsequently, adhesion to fibronectin-coated surfaces from 0-40 minutes were measured after fixation and staining. Spreading was studied and measured under microscopy after allowing cells to adhere for 40 minutes.

Results

Cells without GRK5 showed a reduced ability to adhere compared to cells with GRK5. Upon doxorubicin treatment, reduced adherence was not observed with GRK5 shRNA cells unlike control shRNA cells. No difference in spreading was observed in untreated and treated cell lines.

Conclusions

In this study, we tested the effect of doxorubicin on GRK5- null U2OS cells, observing for effects on spreading and adhesion. This study showed no effect on spreading. However, it appears that GRK5 null cells showed the same extent of adhesion with or without doxorubicin treatment. This means that GRK may work in conjunction with other mechanisms to contribute to cancer cell metastasis.

#10: **Investigating the Relationship between Fluoxetine and G protein Coupled Receptor Kinases Utilizing Caenorhabditis Elegans as an Experimental Model**

Brandon Strickhouser-Monzon;[1] Antonette Soliven;[1] Christopher Hernandez;[1] Christopher So[1]

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Purpose
Selective serotonin reuptake inhibitors (SSRIs) are commonly prescribed for depression. However, their effects on how G protein coupled receptor kinases (GRK), protein kinases that modify serotonin receptor activity, can change their effectiveness is unclear. This is important to determine since GRK expression levels can be modified in various neurological disorders. In this study, we examine the effects of fluoxetine on serotonin-mediated egg laying activities in Caenorhabditis elegans. We then examine the effects of serotonin after this initial treatment.

Methods
3 day old C. elegans, either N2 (wild type), GRK1 or GRK2 knockout C. elegans, were treated for 24 hours within their NGM plate with 1 microM or 10 microM fluoxetine. Then the eggs were moved to plates coated with 10 microM serotonin for an additional 24 hours. Egg laying after both 24 hours fluoxetine treatment followed by 24 hours serotonin treatment was then counted. Eggs laid was interpreted as eggs laid per worm.

Results
The different C. elegans strains had different responses, suggesting that GRK protein levels can play important roles in serotonin signaling modified by fluoxetine. On day 1, after 24 hours of fluoxetine exposure, the wild type N2 animals responded to increases in fluoxetine levels by significantly increasing egg laying. This is similar to that which was observed with animals lacking GRK1. Animals lacking GRK2, however, did not respond significantly to any dose of fluoxetine tested. These GRK2 knockout animals, however, did show significantly higher levels of baseline egg laying compared to N2 wild type or GRK1 knockout animals. Querying responses to 5 mM serotonin treatment for 24 hours after fluoxetine treatment or not on day 2, the N2 wild type animals did not respond to 5 mM serotonin with or without fluoxetine pretreatment whereas the GRK1 knockout animals did respond to 5 mM serotonin, regardless of previous fluoxetine pretreatment. Interestingly, GRK2 knockout animals continued to be non-responsive to serotonin in terms of egg laying with or without fluoxetine pretreatment but did continue to lay higher baseline levels of eggs on day 2 of the experiment .

Conclusions

In this study, we saw different reactions of C. elegans to fluoxetine, depending on if it lacks GRK1 or GRK2. Of note, animals lacking GRK2 did not respond to fluoxetine at the concentrations tested nor did it respond to serotonin after fluoxetine treatment. This suggests that GRK2 knockout animals lack an ability to respond to fluoxetine. Combined with the reaction to fluoxetine of the GRK1 knockout animals, where the animals behaved similar to N2 wildtypes in response to fluoxetine but continued to respond to serotonin later on in their lifespan, these results suggest that GRKs may play an important role in modifying responses to SSRIs in the human brain.

#11: **Utilizing a Bioinformatic Approach for Identifying New G-Protein Coupled Receptor Kinase 5 Interacting Proteins - What Can We Learn from What is Known?**

Ivana Ganeva;[1] Gabriela Cepeda;[1] Yen Pham;[1] Alyssa Marie Viloria;[1] Christina Trinh;[1] Nick Callanta;[1] Christopher Hernandez;[1] Christopher So[1]

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Purpose
In addition to phosphorylating activated forms of G protein coupled receptors (GPCRs) leading to their desensitization, G protein coupled receptor kinase 5 (GRK5) can also phosphorylate some non-GPCRs, with these protein-protein interactions playing many roles in a variety of diseases. Identifying what other proteins GRK5 can additionally phosphorylate and interact with could be important since this protein kinase is involved in the development of a number of diseases. In this study, we attempt to identify new GRK5 phosphorylation substrates by identifying common features of known GRK5 substrates to come up with consensus amino acid sequences and characteristics that would be used to query for new proteins using bioinformatic tools.

Methods
We used bioinformatic databases (Uniprot, Phosida) and BLAST-P from NIH as well as the phosphorylation site predictor GPS (2.1, 3.0, 5.0). We utilized GPS to identify the best and worst GRK5 substrates. The sequences of the best predicted GRK5 phosphorylation sites were aligned with those of known GRK5 phosphorylation sites and a consensus sequence was predicted. This was then used in BLAST-P searches to identify proteins. The identified proteins were then queried for their potential to be GRK5 substrates. Their disease affiliations were also queried using proteinatlas.org.

Results
Using this approach, a number of potentially good GRK5 substrates were discovered, with some potentially having a high possibility of being a better GRK5 substrate based on their post-translational modifications. Of interest, some established GRK substrates were deemed to be better GRK5 substrates than others by analysis with GPS. Some contain certain post-translational modifications that could make them better substrates, although no consistent modification was observed. Doing BLAST-P searches on the consensus amino acid sequence, some candidates were identified, with some proteins being predicted to be better GRK5 substrates compared to others. Of note, a number of substrates are key prognostic indicators for breast and renal cancer.

Conclusions

In this study, we sought to identify GRK5 substrates using bioinformatic approaches. Overall, our preliminary attempt showed that maybe we can identify new GRK5 substrates by using what is known about previously established GRK-interacting proteins. For example, a number of proteins were identified that matched our consensus amino acid sequences entered, with some being better matches than others. This suggests that using this approach may help us identify potential GRK5-interacting proteins, which will help us determine the importance of GRK5 in disorders associated with their various interacting proteins.

#12: **Exploring G Protein Coupled Receptor Kinase Mutations in Cancers- Lessons Learned**

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Purpose
Mutations of various proteins can play a relevant role in many cancers. We may be able to design and implement various treatment strategies if we know which mutations are the most relevant to certain cancers. This study compiles different mutations found for each G protein coupled receptor kinases (GRKs) in various cancers. GRKs are important in cancers because of their role in regulating receptor activity as well as play key roles in abnormal cancer cell growth. The results of this study would help us determine the importance of these mutations leading to cancers.

Methods
Mutations associated with GRKs (1-7) were compiled from the Cancer Genome Atlas (TCGA) and classified according to type, location and prevalence of these mutations.

Results
In the analysis of GRK mutations, a number of different characteristics were observed for the different GRKs. Missense mutations were the most common type of mutation found with GRK3 having the most missense mutations. GRK6 had the most synonymous mutations. The majority of mutations are found in the catalytic domains of the protein kinases.

Conclusions
In this study, we analyze the data of different mutation types of the seven studied GRKs to potentially determine how these mutations can help lead to cancer. We observed that missense mutations are the most common type of mutation found. Also, most mutations are found in the catalytic domain. This may imply a change in GRK phosphorylation activity in cancers which may contribute to abnormal cell activity. This information could help in predicting potential connections between the mutation and cancers associated with them.

#13: **Proposed Study to Explore the Relationship between G protein Coupled Receptor Kinases and Colorectal Cancer Progression**

Tracey Phan;[1] Maria Cruz;[1] Hyunh Le;[1] Alex Kay;[1] Claudia Pham;[1] Moses Kim;[1] Christopher So[1]

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Purpose

Abnormal G protein coupled receptor kinases (GRKs) expression can lead to the development of colorectal cancer and contribute to its pathophysiology. For example, abnormal functions of various kinases are linked to progression and recurrence of cancers. Identifying a link between abnormal protein kinase expression and patient outcomes can provide a way to predict the probable outcome of future colon cancer cases and thus could contribute to the development of detection, prevention and intervention strategies. This would improve long term results and prognosis. In this study, we will be attempting to discover a link between abnormal GRK expression and colorectal cancer prognosis.

Methods

In this study, we utilized the database oncopression (oncopression.com) to compile GRK expression results in colorectal cancer patients. Therefore, we will assess the survival of patients with high individual GRK levels, looking at factors such as gender, age and ethnicity. This information will be gathered from proteinatlas.org.

Results

Thus far, we have discovered that the expression of all GRKs are increased in colorectal cancer patients. To determine the significance of this increase, survival data of colorectal cancer patients associated with high levels of GRKs was collected. Thus far, a data set of 597 patients has been collected, with the average age of 66.1 years.

Conclusions

Thus far, we have discovered that the expression of all GRKs are increased in colorectal cancer patients. To determine the significance of this increase, survival data of colorectal cancer patients associated with high levels of GRKs was collected. Thus far, a data set of 597 patients has been collected, with the average age of 66.1 years.

#14: **A Composition of Phytonutrients for Glycemic and Weight Management**

Yasuyo Urasaki;[1] Timothy Le[1]

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Purpose

Maintaining healthy body weight is an important component of any effective diabetes management plan. However, glycemic management using insulin generally leads to weight gain. In addition, weight loss medications prescribed for diabetes management are often associated with adverse side effects, which limit their long-term usage. Alternatively, nutrition intervention provides a safe, readily accessible, and inexpensive option for diabetes management. This study explores nutrition intervention for diabetes management via the improvement of insulin sensitivity without weight gain or adverse side effects.

Methods

Primary human omental preadipocytes are used to investigate the interaction of berberine, cinnamaldehyde, curcumin, and insulin on the activation of Akt2, glucose uptake, and fat cell differentiation. In addition, a diet-induced obesity murine model is used to assess the efficacy of a dietary supplement comprising berberine, cinnamaldehyde, and curcumin for glycemic and weight management.

Results

In primary human omental preadipocytes, cinnamaldehyde and curcumin additively enhance insulin-stimulated activation of Akt2 and glucose uptake, whereas berberine inhibits de novo fatty acid biosynthesis and fat cell differentiation. In a diet-induced obesity murine model, a dietary supplement with berberine, cinnamaldehyde, and curcumin prevents weight gain, improves glucose tolerance, and reduces HbA1c, blood lipids, visceral adiposity, and liver steatosis.

Conclusions

Collectively, the composition of phytonutrients comprising berberine, cinnamaldehyde, and curcumin protects against obesity and pre-diabetic conditions in a diet-induced obesity murine model. Safety and efficacy assessment of nutrition intervention using combined berberine, cinnamaldehyde, and curcumin for glycemic and weight management in future clinical trials are warranted.

#15: **Detection and Quantitation of Changes in Gene Expression of Heat Shock Proteins 27 (HSP27), HSP 70, HSP 90 and HSP 47 in Doxorubicin-Exposed Human Cells by RT-qPCR**

H Stephen Lee;[1] Christopher So[1]

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Purpose
To detect and compare the changes of Heat Shock Proteins (HSP27, HSP70, HSP90 and HSP47) gene expression in response to doxorubicin in human HeLa cells. HSPs are a family of molecular chaperones and are known to confer additional defense against cellular stress, such as heat, and chemical exposure, including antineoplastic chemotherapy resistance in drug-resistant tumor cells.

