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Welcome from the President

Friends and Colleagues,

Welcome to the Fifth Annual Roseman University of Health Sciences Research Symposium. We are pleased and grateful to continue the momentum that has been building since our first Symposium five years ago. This year, we received 136 abstracts to date across our three campuses in South Jordan, UT and Henderson & Summerlin, NV as well as from a growing contingent from our colleagues outside of Roseman. We look forward to featuring the discoveries and scholarly work of our faculty members, staff, post-doctoral researchers, residents, and students from all of Roseman’s health disciplines. Many of the presenting authors both inside and outside of Roseman carry affiliations with other great universities and entities worldwide. Our presenters are immensely talented and in demand, working across borders to create solutions, collaborating with other great minds, and bridging our communities.

This year’s abstracts cover a wide range of topics in various areas including bench-top science, clinical research, and educational research. These works independently and collectively represent prodigious planning, methodical execution, and deeply insightful findings. With a wide breadth and depth of scientific subject matter, they are steps towards solutions, solutions that advance not only our work and our national and international reputation, but advance the human race. Some of these presentations address a number of diseases including PTSD, HIV/AIDS, diabetes, cancer, depression and fatty liver disease. Other presentations address important health issues such as e-cigarette usage, geriatric health, cannabinoids, opioid prescribing trends and youth prescription abuse. These are in addition to presentations that discuss ways to improve student learning and general wellness in the population. As you can see, the work being conducted is truly transformational and holds great possibility in evolving our understanding of critically important issues.

We believe that this thinking, input and collaboration not only showcases current thinking, but sparks new ideas, new modes of thinking, and imagination. We are proud of the minds and hearts of those in this room today.

Thank you to all those responsible for making this important event happen, as well as to all those attending the symposium and supporting the work of colleagues, students and friends. We believe this symposium will continue to grow and serve as a platform for the best thinking and research and a home for sparking imagination, solutions, discovery and learning.

Sincerely,

Renee Coffman, President
Welcome from the Research Symposium Chairs

Dear Colleagues and Guests,

Welcome to the 2019 Annual Research Symposium at Roseman University of Health Sciences – the 5th anniversary of this university-wide event that highlights the outstanding research and creative endeavors of Roseman community, students, residents, faculty, researchers, staff and our regional and international guests. It is an opportunity to celebrate the innovation, academic scholarship and creativity and a forum to share the discoveries, insight and performance with a broader audience.

The day-long event will take place simultaneously at both campuses in South Jordan, Utah and Henderson, Nevada and will feature 1) keynote speakers, 2) oral and poster presentations, 3) meal, and 4) award presentations. Presentations will be judged by faculty members as well as by qualified guests.

We would like to give our heartfelt gratitude to the Keynote speakers, our local organizing team members, volunteers and staff who worked tirelessly to make this event happen. We would also like to thank the sponsors for your generous support which is vital for the success of the symposium.

We hope you will find this a dynamic opportunity to learn, network and collaborate with fellow healthcare professionals.

Sincerely,

Dr. Kamran Awan, BDS, PhD, FPFA, FADI
Chair, South Jordan Campus
Associate Professor, College of Dental Medicine
Roseman University of Health Sciences

Dr. David Rawlins, PhD
Chair, Henderson Campus
Assistant Professor, College of Pharmacy
Roseman University of Health Sciences
Keynote Speaker: South Jordan

Rena D’Souza, DDS, MS, PhD
President, International Association for Dental Research (IADR), Professor of Dentistry & Assistant Vice President of Academic Affairs & Education, Health Sciences, University of Utah

How Science and Technology Advances Impact Oral Health: IADR’s Vision for the Next Century