Methods
Cultured HeLa cells were utilized as a model in this investigation. Briefly, cells in culture were exposed to 100 micromolar of doxorubicin or vehicle (DMSO) for 24 hours. Total RNA was isolated, and 1 nanogram of total RNA underwent reverse transcription and quantitative polymerase chain reaction (RT-qPCR) with Sybr Green dye, using published primer sequences for HSP27, HSP70, HSP90, and HSP47 and normalized against beta-actin or GAPDH at a final concentration of 100 nanomolar. The RT-qPCR was performed at 37 degrees Celsius for 20 minutes, followed by denaturation and a hot-start PCR at 95 degrees Celsius for 10 minutes, and then denaturing-annealing-extension steps for 40 cycles at 94 degrees, 60 degrees, and 72 degrees Celsius for 10, 30 and 30 seconds, respectively. Lastly, a melt curve analysis was performed, and the data were captured and analyzed by software.

Results
HSP27, HSP70, HSP90, and HSP47 mRNA were all detected using the above method, with the PCR reaction reaching a plateau between cycles 30 to 35. After normalization against the detected quantity of beta-actin mRNA, the changes of gene expression were noted to have altered by the doxorubicin exposure.

Conclusions
HSP27, HSP70, HSP90 and HSP47 mRNA were detected in the present cell culture model and changes in gene expression of these by RT-qPCR method were noted. Future directions include a shorter doxorubicin-exposure time as well as at varying concentrations of doxorubicin treatment.

#16: **Evaluation of Remineralization of White Spot Lesions with Quercetin Nanoparticles**

Brian Decker;[1] Karthikeyan Subramani[1]

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Purpose
One of the most common side effects of orthodontic treatment is the development of white spot lesions (WSLs). WSLs are areas on the tooth surface where there has been degradation of the outer layers of enamel. This degradation is due to demineralization caused by extended periods of plaque buildup. This results in an unsightly, opaque and chalky white lesion on the tooth surface that is difficult to reverse with currently available products.

Methods
Currently, many new bioactive compounds are under investigation for treatment and prevention of WSLs. One class of such compounds are referred to as flavonoids, which are phytochemicals (plant-derived plant chemicals forming plant pigments), found in almost all fruits, vegetables, and beverages such as tea and wine. Our research project will be evaluating the remineralization potential of one such flavonoid in nanoparticle form - Quercetin.

Results
The overall Objective of this research project is to evaluate the remineralization potential of Quercetin nanoparticles as a remineralizing agent for the treatment of WSLs. We hypothesize that quercetin nanoparticles can serve as biotemplates for remineralization of artificial WSLs on extracted human teeth. Quercetin has been investigated for WSLs re-mineralization before, but not in nanoparticle form. We hypothesize that by reducing the typically microscale (10-6 m) particles to the nanoscale (10-9 m), there will be the possibility of higher density of nanoparticle deposition (and therefore remineralization potential) into deeper layers of the demineralized enamel due to the smaller sized particles in the nanometers.

Conclusions
Thus far, we have successfully fabricated Quercetin nanoparticles, tested their size distribution, and analyzed the particles with SEM analysis. We found the average size of Quercetin NPs in suspension when measured, the size was 678.9 nm (Fig. 1). Further SEM analysis of NPs showed that the QNPs were rod shaped with length ranging from 500nm to 700nm and width of 162nm. We have measured the re-mineralization of the enamel using a Vicker's surface microhardness tester, and are awaiting statistics. Quercetin nanoparticles showed similar remineralization potential as fluoride in the hardness tests. We are now awaiting SEM Imaging of the treated surfaces and EDX analysis.

#17: **Orthodontic treatment modalities, do the finished smiles differ?**

Dafjola Bejleraj;[1] Mehtab Warrya[1]

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Purpose
This project will evaluate the level ofaccuracy of orthodontists at determining thetreatment mechanism used to treat a caseby examining only smile esthetic and frontalocclusion. There have been studies thathave looked at esthetic indicators and howthey impact both the orthodontist and thelayperson's assessment of the case.However, this study is unique in that it willexplore orthodontist bias against certaintreatment mechanisms and how that biasmay impact their accuracy in assessingtreatment mechanisms given smile estheticand frontal occlusal outcomes

Methods
This research utilizes a cross-sectionalstudy which will be assessed by use of asurvey. The survey will consist of two mainquestions across multiple outcomephotographs and ten additional demographicand treatment preference questions. The survey will be distributed onlineto 4400 orthodontists through the AAO.There will be a compilation of smile andfrontal occlusion photos (one frontalocclusion and one smile for each case) withtwo accompanying questions for each. Onequestion asks the orthodontists to rate thephotos esthetically based on the smile andocclusion and the other asks them toidentify the treatment mechanism provided.The photo combination will consist of 20finished cases who have already beentreated with different orthodontic treatmentmechanisms including Invisalign, traditionalbraces, in-house-aligners, andteleorthodontic approaches. The cases willthen be divided into 4 groups consisting of 5subjects for each orthodontic treatmentapproach from a sample size of 20 subjects.

Results
This research project is still in progress.

Conclusions
Hypothesis: Evaluating the outcome of acase based solely on the smile and frontalocclusion, orthodontists will not be able toaccurately determine the treatmentmechanism used. But their biases withregards to which treatment they believe tobe most effective and capable of creatingthe best outcome will become obviousbased on how they evaluate the estheticresult and which treatment category theychoose.

#18: **CBCT's significance for orthodontic treatment planning**

Christina Kass Iliyya;[1] Tharani Theivakumar[1]

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Purpose
There is a lack of consensus among the orthodontic community regarding the use of CBCT as the standard of care. The AAO recommends they only be used in specific cases. Current literature on the indications and application CBCT findings on orthodontic patients' diagnoses and treatment plans is conflicting.   Historically orthodontists have been reluctant to embrace change. For example, when cephalograms were first introduced into orthodontics there was also a resistance and lack of consensus for routinely implementing them, yet now they are the standard of care.   The objective of this study is to help illuminate the utility of CBCTs in orthodontic practice.

Methods
This study will comparatively analyze orthodontic treatment plans made using traditional methods (panoramic and lateral cephalometric radiographs, model casts, iTero scans, and both intra-oral and extraoral photographs) both with and without CBCTs. We will include 62 patients in the study

Results
We will evaluate the results of the study and assess if there's a need for CBCT when treating each orthodontic patient.

Conclusions
Conclusions will be drawn from the results regarding the significance of CBCT

#19: **Referral Patterns of Neonatal Healthcare Professionals for Cleft Lip and Palate Patients**

Alyssa Morrow;[1] Ahmad Roosta[1]

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Purpose

Cleft Lip and Palate patients are some of the most vulnerable and complex orthodontic patients. They face a myriad of health challenges including psychological, nutritional, auditory, speech, airway, skeletal, and dental.Ideal comprehensive treatment for CLP patients is provided via multidisciplinary teams of healthcare providers.However, there is currently limited access to proper multidisciplinary care for CLP patients in the US, partly due to lack of education regarding available resources. For the most effective treatment and optimal outcomes, it is essential that coordinated care starts at birth and that parental education begins as soon as CLP is detected in utero. This research aims to improveCLP careby raising awareness amongst healthcare professionals regarding craniofacial orthodontic care for thesepatients, proper treatment sequencing, and local resources available. This study will focus on two major cities in the state of Nevada: Las Vegas and Reno but aims to expand nationwide, assuming a positive correlation is found between the educational program and neonatal healthcare professionals' referral patterns for CLP patients.

Methods

1. Data collection initiated after IRB approval2. Appropriate subjects identified and conferences selected in Las Vegas and Reno, NV3. Pre-survey questionnaire administered to all subjects in attendance4. Educational program delivered5. Post-survey questionnaire administered to same subject group as in Step 36. Statistical analysis performed to correlate pre-and post-survey data

Results

Study will be conducted in early March 2023, so we don't have data to analyze yet.

Conclusions

Study will be conducted in early March 2023, so we haven't drawn any conclusions yet.

#20: **Accuracy of orthocdontic diagnosis via tele-orthodontic consultation versus in-office consultation**

Delaram Mostafavi;[1] Andrew LaPray[1]

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Purpose
If proven that tele-orthodontics is accurate, many in-office appointments could be shortened or even in some cases eliminated. Orthodontic consultations for deciding on treatment or no treatment could be performed through tele-orthodontics and save a trip for the patient to the office. For treatment cases, Records could be accurately taken virtually and based on the diagnosis through tele-orthodontics, treatment plans could be planned by orthodontists even before meeting the patient in the office. Therefore, first in person appointment to the orthodontist is shorted and will be more efficient.

Methods
We will be using Microsoft Teams as our tele-orthodontic interface platform. We have entered into a HIPAA business associate agreement with Microsoft Teams to ensure that they will appropriately safeguard protected health information. Since Teams is both free and HIPAA compliant, it makes the perfect platform for this study. Patient self-taken photos will also accompany the tele-orthodontic session for better diagnostic accuracy. For HIPAA compliance we are using My Orthodontist by Dolphin to allow patients to directly upload their photos into their own clinical charts. Since the University already has a contract with Dolphin, the cost for the additional upgrade to allow photo upload by patients will cost $4195. The cost of the desks, privacy dividers, and computers will be covered by the university.

Results
NA

Conclusions
NA

#21: **Did the Pandemic Change Future Treatment Choices Amongst Orthodontists?**

Ryanna, Robinson;[1] John Atere[1]

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Purpose

The COVID-19 pandemic has presented orthodontists with several obstacles, as well as a shift in perspective on approaches to treatment planning and treatment. Due to the practice limitations imposed by the spread of the virus, many orthodontic offices turned to tele-orthodontics and greater use of clear aligner treatment. This study will survey orthodontists to determine whether adopters have found both tele-orthodontics and an increase in clear aligner treatment to be positive additions to their practice and a treatment modality that is effective and efficient for patient care and that they intend to continue. If not, why.

Methods

This research will consist of an exploratory study, assessed through a 19-question survey. The survey will have a cover letter discussing the aims of the study and will be distributed through the American Association of Orthodontists to approximately 6600 members, with the intention of recruiting a minimum of 50 respondents. The survey is composed of 19 questions, but some respondents will answer fewer questions depending on their response to earlier questions. The planned statistical analysis will be descriptive information analyzed in the form of percentage of categorical responses. This data will be compared according to various demographic information such as gender, years of practice, type of practice, etc. The survey questions were designed to: 1) establish demographics, 2) determine whether tele-orthodontics and clear aligners are used by the orthodontists in their practices 3) Assess whether or not the usage of clear aligners and tele-orthodontics has changed due to the Covid-19 pandemic. This study has been approved by the Roseman University of Health Sciences Institutional Review Board [

#2021-025]. Data collected will be analyzed with IBM® SPSS® version 26 (Armonk, NY). Descriptive statistics will be calculated using Chisquare tests.

Results
N/A

Conclusions
N/A

#22: **CBCT's Significance for Orthodontic Treatment Planning**

Tharani Theivakumar;[1] Christina Kass Iliyya;[1] Kimberly Jones-Rudolph[1]

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[1]Roseman University, AEODO/Orthodontics

Purpose
Current literature on the indications and application of cone beam computed tomography (CBCT) findings on orthodontic patients' diagnoses and treatment plans is conflicting. The AAO and orthodontists in academia and private practice, all have contradictory recommendations regarding when CBCTs should be used. It is imperative that more research is published on CBCTs impact on orthodontics. This study aims to gather specific data to evaluate if findings from CBCTs alter orthodontic diagnoses and treatment plans.

Methods
This study will comparatively analyze orthodontic treatment plans made using panoramic radiographs, lateral cephalometric radiographs, model casts, iTero scans, and both intra-oral and extra-oral photographs both with and without CBCTs. Previous research has found CBCT's to be more effective in detecting root resorption, orientation of impacted canines, and detecting condylar issues than is possible with 2D radiographs. Yet with regards to affecting treatment plans, research has found that the findings on CBCT's that most impacted a change in diagnosis or treatment plan were unerupted teeth, severe root reportions, or severe skeletal discrepancies. But there has been little research that explores the impact of CBCT's on treatment plans and ultimately the findings are important when assessing the utility of CBCT's in orthodontic practice. The question this research will attempt to answer is, do orthodontic diagnoses and treatment plans change after the consideration of CBCTs? The hypothesis is that only 20% of orthodontic diagnoses and treatment plans will change after the consideration of the findings from CBCT's.

Results
None - Research Grant was rejected

Conclusions
None - Research Grant was rejected

#23: **Planning a Review of the Pathogenesis and Management of Valley Fever**

Seattle RA Shakur;[1] Joseph A Dibenedetto;[1] Elaine P Tupas;[1] Megan De Armond;[2] Fariba Donovan;[3] Brian Donovan;[4] Brad A Haubrich;[1]

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Purpose

Valley Fever, also known as coccidioidomycosis, is a fungal infection endemic to desert locations. Illness is often pulmonary, though meningitis and other infections can occur. Cases globally are increasing, as are endemic areas, and climate change may exacerbate the worldwide burden. Although the Infectious Disease Society of America (IDSA) published treatment recommendations in 2016, standards of care continue to vary geographically. While there are several narrative reviews on Valley Fever's pathogenesis and treatment, a scoping review will bring together studies on Valley Fever presentation, diagnosis, and management. This review will compare the current treatments and dosing to find the most efficacious drug and best management of pulmonary symptoms for coccidioidomycosis. Additionally, our paper will discuss current diagnostic criteria and the presentation of coccidioidomycosis. This work will bridge this gap in the literature and may potentially inform better diagnosis and management of this growing health threat.

Methods

This literature review is being conducted in accordance with Joanna Briggs Institute (JBI) methodology. MEDLINE (PubMed), Embase (Elsevier), CINAHL (EBSCO) and Scopus (Elsevier) will be searched, and randomized controlled trials, case studies, and review articles will be included. Gray literature sources will include MedNar (Deep Web Technologies) and Dissertations and Theses Global (ProQuest), as well as reaching out to experts at hospitals in endemic areas.

Results

NA

Conclusions

NA

#24: **Gastral Projections: Comorbidity of Cryptosporidiosis and Inflammatory Bowel Disease**

Belinda Liu;[1] Alexander Schnider;[1] Megan De Armond;[2] David B. Banach;[3] Brad A Haubrich[1]

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[3]University of Connecticut , College of Medicine

Purpose
Cryptosporidiosis, the leading cause of moderate-to-severe diarrhea worldwide, is caused by the protozoan enterpathogen Cryptosporidium spp. In most cases, the illness is self-limiting, but in persons with immunocomprome, treatment with nitazoxanide or other anti-parasitic therapy is often required. Another rising cause of intestinal disease globally is inflammatory bowel disease (IBD), which includes ulcerative colitis and Crohn's disease. Diagnosis of cryptosporidiosis may be missed in patients with IBD, and it remains unclear if IBD comorbidity influences outcomes of cryptosporidial infection. The intent of this work is to systematically review the medical literature for presentation, diagnosis, treatment, and outcomes of cryptosporidiosis in the growing population with IBD.

Methods
This review is being conducted in accordance with Joanna Briggs Institute (JBI) methodology. MEDLINE (PubMed), Embase (Elsevier), CINAHL (EBSCO), and Scopus (Elsevier), will be searched. MedNar (Deep Web Technologies) and Dissertations and Theses Global (ProQuest) will be searched for gray literature. Randomized controlled trials, case studies, and review articles will be included. Originally, we had intended a systematic review focusing on treatment and outcomes in this patient group. Paucity of search results in a preliminary search on MEDLINE highlighted a knowledge gap regarding cryptosporidiosis and IBD comorbidity, and this prompted us to change our intent to scoping review instead of a systematic review, to add presentation and diagnosis to our research question, and to remove exclusion criteria.

Results
NA

Conclusions
NA

#25: **A systematic review of adverse drug reactions of therapeutics of ovarian cancer and its therapeutics**

Jennifer Ryu;[1] Gabriel Carlo Samaniego;[1] Surajit Dey[1]

Author Affiliations
[1]Roseman University, College of Pharmacy

Purpose
The purpose of this study is to explore pharmacologic and non-pharmacologic treatment options for the adverse drug reactions (ADRs) from monoclonal therapy in ovarian cancer.

Methods
Primary literature including trials and studies were reviewed from multiple sources including PubMed, the New England Journal of Medicine (NEJM), and the National Cancer Institute (NCI) to collect information regarding the ADRs of monoclonal therapy in ovarian cancer and how they were being treated.

Results
As there were many resources including literature and studies done on ovarian cancer treatment, the search was narrowed down to two specific monoclonal therapy options for ovarian cancer: bevacizumab and mirvetuximab soravtansine-gynx, ADRs of each medication were examined. Most common ADRs of bevacizumab, a monoclonal IgG1 antibody, included hypertension (HTN), hyperglycemia, hypermagnesemia, weight loss, constipation, diarrhea, loss of appetite, nausea, vomiting, altered taste, headache, arthralgia, hemorrhage, upper respiratory infection, nose bleed, and fatigue. The most common ADRs of mirvetuximab soravtansine-gynx included abdominal pain, constipation, diarrhea, nausea, cornea disorders, eye pain, visual impairment, and fatigue. Research is currently ongoing in order to determine the treatment of ADRs and the most efficacious treatment options being offered to treat the ADRs.

Conclusions
There is a broad range of ADRs in both bevacizumab and mirvetuximab soravtansine-gynx. Research of the treatment of ADRs caused by ovarian cancer therapeutics is currently ongoing.

#26: **Hemorrhagic Septic Emboli and Ring Enhancing Lesions Mimicking Neurocysticercosis**

Axel Rivas;[1] Mckenzie Merritt;[2] Jay Mahajan;[2] Aroucha Vickers[2]

Author Affiliations
[1]University of Nevada, Las Vegas, College of Medicine
[2]Valley Hospital Medical Center

Purpose
To raise awareness of neurocysticercosis as a possible etiology for a patient presenting with altered mental status and to recognize its various radiographic presentations.

Methods
NA

Results
A 67-year-old male with fatty liver disease presented to our hospital as a transfer for neurosurgical evaluation following detection of suspected hemorrhagic septic emboli seen on imaging. Patient had been febrile for 10 days, reaching temperatures as high as 104 °F. Prior to coming to our hospital, he was treated for a urinary tract infection but mentation continued to progressively decline. On examination, he was found to be somnolent, lethargic and disoriented but was otherwise grossly nonfocal. MRI of the brain exhibited ring-enhancing lesions after which the patient was started on empiric antibiotics including antibacterial, antiviral and anti-fungal agents along with dexamethasone. Further infectious and autoimmune serum and CSF work-ups were grossly non-revealing except a neutrophilic pleocytosis and eventual positive IgG immunoassay confirming neurocysticercosis. The patient's mentation continued to improve and he was transferred to a long-term facility in stable condition.

Conclusions
Neurocysticercosis is the most common CNS parasite in the world and increased immigration has resulted in an increase in the number of cases in the United States.(2) Neurological manifestations can include seizure, cognitive dysfunction, dementia, and visual hallucinations.(2,3) Radiographic signs include ring enhancing lesions initially that can calcify and sometimes can show a scolex inside the ring.(5) As reported by Mohamud et al, risk factors for neurological complications are a lack of treatment, with most complications already evident at the time of hospitalization or developing within a few days.(4) For mild to moderate infections, albendazole alongside a corticosteroid are recommended and did result in improvement in our patient's symptoms.(1) This case aims to emphasize the importance of understanding the many different etiologies for altered mentation to have rapid diagnosis of possibly life-threatening diseases and to recognize the various radiographic signs of neurocysticercosis.

#27: **Hypoglycemia: A Mimic of Global Ischemic Injury**

Zachary Leavitt;[1] Jay Babu;[1] Sannah Vasaya;[2] Robert Balsinger;[3] Aroucha Vickers[3]

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[3]Valley Hospital Medical Center

Purpose
To elucidate the detrimental effects of recurrent/prolonged hypoglycemia, the mostsevere of which is neuronal death visible on neuroimaging.

Methods
Case was reviewed with associated literature review.

Results
A 55-year-old female with hypertension, end-stage renal disease noncompliant withhemodialysis, and polysubstance abuse arrived to the ED with altered mentation, initiallynonverbal and only able to follow simple commands. She became progressively obtunded withrespiratory decline eventually requiring intubation. Upon examination, she was nonresponsivebeyond extremity withdrawal to noxious stimuli and intact brainstem reflexes. While laboratoryworkup revealed several metabolic derangements - transfusion-requiring anemia,hyperkalemia, hyperammonemia, and uremia - likely contributing to her encephalopathy, theworsening obtundation coincided with a period of refractory hypoglycemia lastingapproximately 48 hours. Despite administration of Dextrose, blood glucose was undetectable.Given she was a nondiabetic with a HgbA1c of 4.8 and not on any insulin regimen,considerations for the etiology of her spontaneously-resolved hypoglycemia include criticalillness, malnourishment, and unknown intake of exogenous insulin; potentially lethal causesincluding cortisol insufficiency and endogenous hyperinsulinism were ruled out. Neurologicalworkup included an EEG revealing triphasic waves and severe diffuse slowing, a lumbarpuncture not indicative of infectious or inflammatory process, and most notably an MRI withrestricted diffusion of bilateral corona radiata and the splenium of the corpus callosum with acharacteristic "boomerang sign," read as global ischemic or anoxic injury. Even with correctionof her metabolic derangements, the patient showed no improvement on neurological exam,and family opted for hospice care.