Rena D’Souza is Professor of Dental Sciences, Neurobiology & Anatomy, Pathology and Surgery at the University of Utah. She currently serves as Assistant Vice President for Academic Affairs and Education for the Health Sciences. As a clinician-scientist, D’Souza has been strongly committed to discovery and mentoring throughout her academic career. She is a past president of the American Association for Dental Research (or, AADR) and is the current President of IADR, the largest global dental research organization with about 12,000 members in over 100 countries worldwide. Dr. D’Souza has authored over 150 publications and book chapters and has maintained an active research program for over 35 years through grant awards from the National Institutes of Health and other agencies. She has also led two major NIH-funded institutional grants that supported the research training of dentists and dentists-scientists at the predoctoral and postdoctoral levels. She received the 2002 Distinguished Scientist Award from the International Association for Dental Research (IADR) and the Presidential Award for Research Excellence from the Texas A&M Health Science Center in 2010. She was also inducted into the German National Academy of Sciences in 2012. Dr. D’Souza was recognized as the Columbia University College of Dental Medicine’s Birnberg Research Medal in 2016. Dr. D’Souza is the proud recipient of over 15 dean’s teaching excellence awards and is the 2017 Irwin D. Mandel Distinguished Mentoring Awardee.
Keynote Speaker: Henderson

David R. Powell, MD
Senior Vice President, Metabolism Research
Pharmaceutical Biology Department
Lexicon Pharmaceuticals, Inc.
The Woodlands, TX

Sotagliflozin as an Adjunct to Insulin for Patients with Type 1 Diabetes

Dr. David R. Powell is a Senior Vice President over Metabolism Research at Lexicon Pharmaceuticals. He received his Doctor of Medicine from the University of Medicine and Dentistry of New Jersey following a bachelor’s degree in biology from Rutgers University. Following residencies in Pediatrics, Pediatric Nephrology, and Pediatric Endocrinology at the Medical University of South Carolina, University of California-San Francisco, and Stanford University, Dr. Powell joined Baylor College of Medicine as an Assistant Professor in the Department of Pediatrics, Division of Nephrology. By the time he left Baylor in 2004, he was a Professor of Pediatric Nephrology. He joined Lexicon Pharmaceuticals in The Woodlands, Texas as the Director of Metabolism Research.

While at Baylor, Dr. Powell studied ways to treat linear growth failure in children with chronic kidney disease (CKD). His studies demonstrated that growth hormone (GH) increased linear growth in an animal CKD model, a finding that predated clinical data showing that GH improves final adult height of people with CKD. His research group also found that FKHR (now known as FoxO1) was the protein that conferred the negative effect of insulin on hepatic gene transcription. At Lexicon Pharmaceuticals, Dr. Powell has used mouse gene knockouts (KOs) to identify drug targets. His group searched for metabolism drug targets within the nearly 5000 knockouts of druggable genes shared by mice and humans. Through this effort, Dr. Powell identified SGLT1 and SGLT2 as superior targets leading to the development of sotagliflozin (LX4211), an orally delivered dual SGLT1/SGLT2 inhibitor that improved glycemic control in clinical trials. His group has also developed LX2761, an SGLT1 inhibitor restricted to the intestine, which is undergoing clinical trials. They also studied Xermelo, an oral tryptophan hydroxylase (TPH) inhibitor that lowers serotonin production and treats carcinoid syndrome diarrhea, and performed preclinical studies for LX1031, a TPH inhibitor that provided significant relief to subjects with diarrhea-predominant irritable bowel syndrome. He has also developed antibodies that lower lipid levels and developed inhibitors of Notum, a Wnt deacetylase, which are bone anabolic agents. His group has also found a number of other key genes that are involved in obesity and diabetes, including polymorphisms that are linked to diabetes risk, as well as genes that influence bone mass in humans.
Roseman University of Health Sciences
Utah Abstracts
01: Secretome Analysis of Oral Keratinocytes Chronically Exposed to Shisha

Shankargouda Patil;¹,² Niraj Babu;³,⁴ Tejaswini Subbannayya;³ Sonali V Mohan;³,⁴ Gajanan Sathe;³ Hitendra S Solanki;³ Pavithra Rajagopalan;³ Krishna Patel;³ Jayshree Advani;³,⁴ Shilpa Bhandi;² David Sidransky;⁵ Aditi Chatterjee;³ Harsha Gowda;³ Marco Ferrari.¹,⁶

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Purpose
Shisha smoking has been associated with multiple diseases including oral cancer. However, a mechanistic study to investigate the alteration of secreted proteins in oral cells due to shisha smoking is lacking. Thus in our present study, we analyzed the differentially secreted proteins of immortalized human normal oral keratinocytes (OKF6/TERT1) upon chronic exposure to shisha.