Conclusions

We present a case demonstrating hypoglycemia's potential for significant and insidiousconsequences. Physicians treating comatose patients should recognize similarities inpresentation in both imaging and history that can be confused with acute or chronic ischemicinjury. 3 With persistent hypoglycemia, exhaustion of essential nutrients glucose, lactate, andglutamate results in hypoglycemic encephalopathy or coma. 2 Recurrent hypoglycemic statescan deplete glutathione stores resulting in oxidative damage and neuronal death. 3 There is needfor further research into mechanisms of hypoglycemia-induced neuronal death, as well aspossible alleviating therapies. Although reports of experimental treatments including N-acetyl-L-cysteine, pyruvate, and steroids have been published, these are sparse, and additionalresearch would be of benefit. 4,5,6

#28: **Moyamoya-like syndrome in a stroke patient**

Christy Diuguid;[1] Mckenzie Merritt;[2] Srinivas Halthore;[3] Aroucha Vickers[4]

Author Affiliations
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[3]Neurology Specialists
[4]Valley Hospital Medical Center, Administration/Staff

Purpose
Ischemic strokes are a leading cause of morbidity and mortality.(1) Moyamoya Syndrome (MMS) is a rare cerebrovascular condition within the basal ganglia comprising of progressive occlusion of the internal carotid arteries (ICA's) and the subsequent development of small collateral vessels (2). MMS is associated with a known atherosclerotic condition whereas Moyamoya disease (MMD) has idiopathic or genetic causes.(3) Most patients with MMS typically have bilateral carotid artery involvement and can present in adulthood after a stroke, transient ischemic attack, intracranial hemorrhage, or seizure.(2) We report a case of MMS with unilateral internal carotid stenosis and development of distal collaterals, and describe the patient's management post-stroke.

Methods
NA

Results
A 50-year-old female with a past medical history of hypertension, hyperlipidemia, and diabetes presented to our hospital with left-sided facial droop and left arm and leg paresthesias and was found to have an acute to subacute right basal ganglia infarct with occlusion of the short segment of the right M1 with stenosis of short segment of the right ICA. Alteplase was deferred due to prolonged onset of symptoms and thrombectomy was deferred due to distal revascularization and a low NIH score. Patient was started on dual antiplatelet therapy and strict hypertension to perfuse through collateral arteries with a very slow graduated decrease in blood pressure to where the patient no longer required pressor support and was able to be discharged to a rehab facility with consideration for encephaloduroarteriomyosynangiosis (EDAMS) neurosurgical bypass procedure outpatient.

Conclusions
Current treatments for MMD and MMS are centered on a patient's anatomy via direct or indirect surgical revascularization, with medications used in the meantime as a temporary solution to slow disease progression and improve symptoms. EDAMS remains the gold-standard surgery for MMS, but prognosis and quality of life measures post-surgery have still yet to be determined.(4,5,6) This case is important for us to be able to raise awareness for alternative causes of stroke including MMS and MMD and their potential difference in management with surgical options like the EDAMS procedures being important considerations for secondary stroke prevention.

#29: **Antipsychotic use in the intensive care unit (ICU) for treatment of delirium and agitation**

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[2]Roseman University, College of Pharmacy

Purpose
Delirium is associated with increased ICU mortality, prolonged length of stay (LOS), higher healthcare costs, and long-term cognitive dysfunction.1 The 2018 PADIS guideline suggests utilizing antipsychotics only in patients with significant signs of delirium. However, antipsychotics are not without adverse effects, especially risk of QTc prolongation.2 The goal of this medication use evaluation is to assess whether antipsychotics were safely used in the ICU to treat delirium and agitation and if they were discontinued prior to downgrade or discharge.

Methods
In this single-center retrospective chart review, a clinical software program was used to identify adult patients admitted to the ICU from October 15, 2021, to July 31, 2022, who received at least one dose of an antipsychotic. As needed, on-call, and one-time orders were excluded. The total number of QTc-prolonging agents received was collected, along with the available QTc values prior to the first dose, within 48 hours and 7 days post-treatment, and prior to downgrade or discharge. Charts were screened for documentation of arrhythmia during antipsychotic therapy. The primary outcome was to determine if QTc was monitored before initiating antipsychotics. The key secondary outcomes were to evaluate how often QTc was documented, and if antipsychotics initiated in the ICU for delirium and agitation were discontinued.

Results
Fifty of the 216 patients screened were included in the analysis. Twenty percent had documented QTc prolongation prior to initiation of antipsychotic and 60% were on more than one QTc prolonging agent. Sixty percent did not have an EKG ordered within 48 hours of initiation, and 67% did not within 7 days. Eight percent developed arrhythmias during antipsychotic treatment. All antipsychotics initiated in the ICU were discontinued prior to ICU downgrade or hospital discharge.

Conclusions
Despite noted baseline QTc prolongation, patients were initiated on antipsychotics. The facility has a protocol stating that daily EKG and QTc should be assessed in the ICU for some of the antipsychotics used for delirium. To reduce the risk of arrhythmias, the protocol should specify on the frequency of EKG and QTc monitoring for frequently used antipsychotics.

#30: **Evaluating the appropriateness and compliance of heparin infusion protocols in an acute care hospital**

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Purpose
Unfractionated heparin is a parenteral anticoagulant for the treatment and prevention of thromboembolic events. Healthcare facilities maintain standardized protocols used to titrate and monitor heparin infusions. Several studies have demonstrated increased efficacy and safety with the use of standardized heparin infusion protocols. It is crucial that these protocols are followed to ensure efficacious treatment while preventing serious adverse effects, such as bleeding. The purpose of this medication use evaluation is to assess the appropriateness and compliance to nursing-driven heparin infusion protocols.

Methods
In this single-center retrospective review, patients admitted from January 1st to June 14th, 2022 who received at least one infusion of heparin were identified using a clinical support software. Demographic information included age, gender, weight, and level of care in which heparin was administered. Appropriateness and compliance to heparin protocols was evaluated by actual versus estimated weight documented at the time of heparin administration, time between order entry and heparin administration, time between heparin administration and first non-baseline activated partial thromboplastin time (aPTT), time between first non-baseline aPTT and heparin infusion rate titration, and appropriate heparin protocol chosen based on diagnosis.

Results
The results of this evaluation are to be determined.

Conclusions
The conclusion of this evaluation is to be determined.

#31: **Evaluating the appropriateness of initiation and formulation of total parenteral nutrition (TPN) at an acute care hospital**

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Purpose
Total parenteral nutrition (TPN) provides nutrient intravenously when the enteral route is unavailable. However, use of TPN exposes patients to a variety of complications. The goal of this evaluation is to assess appropriateness of TPN initiation based on indication, utilization of premix versus custom TPN, and possible areas for improvement in a newly implemented pharmacist-driven TPN process.

Methods
This is a single-center retrospective chart review of patients who received TPN from October 1st to December 31st, 2021 under the pharmacist-driven TPN process. Patients were identified utilizing a clinical support software. Information collected included indication, premix versus custom TPN utilized, and titration to dietician recommended goal macronutrients within 3 days of initiation. Appropriate indications and appropriate reasons for custom TPN were outlined in the institutional pharmacy to dose TPN standard operating procedure. Appropriate indications included non-functional gastrointestinal tract, no enteric nutrition for 10 days or 5 days if post-operative, unable to reach enteral nutrient goal by day 7, anticipated need for parenteral nutrition > 7 days with no pre-existing malnutrition or > 5 days with pre-existing malnutrition, and on active chemotherapy unable to absorb nutrients for > 7 days. Appropriate reasons for custom TPN included unable to advance macronutrients to goal with available premix TPN, more than a total of 5 additives in TPN, fluid adjustments, electrolyte imbalances, and premix TPN/additive/electrolyte shortages. Rationale for use of custom TPN and delay to reach macronutrients were collected, if available.

Results
There were 93 patients with 929 TPN orders analyzed. Within the specified time period, 90.0 % of TPNs were appropriate based on indication. From 929 TPN orders, 83.0 % were custom TPNs with 99.9 % of those being appropriate for custom TPN. Among the patients analyzed, 49.2 % of patients were not titrated to goal macronutrients by day 3 of TPN, with 96.8 % of those patients having an appropriate reason.

Conclusions
Most TPN orders analyzed under the newly implemented pharmacist-driven TPN process were found to be appropriate based on indication and were appropriately titrated to goal macronutrients. However, the use of premix TPNs versus custom TPNs were more than expected given unexpected drug shortages.

#32: **Evaluating the appropriateness of initial febrile neutropenia treatment at an acute care hospital**

Albert Diep;[1] Kelli Kronsberg[1]

Author Affiliations
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Purpose
The purpose of this medication use evaluation (MUE) is to assess treatment of febrile neutropenia and evaluate which components of treatment were appropriate per National Comprehensive Cancer Network (NCCN) guidelines.

Methods
This was a concurrent MUE conducted at a 425-bed tertiary care hospital in Las Vegas, Nevada. Patients admitted from August 1st to November 30th, 2022 who received antimicrobials with an indication of febrile neutropenia were identified utilizing a clinical support software. Demographic information obtained included age, gender, intensive care unit (ICU) admission status, and providers who initiated treatment. Cultures and susceptibilities were collected if available. Patient vital signs and lab values were examined to ensure that febrile neutropenia was an accurate indication. If patients did not meet criteria for febrile neutropenia (temperature $\geq$ 38 °C and absolute neutrophil count < 500 cells/mm3), they were excluded from this study. Appropriateness of febrile neutropenia treatment was defined by proper selection of an antipseudomonal agent, methicillin-resistant Staphylococcus aureus (MRSA) active agent, antifungal agent, and an anaerobic agent.

Results
A total of 38 patients received antimicrobials with an indication of febrile neutropenia during the specified dates. These patients were then evaluated for whether they met criteria for febrile neutropenia, of which 10 were excluded due to having an ANC $\geq$500 cells/mm3. The remaining 28 patients were included in the analysis. Appropriate treatment was prescribed for 18 of these patients. The majority of those that were not considered appropriate, 8 out of 10, involved vancomycin initiation without documentation of suspicion of a source such as chest port infection, skin and soft tissue infection, or pneumonia. Three cases involved antifungal treatment being initiated in a manner not consistent with current guidelines. NCCN guidelines recommend waiting 4-7 days prior to broadening antifungal treatment and initiating vancomycin which was not done in these cases.

Conclusions
Providers frequently prescribed vancomycin inappropriately without a valid indication and may benefit from additional education about appropriate timing and sources of infection to initiate anti-MRSA agents. Education regarding when vancomycin and antifungal treatment is recommended in febrile neutropenia in the form of a facility-specific febrile neutropenia guidance may help improve management.

#33: **Evaluation of nasal mupirocin use in intermediate medical care units at an acute care hospital**

Manar Alkahby;[1] Albert Diep;[1] Kelli Kronsberg[1]

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Purpose
Nasal mupirocin is a preventative strategy to reduce the incidence of hospital-acquired Staphylococcus aureus bloodstream infections. The Centers for Disease Control and Preventions (CDC) recommends initiating nasal mupirocin for a maximum of 5 days in patients who are admitted to intensive care unit (ICU), receiving dialysis, or undergoing high-risk surgeries. This medication use evaluation was to assess how nasal mupirocin was initiated and discontinued per CDC and local facility risk factors before and after the "ICU MRSA universal decolonization" order set was removed from the intermediate medical care (IMC) unit reflex transition order.

Methods
In a single-center, retrospective chart review, a clinical surveillance platform identified IMC patients that received nasal mupirocin from a pre-intervention period of August 15 to September 30, 2022 and post-intervention period of October 20 to November 30, 2022. Local facility risk factors that warranted initiation of nasal mupirocin were current ICU admissions , documented history of methicillin-resistant Staphylococcus aureus (MRSA) colonization, current MRSA infection, incarceration, undergoing high-risk surgeries, resident of long-term care facility or homeless shelter, receiving dialysis, or presence of central venous catheter or midline. Patients were assessed on any local risk factors , followed by the duration and appropriate discontinuation of nasal mupirocin per institution-wide protocol.

Results
Of the 193 patients that were screened in the pre-intervention period, 62% presented with risk factors. Eighty-seven percent of the order sets used in the pre-intervention period was the "ICU MRSA universal decolonization" order set, with only 23% being recent ICU admissions. After the intervention occurred on October 20, 73 patients were screened in the post-intervention period. Ninety-two percent of patients in the post-intervention period had risk factors. Sixty-two percent of orders in the post-intervention period that could have been discontinued per institution-wide protocol were not, resulting in an average extra 2 days of therapy per patient.

Conclusions
While majority of the pre-intervention period patients had nasal mupirocin initiated without any risk factors, a reduction in orders without risk factors was noticed once the order set was removed from the IMC transition order. To further increase appropriate use, a nursing in-service can be performed regarding the discontinuation of nasal mupirocin .

#34: **Mclena-1: A Phase II Clinical Trial for the Assessment of Safety, Tolerability, and Efficacy of Lenalidomide in Patients with Mild Cognitive Impairment Due to Alzheimer's Disease; Trial Design and Rationale**

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Purpose
Accumulating evidence indicates that inflammation mediated by tumor necrosis factor alpha (TNF alpha), interleukins (e.g. IL-1 beta, IL-2, and IL-6), and chemokines (e.g. IL-8), is prominent both in the blood and central nervous system (CNS) of Alzheimer's disease (AD) patients. These data suggest that systemic inflammation plays a crucial role in the cause and effects of AD neuropathology. Thus, we propose that modulating systemic inflammation via a pleiotropic immunomodulator is a putative therapeutic intervention if administered at a proper time window during the course of the disease.

Methods
This is a Phase II, proof-of-mechanism, placebo-controlled clinical study on single and multiple domain amnestic mild cognitive impairment (aMCI) male and female subjects administered 10 mg/day the immunomodulator, anti-cancer agent lenalidomide for 12 months on a 1:1 ratio (15 placebo + 15 drug-treated subjects total) followed by an 18 months washout period. All enrolled subjects will have amyloid loads in their brain (Florbetapir PET imaging). The primary objective of the study is to assess the effect of 12 months of treatment with lenalidomide on cognition. The secondary objective is to assess the safety and tolerability of lenalidomide in aMCI patients. Tertiary and Exploratory Objectives are to investigate the potential of blood inflammatory markers as surrogate markers of the therapeutic efficacy of the study drug.The Primary Endpoints are cognition measured via a large battery cognitive tests at regular intervals, and comparison of brain amyloid loads (Florbetapir PET imaging) and neurodegeneration (volumetric MCI) prior to and post-drug treatment. The secondary Endpoints are safety, which is evaluated through reported adverse events (AEs), clinical laboratory tests (hematology, serum chemistry, urinalysis), vital signs, physical and neurological examinations, and electrocardiograms. The Tertiary and Exploratory Objectives will assess blood inflammatory markers after lenalidomide vs. placebo administration.

Results
N/A

Conclusions

Capitalizing on our experience from a previous clinical trial with thalidomide (lenalidomide analog) and our animal data, in the current project we aim to investigate lenalidomide as a possible AD therapy. Our study should allow determining whether or not lenalidomide is safe in subjects suffering neurological disorders, and whether it can alter the clinical course of AD.

#35: **The Effects of a Pharmacy Driven Continuous Sedation Stop Procedure on Mechanical Ventilation Days**

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Purpose
To assess the effectiveness of a pharmacy driven continuous sedation stop procedure and its impact on mechanically ventilated patients in terms of total days of mechanical ventilation

Methods
This is a retrospective, single-center, cohort study that is being conducted by evaluating the medical records of subjects at a 326 bed level III trauma center. Adult subjects aged 18 years or older, admitted to the ICU on any sedation drip for >48 hours (Opioid, Dexmedetomidine, Propofol, Benzodiazepine, Ketamine) between January 1, 2019, and December 31, 2019 were screened and compared to patients between January 1, 2022, and November 31, 2022. Subjects were excluded from this study based off of the criteria of: Comfort care, death prior to day 5 of mechanical ventilation, neuromuscular blocker infusion, status epilepticus/seizures, induced hypothermia, substance withdrawal, proning, or high ventilator settings (FiO2 >80%, Peep >10) at day 5. The primary outcome of this study is total mechanical ventilation days. Secondary outcomes include: Average number of ICU days, number of delirium free days, number of patients who have achieved RASS goal of -1 to +1 off of continuous infusions of analgesia and sedation, and all-cause mortality rates.

Results
Research in progress

Conclusions
Research in progress

#36: **Efficacy of Pharmacy Managed Conversion of Intravenous Insulin Infusion to Subcutaneous Insulin in Cardiac Surgery Patients**

Megan Farrell;[1] Travis Merkle;[1] Kathryn Mrzljak[1]

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Purpose
Evaluate the efficacy and safety of pharmacist-managed transition of intravenous insulin infusion to a subcutaneous insulin regimen in post-cardiac surgery patients in the intensive care unit of a community hospital.

Methods
Retrospective chart review including records from both St. Rose Dominican Hospital-Siena Campus and St. Rose Dominican Hospital-San Martin Campus Inclusion: adult patients that underwent an open-heart procedure (CABG, AVR, MVR, SMVR, etc.) at either hospital campus and were managed with an intravenous insulin infusion postoperativelyExclusion: patients that died prior to transition from intravenous insulin infusion to subcutaneous regimenOutcomes: achievement of target glycemic goals (70-180 mg/dL) in the 48-hours after pharmacist-managed conversion from intravenous to subcutaneous insulin, incidence of hypoglycemic events, postoperative incidence of acute kidney injury, postoperative incidence of atrial fibrillation, and continued utilization of insulin for > 24 hours postoperatively in non-diabetic patients

Results
In progress

Conclusions
In progress

#37: **The Impact of a Hospital Protocol in Neonates at Risk for Neonatal Abstinence Syndrome (NAS)**

Victoria Pang;[1] Jenny Nguyen;[1] Ragini Bhakta;[1] Aspen Bryant[1]

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Purpose
This retrospective study will assess the effectiveness of the Eat, Sleep, Console (ESC) Protocol in neonates at risk for Neonatal Abstinence Syndrome (NAS) at St. Rose Dominican Hospital - Siena Campus. The main goal of the Eat, Sleep, and Console Protocol is to maximize the usage of non-pharmacologic measures in subjects with NAS to counteract signs of withdrawal, limit use of pharmacological therapy, and decrease length of hospital stay. This study will be conducted to evaluate these outcomes prior to (11/01/2020-08/31/2021) and after ESC protocol implementation (09/01/21-3/31/2023). Expected outcomes include reduced length of stay, and reduced usage of morphine due to implementation of the ESC protocol.

Methods
This study will include neonates (age $\leq$ 28 days since birth) staying in the NICU or PED units with a positive urine, cord, or meconium toxicology for polysubstance, and administration of oral morphine. Exclusion criteria for this study include neonates with a gestational age of < 37 weeks, and a negative toxicology screening with symptoms of withdrawal. The primary outcome of this study is to observe the length of hospital stay in subjects who underwent ESC. The secondary outcome would be cumulative doses of (scheduled and as needed) morphine given during the subjects' stay.

Results
N/A, research in progress.

Conclusions
N/A, research in progress.

#38: **A Novel Protocol for Triaging Patients before Thrombectomy: A Review of Outcomes at a Comprehensive Stroke Center**

Alana Whittaker;[1] Kaylee Putney;[1] Evan Williams;[1] Paul Janda;[2] Rajneesh Agrawal;[2] Aroucha Vickers;[2] Taylor Campbell;[2] Trusha Mehta;[2] Cory Nichols;[2] Aric Felton;[2] McKenzie Merritt;[2] Sannah Vasaya[2]

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Purpose
Patients who have a thrombotic stroke are screened to determine if they are candidates for thrombectomy secondary to a Code White/Large Vessel Occlusion (CW/LVO) and/or thrombolytic therapy. If patients are candidates for thrombectomy, then there are two viable options when triaging these patients in the emergency setting. Patients could be taken directly to the Interventional Radiology (IR) suite and given conscious sedation or anesthesiology can be consulted to intubate the patient. Risks can occur with both options. Most hospitals currently consult an anesthesiologist to sedate patients which could more time consuming than having the Emergency Room (ER) physicians intubate and send to the IR suite. Valley Hospital Medical Center has instituted a protocol where ER physicians immediately intubate patients designated for thrombectomy and send them to the IR suite. This study seeks to determine if this practice has a positive impact on patient outcomes.

Methods
This is IRB approved secondary research utilizing electronic medical records to collect data. A list of patients who received thrombectomy secondary to CW/LVO and intubated in the ER by the ER physician will be queried. Patients will be included if they are 18 years and older, candidate for thrombectomy secondary to CW/LVO and intubated in the ER by the ER physician and excluded if they were intubated by anesthesiologist and used conscious sedation. Demographic information such as age, gender, ethnicity will be collected. Other information such as etiology and location of stroke, door to puncture time, National Institutes of Health Stroke Scale (NIHSS), Modified Rankin Score (mRS), tPA used and hemorrhagic conversion will be collected. The objectives of this study are to compare the door to puncture time, NIHSS at discharge or at 90 days or whichever comes first, reduction in NIHSS from before thrombectomy to 24 hours post thrombectomy with national data. Statistical analysis such as one-sample t-tests and chi-squared tests will be conducted. Statistical analyses will be conducted using SPSS v28.

Results
NA

Conclusions
NA

#39: **Ure-Na versus Tolvaptan for the treatment of hyponatremia**

Nusrat Alex Hossain;[1] Alana Whittaker;[1] Evan Williams[1]

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Purpose

Hyponatremia is a common electrolyte abnormality observed in hospitalized individuals and is closely associated with increased mortality. Current studies for treatment of hyponatremia comparing ure-NA and tolvaptan are limited to patients with syndrome of inappropriate antidiuretic hormone secretion (SIADH). Tolvaptan is an expensive option for the treatment of hyponatremia, however ure-NA could be used as a more cost-effective alternative. The purpose of this study is to assess the effectiveness and safety of ure-NA compared to tolvaptan for the treatment of inpatient hyponatremia.

Methods

This retrospective cohort study will analyze hospitalized adult patients with hyponatremia between August 2019 and September 2022 at Valley Hospital Medical Center. The study compares patients that received ure-Na, tolvaptan, or both. The primary outcome will be change in serum sodium level at 24hrs after initiation of treatment. Secondary outcomes will consist of change in serum sodium level at 48hrs and 72hrs after initiation of treatment, proportion of patients who achieved serum sodium concentration greater than or equal to 135, and length of stay.