Methods
OKF6/TERT1 was chronically treated with 0.5% shisha extract for 8 months. Conditioned media from shisha treated (OKF6/TERT1-Shisha) and untreated (OKF6/TERT1-Parental) cells were subjected to TMT-based quantitative proteomic analysis. Bioinformatics analysis of differentially secreted proteins was carried out using SignalP, SecretomeP and TMHMM. Immunoblot validation of selected proteins was carried out to confirm the proteomics results.

Results
Proteomic analysis of OKF6/TERT1-Parental and OKF6/TERT1-Shisha secretome resulted in the identification of 1,598 proteins, of which 218 proteins were found to be differentially secreted (1.5-fold; p-value 0.05) in shisha treated cells. Bioinformatics analysis using prediction tools showed secretory potential of differentially secreted proteins identified in OKF6/TERT1-Shisha. Western blotting validated the expression of AKR1C2, HSPH1 and MMP9 in OKF6/TERT1-Shisha secretome in agreement with proteomic data.

Conclusions
This study serves as a useful resource to understand the effect of chronic shisha smoking on the milieu of secreted proteins of oral cells. In vivo studies are warranted to supplement our in vitro data to elucidate the role of these proteins as early diagnosis.
02: RAGE Targeting Ameliorates Responses to Antenatal SHS Exposure

Hannah Aanderud-tanner;¹ Kelsey Hirschi;¹ Kary Tsai;¹ Christian Clark;¹ Tanner Hutchinson;¹ Parker Hall;¹ Juan Arroyo;¹ Paul Reynolds.¹

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Purpose
Secondhand tobacco smoke (SHS) exposure during pregnancy is associated with increased health complications to both mother and fetus. Exposure can lead to anomalous organ development, increased blood pressure, and decreased metabolism. Receptors for advanced glycation end-products (RAGE) are pro-inflammatory transmembrane receptors increased by SHS. Inhibition of RAGE signaling by semisynthetic glycosaminoglycan ethers (SAGEs) has been shown to reduce inflammation in the adult and improve fetal birthweight. We tested the hypothesis that in vivo inhibition of RAGE by SAGEs during antenatal SHS exposure improves postnatal health of the offspring.

Methods
Pregnant Balb/C mice were exposed to SHS alone or SHS + SAGEs from embryonic day (E) 14 to E17. RAGE expression and general measures of development were assessed in the offspring at four and twelve weeks of age. Statistical analysis was completed using nonparametric Mann-Whitney testing.

Results
Antenatal SHS resulted in the following at four weeks of age: 1) increased body weight (p =0.0118) which was reduced to basal levels when treated with SAGEs; 2) decreased heart (p=0.0017) and kidney (p=0.0001) weights and improvement with concurrent SAGEs; 3) increased neonatal blood pressure and further increases with SAGEs; 4) increased expression of RAGE in kidney (p=0.0090), heart (p=0.044), and lung (p=0.0022) with significant recovery with SAGEs; 5) mild reduction in alveolar surface area via MLI assessment and airspace normalization with SAGE treatment. No significant differences were apparent for any metric at 12 weeks of age.

Conclusions
We conclude that inhibition of RAGE protects against fetal health complications following antenatal SHS exposure. Our results further suggest that there is a correlation between RAGE expression and a plausible role for RAGE signaling in key organs following maternal SHS exposure. These studies provide insight into tobacco-mediated health compromise and implicate possible avenues worth pursuing further in the alleviation of symptoms of antenatal SHS exposure.
03: RAGE Implications During DNA Double Strand Breaks in Trophoblast Cells

Abby Bennett;¹ Kary Tsai;¹ Kelsey Hirschi;¹ Nekel Knowlton;¹ Juan Mejia;¹ Parker Hall;¹ Taylor Davis;¹ Paul Reynolds;¹ Juan Arroyo.¹