Results

This is project is still in progress

Conclusions

This project is still in progress

#40: **Evaluation of Antifungal Efficacy in the Treatment of Candida auris Bloodstream Infections**

Monique Busacay;[1] Rebecca Jayakumar;[2] Kaylee Putney[3]

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Purpose

Candida auris infections continue to be a growing issue throughout the United States. In the Valley Health System (VHS) alone, there has been a rise of Candida auris cases, particularly bloodstream infections (BSIs). Although echinocandins are the drugs of choice for C. auris BSIs, other antifungals have been increasing. Limited studies are available for the treatment, patterns of resistance, and sources of this candidemia. The purpose of this study is to evaluate antifungal use in C. auris BSIs and identify risk factors for infection.

Methods

This is a retrospective, descriptive study involving electronic medical review within the Valley Health System. Patients will be identified via a microbiology report of all positive blood cultures for C. auris. Patients will be included if they are over 18 years of age, admitted to a VHS hospital, have at least one confirmed positive blood culture with C. auris, and treated with antifungals. Patients will be excluded if given less than 48 hours of antifungal treatment, survived less than 48 hours from a positive culture, or if a bacterial BSI is present. The primary outcome will be all-cause mortality. Secondary outcomes will include discharge deposition, readmission for fungal infection, hospital length of stay, and concomitant bacterial or viral infection. Additionally, patient demographics, comorbidities, culture and susceptibility data, antimicrobial therapy, Pitt Bacteremia Score, and documented side effects will be collected. Descriptive statistics will be utilized to characterize demographics and outcomes.

Results

N/A

Conclusions

N/A

#41: **Impact of Progesterone Surge in Oral Health and Hygiene.**

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Purpose

The purpose of this study is to understand the effect of progesterone surge on oral health and hygiene during menstruation and pregnancy.

Methods

A keyword-based primary literature search in PubMed and Google Scholar database was conducted to understand the effect of progesterone surge during pregnancy and menstruation cycle that affects oral health and hygiene. Retrospective clinical data analysis included published original research and review articles with keywords progesterone surge, premenstrual syndrome, menstrual cycle, pregnancy, oral health, oral hygiene, and physiological variables.

Results

A correlation was observed between progesterone surge during menstruation and pregnancy, and oral health. Progesterone surge during pregnancy have also been correlated with oral cancerous lesion observed in about 5% of pregnancies. Hormonal changes during menstruation and pregnancy impact the blood supply to the oral mucosal area and plaque buildup leading to oral mucosal inflammation. Higher level of progesterone can increase susceptibility to bacterial plaque buildup causing gingivitis most noticeable during second to eighth month of pregnancy. Clinical diagnosis during gestation was correlated with the total bacterial count. A higher prevalence of Tannerella forsythia and was identified in first trimester of pregnancy that was correlated with the diagnosis of gingivitis in these women. Porphyromonas gingivalis showed a positive correlation with progesterone levels in the first trimester. Certain oral contraceptives that contain progesterone may also cause gum inflammation due to increased plaque buildup and heightened immune response to the toxins produced by plaque-associated commensals turned into pathogens.

Conclusions

Progesterone surge during menstruation and pregnancy in women leads to oral mucosal inflammation and plaque buildup thus impacting oral health and hygiene. Certain measures such as increased intake of vitamin B and C, stress reduction can directly affect progesterone production, therefore improving oral health-related problems in these conditions.

#42: **New Year New Variant or A Subvariant of Old Omicron?**

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Purpose
The purpose is to provide an overview of coronavirus infectious disease 2019 (COVID-19) variants, subvariants and vaccine-induced immune protection against Omicron variant and subvariant of Omicron XBB.1.5.

Methods
Keyword search and review of COVID-19 variants, subvariants was performed using primary and tertiary literatures available in medRxiv, PubMed, CDC and NIAID databases. The search focused on emergence of COVID-19 variants of concern (VOC), subvariants, infectivity, vaccination, real-world protection data, waning of immune-protection, and bivalent booster recommendation and immune protection.

Results
COVID-19 vaccine real-world data showed strong and durable humoral and cellular immunity with high degree of protection against the original strain led severe infection, hospitalization and death. But durability of vaccine-induced immune protection waned after about 6 months from vaccination requiring a booster dose to enhance immune protection. Recent VOC Omicron and its subvariants particularly XBB.1.5. is the predominant infective strain in U.S. and world-wide. 69.1% of the total U.S. population have received a primary series vaccination while only 15.4% have received an updated bivalent booster dose as of 1/4/23. A small study immunogenicity data indicated 1.9% infection in the original vaccine-booster recipients compared to 3.2% in bivalent booster recipients. Overall, primary series vaccination complemented with a booster dose are still effective against severe infection, hospitalization and death by Omicron and subvariant XBB.1.5 infection.

Conclusions
Development of safe and effective COVID-19 vaccines and boosters have been accomplished. Emergence of new VOC and subvariants possess a challenge to successful control of the pandemic. Increased immunization and robust clinical efficacy data on primary, and bivalent booster immunization is required to control and end COVID-19 pandemic.

#43: **Adverse Infusion-Related Event Severity in Oncology Patients Receiving Chemotherapy Agents vs. Immunotherapy Agents**

Tayler Hutto;[1] Megan Mullalley;[2] Neil Adams[2]

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Purpose

In recent years, immunotherapy investigational drugs in cancer research has been underway in treating multiple forms of cancer due to a lower side effect profile and decreased severe infusion-reaction risk compared to conventional chemotherapy agents. The purpose of this study was to determine the infusion reaction severity among patients receiving either chemotherapy treatment or immunotherapy agents based on the CTCAE (Common Terminology Criteria for Adverse Events) scale to improve patient care outcomes.

Methods

In this intent-to-treat, retrospective observational study, a survey of patients throughout 10 Intermountain Healthcare infusion clinics was conducted to obtain documentation on patients who had received chemotherapy and/or immunotherapy agents as part of their cancer therapy course and their respective adverse events that had occurred during infusion time. Data was abstracted on a total of 295 patients, both men and women, between the ages of 2-90 years old. Among these participants, a total of 140 patients had met inclusion criteria for study enrollment. The level of severity of reaction event was determined using CTCAE scale 1-5.

Results

Among the participants, data showed that 90 patients (0.64 percent) who had received chemotherapy agents during their cancer treatment saw infusion-related adverse effects with the level of severity among this group averaging at a 2 (reaction prompting medication intervention) compared to 50 patients (0.36 percent) who received immunotherapy. Patients who were noted to have adverse events at a level 3 severity between both groups of patients that warranted early termination of treatment and prompted immediate medical attention included 5 patients receiving chemotherapy and 1 patient receiving immunotherapy. A chi-square test of independence showed there was no statistical significance between patients who received chemotherapy and immunotherapy based on the severity of the infusion-related event $X2(1, N=140) = 0.99$, $p < 0.05$.

Conclusions

Although the findings this study were not statistically significant between patients receiving chemotherapy compared to patients receiving immunotherapy agents to effectively treat cancer diagnoses, the study did show clinical significance based on the reaction incidence and level of severity and the tolerance to treatment.

#44: **Partnering With State Organizations to Improve Pharmacy Staff Understanding of Medicare and Federal or State Subsidy Programs**

Laci Quick;[1] Kalin Pascacio-Bayles;[1] Angela Nakhla;[1] Marc Lococo;[1] C. Leiana Oswald;[1] Michelle Hon[1]

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Purpose
To improve knowledge of Medicare and subsidy programs and measure application of knowledge by pharmacy personnel. Pharmacy patients who are Medicare beneficiaries may not receive appropriate counseling secondary to inadequate Medicare training among pharmacy staff. This can lead to a loss of benefits, compliance issues, and incurred long-term costs.

Methods
Roseman University of Health Sciences will partner with Medicare Assistance Program (MAP) of Nevada to provide Centers of Medicare & Medicaid Services-approved Medicare training to pharmacists and pharmacy technicians in June 2022. The five-hour Accreditation Council for Pharmacy Education accredited curriculum will be provided in-person to attendees. Pharmacists and pharmacy technicians will be assessed on their Medicare baseline knowledge using a questionnaire prior to receiving training. The participants will receive the same questionnaire three months post-training to evaluate their retention and application of information relative to their respective patient populations.

Results
The researchers anticipate that the participants' overall comprehension of Medicare and subsidy programs will improve empowering the pharmacy staff members to provide better patient care to Medicare beneficiaries.

Conclusions
Partnering with state organizations, like MAP or State Health Insurance Assistance Programs that exist in every state, can help educate pharmacy teams on Medicare processes and subsidy programs that will give them the opportunity to provide holistic patient-centered care.

#45: **The management of insulinoma using the drug Octreotide: a literature review and a brief case report.**

Ijeoma Agada;[1] Michelle Dinsmoor;[1] Jousef Alandy-dy;[1] Dr. Stephen Lee;[1]

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Purpose
To conduct a medical literature review on the use of Octreotide in the clinical treatment of insulinoma.

Methods
A PubMed search was performed using the keywords; "Insulinoma", "Hyperinsulinism", "Hypoglycemia", "Octreotide", and "Somatostatin analog treatment".   Peer reviewed articles were selected and evaluated.

Results
Insulinoma is a rare, life-threatening medical condition often associated with inappropriate endogenous hypersecretion of insulin by abnormal tissues inside or outside the pancreas. The disease state requires both acute and chronic management. Octreotide is a somatostatin analog used as a chronic insulinoma treatment, which is available in short-acting and   long-acting parenteral formulations. The identified literature was composed of mostly case reports and few clinical trials, supporting the use of octreotide for the management of insulinoma with limitations and remaining questions. Commonly reported adverse drug reactions included nausea, abdominal cramps, diarrhea, flatulence, and fat malabsorption. The medical management of a patient treated for insulinoma using Octreotide at a local facility is briefly discussed.

Conclusions
After reviewing the literature, the use of Octreotide in the chronic management of insulinoma is supported and appears to be reasonable. However, limitations include dosing, formulations, drug tolerability, adherence, duration of treatment and concerns for patients' safety.

#46: **The Outbreak of Mpox 2023: An Overview**

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Purpose

To provide a clinical overview of the most recent zoonotic infectious viral disease, Mpox.

Methods

Pertinent literature was reviewed by searching various search engines such as PubMed, Google Scholar, and websites including the Center for Disease Control (CDC), Cleveland Clinic, and the World Health Organization (WHO) to collect data regarding Mpox.

Results

The WHO now calls the Mpox virus the Monkeypox virus due to the stigmatized nature of the name. The Mpox virus is one of the many zoonotic viruses that belong to the Orthopoxvirus genus of the Poxviridae family. Previously endemic to regions of Africa like the Democratic Republic of the Congo, most Mpox cases are noted in countries around Europe and the western hemisphere, including the USA. As of January 2023, there has been a total of 84,648 cases worldwide, with 29,980 cases in the USA alone and 21 confirmed dead. As a treatment of choice, the CDC recommends administering the smallpox vaccine within four days of exposure, which may prevent the disease.Additionally, the antiviral tecovirimat (Tpoxx®) may be administered in severe cases. Research is currently underway to test the safety and efficacy of tecovirimat. The smallpox vaccine has provided cross-immunity to the Mpox virus. However, monkeypox cases have become more prevalent upon cessation of the smallpox vaccine administration.

Conclusions

Currently, there is no definite treatment for Mpox. In the absence of simple and economical diagnostic tests, verifying the disease solely based on clinical symptoms has presented challenges to many countries. Various methods for detecting Mpox involve genetic, phenotypic, immunological methods, and electron microscopy. These tests require modern equipment and expert hands, which may not be available in developing countries where this disease is prevalent.

#47: **Incorporating Physical Function Screening Into a Primary Care Clinic for People Living With HIV (PLWH)**

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Purpose
Our purpose of this study was to assess frailty and pre-frailty in our populations that are at higher risk. In order to assess as many participants as possible, we integrated our program into the regular patient visit.

Methods
During regularly scheduled appointments with patients living with HIV, we incorporated a survey consisting of basic demographic information, core determinants of health, and the Brief Pain Inventory to assess any chronic pain. Following the survey, we conducted the Short Physical Performance Battery to assess any potential frailty. We also examined patient charts to record any comorbid conditions and a Waist-to-Hip ratio.

Results
Within the results of the survey, we found that among patients that reported chronic pain, they specified their back and knees as the most affected. We found that among the 105 participants, the most common comorbid condition was syphilis at 43 participants.

Conclusions
After running statistical analyses on the different age groups, years living with HIV, and Waist-to-Hip ratio, we were unable to come to any significant conclusions. However, we plan to further continue this integration into our HIV follow-up appointments to create longitudinal data.

#48: **Meeting the Needs of Our Communities, the CVS Health Spanish Pathway Program**

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Purpose
There is a disproportionate number of Spanish-speaking pharmacists to meet the needs of the growing Hispanic/Latino population in the United States. The CVS Health Spanish Pathway Program (SPP) aspires to increase the number of qualified pharmacy talent who speak Spanish and are devoted to providing healthcare services to Hispanic/Latino communities.

Methods
Since 2018, RUHS has partnered with CVS Health to introduce Spanish-speaking students to pharmacy careers and recruit and retain these students. Students selected for the SPP are placed at predominately Spanish-speaking CVS Health pharmacies for their introductory pharmacy practice experiences and receive special opportunities to network with local, regional, and national CVS Health leaders. SPP students receive additional quarterly student mentoring and complete a medical Spanish certification course. Movimiento Estudiantil Roseman (MER), a University student organization, provides SPP students service activities to meet the healthcare needs of local Spanish-speaking communities. The SPP offers students opportunities in leadership and self-development with coaching from SPP faculty members.

Results
To date, there have been 27 students enrolled in the SPP across three classes and two campuses. 86% of SPP graduates have been employed at predominately Spanish-speaking CVS Health pharmacies. In addition, the SPP has impacted the University and College of Pharmacy with an increased student MER membership and the enrollment of over 200 students in our medical Spanish elective in the last two years.

Conclusions
RUHS and the CVS Health SPP has successfully met the needs of our communities by graduating Spanish-speaking pharmacists who work in Spanish-speaking community pharmacies.

#49: **Oral, Cardiovascular and Respiratory Effects of E-cigarettes: A synthesis of literature**

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Purpose
The introduction of e-cigarettes into the tobacco market appeared to be a revolutionary product with a net public health benefit. Advertised to adults as an effective smoking cessation aid, e-cigarette sales soared in the U.S. However, there was a lack of available research on the actual benefits from switching to e-cigarettes from conventional cigarettes, and even more importantly on their possible long-term impacts.

Methods
A literature review was completed using Pubmed to examine all available articles in the area. The keywords utilized for the article search included "e-cigarretes", "vaping", "EVALI", and "electronic cigarettes". A total of n=98 research articles were found and reviewed, 57 of which involved experiments conducted on rats and 2 on mice. Most of the studies were conducted in the United States, however some studies were completed outside of the United States. This review focused on behavioral patterns in regard to age, and possible side effects involving the cardiovascular and respiratory systems as well as the oral cavity.

Results
The median age of EVALI survivors was 23 years and the median age of EVALI deaths was 45 years with most cases involving THC-containing products. E-cigarettes contain over 80 compounds, including known toxins. Most e-cigarette products emit these potentially toxic substances in highly variable amounts, with the number of substances and levels emitted varying drastically depending on the product and how it is operated. Due to the relative novelty of e-cigarettes, there is a lack of data on the association of vaping with long-term health effects. However, there was substantial evidence demonstrating the short-term effects of vaping which included: increased heart rate, acute endothelial dysfunction, and oxidative stress. Previously non-smoking young adults and adolescence are more likely to try conventional cigarettes once they use e-cigarettes.

Conclusions
Many of the adverse effects of e-cigarettes including respiratory, oral, and cardiovascular diseases were evident from the current research. Widespread consensus appears to be that certain components of e-cigarettes are hazardous to human health, and thus more research on these topics is required. Further knowledge can help implement more stringent regulations of these products.

#50: **Stimulating and Sustaining Scholarly Activity at Teaching-Intensive Institutions**

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Purpose
Research and scholarship are core elements of the academic mission. Yet, fulfilling institutional and accreditation requirements for scholarly activity can be challenging, particularly for teaching-intensive institutions. The current paper describes strategies for employing a teacher-scholar model to stimulate and sustain scholarly activity.

Methods
Metrics of scholarly productivity were programmatically assessed and reported for at least five years following implementation of sixteen different strategic initiatives at three teaching-intensive colleges of pharmacy. Data reported included: publications (original peer-reviewed publications, case reports, review articles), presentations (posters, podiums, and continuing education sessions), peer-reviewed published abstracts, grants awarded, and total extramural funding per annum. Faculty and student engagement in scholarship was indicated by authorship on at least one scholarly work.

Results
Broad increases in metrics of scholarly productivity were observed, while the timing and degree of change varied (1.4-fold to 10.4-fold, across all institutions, all years). Notably, the most robust growth was observed in grantsmanship and the number of faculty and student contributors to scholarly works. A key observation was that increased scholarly output was sustained, as during the most recent three-year period publications increased 1.6-fold, grants and extramural funding increased 3.4 and 15.8-fold, respectively, and faculty and student contributors increased 1.8 and 4.5-fold, respectively.

Conclusions
Overall, these data point to a substantive, detailed approach for increasing scholarship at diverse, teaching-intensive institutions by implementing cost-conscious strategies, including clear ties between scholarly effort/productivity and faculty performance/advancement, strong faculty development and mentoring, institutional commitments to infrastructure and research budgets, and student engagement in scholarly activities.

#51: **THE IMPACT OF APHA'S MEDICATION THERAPYMANAGEMENT (MTM) CERTIFICATE TRAINING ON COMMUNITY PHARMACISTS'AND STUDENT PHARMACISTS' SELF-EFFICACY IN DELIVERING MTM**

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Purpose
Medication Therapy Management (MTM) services utilize pharmacists' clinical knowledge and engage them in interprofessional, team-based models. In addition to improving patient care, these services also provide an additional revenue stream for pharmacies. MTM is further emphasized by the Accreditation Council for Pharmacy Education (ACPE) 2016 Accreditation Standards for Doctor of Pharmacy programs recognizes the importance of preparing students to utilize MTM services to engage in patient-centered care. For pharmacists to effectively engage early in their careers, it is important that pharmacists and future pharmacists gain experience and training to enable them to impact patients' medication-related outcomes. The American Pharmacists Association (APhA) provides a certificate program for pharmacists and student pharmacists to prepare them to deliver MTM services. The implementation of the APhA MTM program in a college of pharmacy curriculum has been shown to increase student knowledge regarding MTM concepts and improve students' confidence in providing MTM services. Roseman University of Health Sciences's (RUHS) 3-year PharmD program does not currently provide the APhA MTM Certificate as a part of the curriculum. The objectives of this study is to evaluate the impact of providing APhA's MTM Certificate training on pharmacists' and pharmacy students' self-efficacy in conducting MTM and to evaluate pharmacists' self-efficacy in precepting these skills.

Methods
Second-year student pharmacists from RUHS Henderson, Nevada Campus and community pharmacy Preceptors from the Las Vegas Valley and Arizona River Region were recruited. Students and pharmacists who were selected to be a part of the study were paired-up based on location to allow for ease of the pharmacist to precept students during their completion of the required Comprehensive Medication Therapy Reviews (CMRs). Participants completed the requirements of the APhA MTM Certificate program, which included viewing online modules, attending a live session, and participating in a specified number of CMRs. Participants also completed three IRB approved Qualtrics surveys: pre-course work, post live session, andpost certificate completion that evaluated their self-efficacy in conducting MTM. Pharmacists completed an additional Qualtric survey utilizing the American Association of College of Pharmacy's Entrustable Professional Activities grading scale in the performance of their assigned student and evaluated their self-efficacy in precepting MTM after the certificate was complete. Data analysis will include frequency statistics analysis at the completion of study.

Results

To date, twenty student pharmacists and nineteen pharmacists from community chain and community independent pharmacies and an insurance provider initially enrolled in the program. Thirty-seven participants attended live training, and twenty-three participants completed post-live training work and the entire certificate program requirements. Data analysis of the surveys is currently on-going. We anticipate an increase in self-efficacy in participants as they complete the components of the APhA MTM Certificate and an increase in self-efficacy for preceptors in teaching and assessing students in the completion of MTM skills.

Conclusions

For pharmacies to administer MTM, they need training that allows them to feel confident in providing this service. This study will help develop a methodology on how this training can be integrated into an PharmD program and as a postgraduate continuing education program so that community pharmacies can have self-efficacy in providing MTM to CMRs and related clinical services.

#52: **Application of Ethics in Healthcare Education**

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Purpose
To improve adherence of ethical principles throughout the nursing curriculum. Focus on ethics throughout the nursing curriculum to ensure that this principle and interrelated concepts are applied.

Methods
Literature review to be conducted with the criteria of utilizing peer-reviewed articles in scientific journals.

Results
It is essential that nurse educators incorporate ethics consistently in the curriculum.

Conclusions
The authors will conduct a literature review for the purpose of highlighting the importance of applying the practice and philosophy of ethics in the nursing curriculum to improve nursing student's delivery of care with patients.

#53: **Nurse Educator Transition into Academia: Lived Experience**

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Purpose
Transitioning from bedside nursing to part-time faculty to full-time academia can be challenging. Orientation, mentorship, and faculty development are essential in helping with the best transition. Learning this new role of full-time academia is both demanding and rewarding. The shortage of nursing faculty translates to fewer student admissions into the nursing programs across the country. There is an intrinsic connection between the nursing shortage and nursing faculty shortage. The nursing shortage jeopardizes the quality and safety of patient care. The transition made it more challenging with the COVID-19 global pandemic forcing faculty to fast learning new platform to deliver teaching concepts and materials through on-line.

Methods
A literature review and preliminary survey via 1:1 interview with multiple full-time faculty members who transitioned from adjunct faculty position were included.

Results
There is a need for more orientation, mentorship, and faculty development opportunities to improve the transition. Current practices indicate the lack of support to provide an ideal transition as seen across the profession. Responses gathered from a study revealed nurses were unsure and unable to provide objective student evaluations. Interview with new nurse educators shows there is a lack of clear direction, no handbook during the transition and more of a "learn as you go" experience. "Having a faculty mentor, someone as a resource to help during the transition, was beneficial to me."