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Purpose
Intrauterine growth restriction (IUGR) is an obstetric pathology characterized by an increase in trophoblast apoptosis and decreased cell invasion. Trophoblasts are critical for a successful pregnancy and they mediate important steps such as implantation, immune protection of the fetus, maternal blood flow to the placenta, and delivery. Previous mouse studies in our laboratory showed increased trophoblast apoptosis, decreased cell invasion and increased placental receptors for advanced glycation end-products (RAGE) during second hand smoke (SHS) treatment. More recently, a role for nuclear RAGE (nRAGE) has been implicated in DNA double strand break (DNA-DSB) repair. We tested the hypothesis that RAGE is involved during DNA-DSB repair in trophoblast cells. DSBs were induced in human trophoblasts (Bewo and Sw71) with cigarette smoke extract (CSE) or bleomycin (BLM).

Methods
Assessment of nRAGE and γ-H2AX (involved in DNA-DSB repair) was done by immunostaining. Invasion was measured in trophoblast cells after CSE and BLM treatment. Immunoblot was used to quantify nRAGE and γ-H2AX in cells. DNA degradation was used to determine DNA integrity.

Results
Increased Co-expression of RAGE and γ-H2AX was observed in treated trophoblasts when compared to controls. Increases protein expression of RAGE and γ-H2AX was quantified by immunoblot in control and treated trophoblast cells. Trophoblast invasion was decreased 50% with 20ug/ml BLM treatment (p<0.0001) and 80% with 30ug/ml as compared to controls (p<0.0001). Invasion of trophoblast cells was decreased 92% (p<0.002) when treated with 0.5% CSE. Trophoblast DNA degradation was significantly detected following treatment with BLM or CSE.

Conclusions
We conclude that CSE and BLM causes DNA-DSBs in trophoblast cells and repair may plausibly be regulated by nRAGE and γ-H2AX. Confirmatory studies in the absence of RAGE are necessary in order to validate a possible link. DNA-DSBs could be a factor in inhibited trophoblast invasion observed in compromised placenta. These studies provide a critical initial step in dissecting tobacco-mediated IUGR progression.
04: RAGE and SAGE: Ameliorating COPD Pathogenesis via RAGE Abrogation
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Purpose
Chronic obstructive pulmonary disease (COPD) is a progressive lung disease involving chronic airway inflammation and emphysema. While primary smoke poses the greatest risk, evidence suggests nearly half of the US population is also at risk due to exposure to second hand smoke (SHS).

Methods
In the present study, we used control, RAGE null, and lung-specific RAGE overexpressing transgenic (TG) mice to study the role of RAGE during responses to SHS. We evaluated inflammatory effects of SHS in these mice with and without the administration of semi-synthetic glycosaminoglycan ethers (SAGEs), a family of anionic, partially lipophilic sulfated polysaccharide derivatives known to inhibit RAGE signaling. Mice were weaned and fed doxycycline to induce RAGE in TG mice at PN30. Select mice were exposed to SHS from three Kentucky 3R4F research cigarettes via a nose-only delivery system (Sireq Scientific, Montreal, Canada) five days a week and ip injections of PBS or SAGE (a 30mg/kg body weight) occurred three times per week from PN40-70 before all mice were sacrificed on PN70.

Results
RAGE mRNA and protein expression was elevated following SHS exposure of control and TG mice and no expression was detected in RAGE null mice. Bronchoalveolar lavage fluid (BALF) analysis revealed RAGE-mediated influence of inflammatory cell diapedesis and BALF protein abundance. A multiplex cytokine array was performed in order to precisely determine the secretion of pro-inflammatory modulators into BALF. Lung histological assessment revealed indistinguishable morphological changes following exposure, yet apoptosis was increased in lung parenchyma.