Conclusions
Nurses in general have the desire to give back to the nursing field and contribute to shaping the future of nursing. Transitioning from bedside nursing into full-time faculty position is challenging and can be discouraging when proper orientation, introduction about the role change and faculty mentoring are lacking. There are current articles that support the need for more orientation, mentorship, and faculty development. Further studies are warranted to better understand the core needs of nurses who take the courage to make the transition into a nurse educator role in academia.

#54: **The Effectiveness of Changing Negative Self-Talk**

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Purpose
The overall purpose of this study was to investigate the impact of an instructional unit focusing on self-affirming strategies on learner's perceptions of their ability to recognize understand and change self-talk. The objective is to explore how changing negative self-talk into positive self-talk can be effective in influencing an individual's self-confidence, the way they view their value and self-worth. Teaching participants struggling with negative self-talk or negative self-statements how to change them to be positive will help them increase their effectiveness in their personal and professional domains. The intervention was designed to help individuals become more aware of their self-talk, as well as help them understand that by changing their self-talk they will increase and boost their self-confidence, which will help them be more effective personally and professionally.

Methods
Data collection began with using the researcher created quantitative Likert scale pre-instructional unit survey. The questions on this survey helped the researcher assess the participant learner's perception of their knowledge regarding self-talk, self-esteem and knowledge on the bucket filling theory concept before experiencing the instructional unit. The post-instructional unit survey is parallel to the pre-instructional unit survey. The post-instructional unit survey helped the researcher assess what the participant learners perceive to have learned from the instructional unit.

Results
The quantitative data gathered from the instructional unit was analyzed after the completion of the pre-instructional survey, instructional unit, and the post-instructional survey. The results were broken down into three sections Self-talk, Self-Esteem and The Bucket Filling Theory. Descriptive statistics were used to determine the mean scores for the pre-and post-instructional surveys, each section, and each representative question option.

Conclusions
The mean average for each section showed a slight increase with the largest increase in the Self-Esteem section. A positive impact was made on the participant learners based on the +1.25-point increase shown on the comparison of the pre and post-instructional unit surveys. The descriptive statistics from both pre-and post-survey's also show an overall +0.32-point increase indicating that a positive impact was made on participant's perception on their ability to recognize, understand, and change self-talk.

#55: **Impact of Virtual Learning During the COVID-19 Pandemic on Pharmacy Students' Perceived Learning and Wellbeing**

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Purpose
The year 2020 brought about an undeniable drastic change in daily life. As the coronavirus disease-2019 (COVID-19) pandemic ensued, educational institutions had to quickly shift from in-person to virtual learning. Identifying an appropriate virtual learning platform and learning to use it effectively in a short period of time became a challenge most educators and students faced in addition to added obligations such as caring for others and/or increasing employment demands. The objective of this study is to assess the impact of the COVID-19 pandemic on pharmacy students' perceived learning and wellbeing within an accelerated Doctor of Pharmacy (PharmD) program.

Methods
A descriptive electronic survey was sent in May 2022 to the Class of 2023 students, currently admitted to Roseman University of Health Sciences College of Pharmacy (RUCOP) accelerated PharmD program on the Henderson, Nevada Campus. The survey was administered via Qualtrics to maintain anonymity and responses were collected over 2 weeks. Students were asked numerous questions to assess the impact virtual learning during the 2020-2021 academic year had on their learning and wellbeing. As students at RUCOP had the option to attend class in-person, virtually, or hybrid during this time, questions were directed based on what method they chose to attend class. Specific questions were asked to assess perceived learning in addition to wellbeing.

Results
Thirty students completed the survey. Of those 30 students - 4 students attended lecture in-person, 17 attended virtually, 7 chose a hybrid of virtual and in-person, and 2 did not attend lecture. There does not appear to be a difference in perceived learning when asked if virtual learning negatively impacted the students' ability to comprehend and apply the material or if it affected their academic performance. Students in the hybrid group worked more hours at their place of employment compared to the other groups. Fifty-seven percent in the hybrid group worked greater than 10 hours per week compared to 50% in the in-person and did not attend lecture groups and 18% in the virtual group. Students in the hybrid group spent more time studying compared to the other groups. All students in the hybrid group spent more than 10 hours per week studying compared to 82% in the virtual group, 75% in the in-person group, and 50% in did not attend lecture group. Re-watching recorded lectures improved understanding of material for students in all groups, however, more notably in the virtual group. Students in the virtual learning group reported less burnout than those in the hybrid and in-person groups.

Conclusions

All methods of delivering education including in-person, virtual, and hybrid appear to be similar with regards to student-perceived learning in the RUCOP accelerated PharmD program, however, there were some key differences. Notably, those that chose the hybrid method worked more hours at their place of employment and spent more time studying. There did appear to be a trend of less burnout in those in the hybrid group compared to the other groups. These results were based on a small sample size and further research needs to be done to validate the results.

#56: **Efficacy of implementing an end-of-day quiz and its impact on academic performance and student attendance in a three-year doctorate of Pharmacy program.**

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Purpose
Roseman University, College of Pharmacy is a three-year accelerated program implementing a block system where students are taught an average of two weeks per block and six hours per lecture day. Students are then assessed every alternate week for each specific block. This study evaluates the impact of implementing additional low-stakes quizzes at the end of each lecture to improve student attendance and academic performance.

Methods
Students traditionally attempt an online morning quiz regarding the previous day's material. Additional end-of-day quizzes (EODs) were given on two separate occasions (one in written and another in oral format). Student performance based on their morning quiz scores was compared between the days when EODs were given (written and oral) and when no quiz was given. Attendance was taken, and a comparison was made of the number of students present between days with EODs given versus when no end-of-day quiz was given. We also conducted a perception survey to view how students perceived the additional EODs.

Results
The attendance at the beginning and end of both EOD days was similar to days with no EOD given. The written EOD correspondingly depicted an increase of 17% of the students that went from no pass grade to passing grade (90% and above). There was a 12% increase in passing rate with Oral EOD compared to baseline. 70% of the students perceived that the EOD would not affect their attendance (neutral), as shown in our data. Over 69% of the students agreed and strongly agreed that the EOD helped improve their next-day morning quiz scores.

Conclusions
There was an increase in the average mean score in the morning quiz with an additional EOD quiz. The improvement in the passing rate for the canvas morning quizzes was consistent with the student's perception. Attendance and EOD quizzes did not depict an observable trend. This study will further evaluate the impact of the additional EOD quizzes on the actual assessment scores and student passing rates at 90% and above in each block.

#57: **The usefulness of quizzes after each learning objective compared to an end-of-the-day quiz in a three-year accelerated Doctor of Pharmacy program.**

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Purpose
The Roseman University of Health Sciences provides an accelerated three-year College of Pharmacy program. The didactic courses are structured in a block curriculum allowing the student to focus in-depth on the subject. Students are required to learn actively in the classroom daily due to the program's fast-paced nature and a high standard of passing. Students must achieve 90% or higher to pass biweekly assessments. A next-day morning quiz is typically administered to monitor student learning and knowledge retention. We recently found that administering an end-of-the-day (EOD) quiz covering essential learning objectives improves student confidence and performance based on the performance at the next-day morning quiz and student survey. In this study, we will evaluate the efficacy of a formative assessment of students throughout the day by adding quizzes after each concept (learning objective) compared to a single end-of-the-day quiz to supplement the next-day morning quiz. Formative learning help students refine their studying to see what they did wrong and refocus their study time that day. We hypothesize that quizzing after each learning objective will improve learning and knowledge retention compared to the EOD and without supplemental quizzes.

Methods
This study will be conducted during the first professional year of pharmacy school in a biochemistry course. On specific days, students will either take one end-of-the-day (EOD) quiz after the lecture or give short quizzes throughout the lecture after each learning objective. The percentage of correct answers in the morning quiz of the following day will be used to measure student performance. The student performance from the next-day morning quizzes will be compared. Performance of the morning quiz without any prior supplemental quiz will be used as a control. A written survey will be given to the students at the end of the block to determine which formative learning method is preferred.

Results
Not applicable since it is research in progress

Conclusions
Not applicable since it is research in progress

#58: **Evaluation of the 2021 Roseman Basics Leveling Course - Survey and Focus Group Results**

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Purpose
As an accelerated program, Roseman is very fast paced and thus having a solid educational foundation will help students keep up with the courses. Therefore, assessing the effectiveness of the leveling course, Roseman Basics, is important as it develops a solid foundation that can help them thrive in the program. By collecting information from students who have previously taken the course, we are able to evaluate and analyze key concepts that students find useful. Additionally, we can improve the delivery method of the materials to give a more enjoyable experience for the students doing the modules. In this study, we convey some of the results attained from the 2022 Roseman Basics student survey and 2022 Roseman Basics student focus group on the 2021 version of Roseman Basics.

Methods
The survey was given to P1 students on both campuses February 2022, asking questions concerning the 2021 Roseman Basics. The survey asked questions such as the usefulness of each module and the ease of using it. Subsequently, a focus group was put together from the P1 classes on both campuses and carried out in April 2022. Comments and design ideas were collected.

Results
Overall, according to the survey, student opinions on topics such as usefulness and organization were positive but further improvements were suggested. From the focus group, suggestions were made for improvement but certain positives were mentioned such as it gave an idea of what the professor will be teaching. A weakness mentioned was not retaining the information when the topic arrives during didactic curriculum, among others.

Conclusions
This study details feedback from students concerning the 2021 version of Roseman Basics administered to the incoming P1 class of 2021. This information is helpful for the further development of Roseman Basics. For future course development, survey and focus group results would be compared between the incoming P1 classes to ensure that proper improvements have been made. This would potentially help solidify student knowledge prior to the start of the P1 didactic curriculum.

#59: Utilizing Interprofessional Education to Enhance Healthcare Professional Student Learning Surrounding Opioid Use Disorder

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Purpose

The purpose of this study is to evaluate the effect of IPE focused education discussing substance use disorders, by measuring healthcare students' comfort regarding overdose prevention and substance use disorder treatment.

Methods

245 healthcare professional students were invited to complete a 17 question pre- and post-IPE survey covering understanding and comfort levels regarding educating and counseling on naloxone, as well as familiarity with community resources (likely-scaled). Analysis was performed in SPSS v28 with alpha set to 0.05.

Results

A total of 229 students completed the pre-IPE survey and 129 completed the post-IPE survey. Over 80% of respondents were 25-34 years of age, 60% were female, and approximately one-third were from pharmacy, one-third from physicians assistant, and one-third from doctor of osteopathic medicine programs. Significant improvements were observed in level of understanding of naloxone (0.52, 95% CI 0.44-0.62), comfort level surrounding counseling (0.99, 0.85-1.14) and initiating naloxone conversations in high-risk patients (0.45, 0.32-0.58) and persons living with opioid Ouse disorder (0.54, 0.43-0.66). Respondents reported improved familiarity with community opioid use disorder and overdose prevention resources (1.16, 1.07-1.26).

Conclusions

IPE offers and opportunity to positively impact future healthcare professionals' comfort levels in initiating critical conversations surrounding substance use, providing overdose prevention counseling, and raising awareness with community resources.