Conclusions
Thematically, inflammatory signaling intermediates and downstream responses induced by SHS exposure were influenced by the availability of RAGE, as evidenced by RAGE nulls and SAGE treatment. These data reveal fascinating data suggesting therapeutic potential for the use of RAGE inhibitors in lungs exposed to SHS smoke.
05: Differential Expression γ-H2AX and RAGE in the Placenta of Gestational Diabetes Mellitus (GDM), Preterm Labor (PTL) and Preeclampsia patients

Sam Llavina;¹ Kary Tsai;¹ Kelsey Hirschi;¹ Taylor Davis;¹ Nekel Knowlton;¹ Abby Bennett;¹ Paul Reynolds;¹ Juan Arroyo.¹

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Purpose
The integrity of the genome is fundamental for human health. Defective DNA repair response (DRR) is associated with several diseases, including pulmonary fibrosis, neurodegeneration, and in diseased placenta. The most destructive form of genomic damage is known to be DNA double strand breaks (DNA-DSBs), in which both strands of DNA are ruptured. γ-H2AX is a component of the histone octomer and is phosphorylated in response to DNA-DSBs. The receptor for advanced glycation end-products (RAGE) is a multi-ligand receptor primarily expressed on cell membranes, where it functions as a progression factor in inflammatory signaling; however, the nuclear isoform of RAGE (nRAGE) has been described as having a crucial role in DNA-DSBs repair. The purpose of this study was to identify placental nRAGE and γ-H2AX expression during normal gestation (Control), gestational diabetes mellitus (GDM), intrauterine growth restriction (IUGR), preterm delivery (PTL) and preeclampsia (PE).

Methods
Immunohistochemistry was used to determine localization of both molecules present in human placenta. Immunoblot was further used to quantify nRAGE and γ-H2AX production. Assessing DNA degradation was used to confirm placental DNA damage during pregnancy complications.

Results
Relative to controls we observed: 1) Increased staining for of RAGE and γ-H2AX in PTL and PE placentas; 2) increased placental nRAGE protein in the PTL and PE placentas; 3) increased placental γ-H2AX protein in both PTL and PE conditions; and 4) increased DNA damage in the diseased placenta.

Conclusions
This research suggests a potential role for nRAGE during DNA-DSB detection and repair in human PTL and PE placentas. These results may provide insight into the physiological relevance of these molecules, and if so, their modification during gestation may help alleviate placental disease.
06: Prophylactic Drug Treatment to Reduce PTSD Behavioral Symptoms in Rats
Gabriel Melendez;¹ Jeffrey Edwards;¹ Roxanne Miller;¹ Devin Moffat;¹ Erin Saito.¹

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Purpose
Significant fear-based stress experiences, such as those related to post-traumatic stress disorder PTSD, have been shown to induce changes within regions of the brain involved in emotion and fear memory processing. According to the U.S. Department of Veterans Affairs, approximately 8 out of every 100 adults will develop PTSD at some point in their lives. Because the mechanisms governing PTSD are not fully understood, there is a lack of effective pharmacological treatment. Because it has been shown that the sympathetic nervous system is overactive in both animals and humans with PTSD, we targeted interactions between sympathetic/stress hormones and the memory-forming regions of the brain in rats.

Methods and Preliminary results
We first compared the effectiveness of two models of stress induction—1) two days of single prolonged stress with two weeks of chronic light versus 2) social defeat with two weeks of chronic light. Using elevated plus maze and light-dark transition behavioral assays to test for anxiety-like and depression-like behaviors, and field electrophysiology to detect differences in synaptic plasticity learning mechanism in the hippocampus, amygdala, and prefrontal cortex, we determined that the social defeat with chronic light model was more effective in inducing significant PTSD-like behavioral and physiological changes in rats.

After determining the more effective PTSD model, we injected rats with two drugs—propranolol, a beta-adrenergic antagonist, and mifepristone, a glucocorticoid receptor antagonist. Propranolol and mifepristone while used in treatment for human PTSD after disease onset, have never been tested when they are taken both together and done so prophylactically, before the PTSD-inducing event. We injected both drugs at a 10mg/kg dosage for a total of three weeks— one week prior to the initiation of the stress protocol and throughout the two-week duration of the stress protocol. The rats are subsequently evaluated through the elevated plus maze and light-dark transition behavioral assays to test the drugs’ effectiveness at preventing PTSD behavioral symptoms. Our research on the effects of these drugs is currently in progress. Understanding the capabilities of these drugs, when taken prophylactically, offer promise in elucidating the mechanisms that govern PTSD and may offer a potential preventative treatment for PTSD.
07: A Prophylactic Treatment in a Rat PTSD Model Examining Plasticity of Brain Regions Altered in this Disorder

Eliza Neal;¹ Spencer Kimball;¹ Jeffrey Edwards.¹

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Purpose
Post-traumatic stress disorder (PTSD) is a complex anxiety disorder that affects about 1 out of 4 individuals after a traumatic experience. This disorder is a reactionary one that is prominent after episodes of sexual assault, warfare, and other life-threatening events. Victims of PTSD are often found with increased levels of catecholamines (adrenaline) and corticosteroids--hormones that increase plasticity in the memory and emotion regions of the brain. While one approach to treating PTSD is to give receptor antagonists for these hormones after a trauma has occurred, our research examined the use of hormone receptor antagonists--propranolol and mifepristone--prior to the trauma in an attempt to prevent PTSD onset.

Methods
To study the efficacy of these antagonists, a social defeat (SD) model was introduced in rats to induce PTSD-like symptoms. The use of the SD protocol is significant as its inclusion of social interaction mirrors the social aspect of human PTSD. To mimic the formation of memories, we performed field electrophysiology experiments in the brain slices of SD and control rats, measuring long-term potentiation (LTP), the cellular mechanism mediating learning and memory. In PTSD, LTP is usually altered in the emotion and learning centers of the brain including the ventral hippocampus (VH), lateral amygdala (LA), and medial prefrontal cortex (mPFC).

Results
Results demonstrated that SD caused a significant increase LTP in the VH, LA, and mPFC. Finally, to determine whether a prophylactic treatment could prevent the physiological changes of PTSD (i.e., increased levels of LTP), we simultaneously administered propranolol and mifepristone at 10 mg/kg doses by intraperitoneal injection one week prior to and throughout SD. The levels of LTP returned to control levels in the VH, LA, and mPFC of SD rats that received drug injections when compared to SD rats with no drug injections and controls. Overall, our data suggest that propranolol and mifepristone together may be a viable prophylactic treatment for preventing PTSD. This could be beneficial to those who are more susceptible to experience PTSD such as military personnel, emergency responders, and law enforcement officers.

Conclusions
Overall, our data suggest that propranolol and mifepristone together may be a viable prophylactic treatment for preventing PTSD. This could be beneficial to those who are more susceptible to experience PTSD such as military personnel, emergency responders, and law enforcement officers.
08: Diabetic Gait is Not Just Slow Gait
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Purpose
Instrumented gait analysis has the potential to contribute to the assessment and treatment of diabetic peripheral neuropathy (DPN). Traditionally, clinicians have relied on plantar pressure (PP) measurements to predict ulcer risk, prescribe interventions, and extrapolate gait compensations in individuals with DPN. However, there is still no consensus on specific PP alterations in DPN, optimal PP metrics, or altered PP etiology. Joint kinetics may provide a more robust and informative characterization of DPN gait alterations. While studies have looked at DPN gait, these have not accounted for the confounding effects of walking speed and the interplay among lower extremity joints. The purpose of this study was to assess gait kinetics alterations in DPN by controlling walking speed and incorporating a multi-segment foot model into a full body gait analysis.

Methods
Ten subjects with DPN (ht: 178.9 ± 8.5 cm, wt: 108.8 ± 16.7 kg, age: 61.5 ± 13.5 yrs.), and 10 healthy matched controls (ht: 180.0 ± 6.4 cm, wt: 92.9 ± 14.5 kg, age: 59.4 ± 7.5 yrs.) participated. Reflective markers were attached to each participant according to a custom full body model, including a kinetic multi-segment foot. Subjects walked overground at a controlled speed (1.0 m/s) while plantar pressure, force, and motion capture were collected. Peak PP and pressure-time integrals as well as midtarsal, ankle, and hip joint moments and powers were calculated and compared between groups using t-tests.

Results
No group differences were noted in any PP measurements. During mid-stance there was an increased and prolonged hip extension moment. In late stance, midtarsal and ankle joint moments were similar between groups, but delayed transitions between power absorption and generation were evident in both joint powers. These delays resulted in increased negative work in both joints.

Conclusions
Findings demonstrated that individuals with DPN use hip musculature to compensate for distal muscle weakness. Overall, joint kinetics may provide more insights into DPN gait compensations than traditional PP measurements and may inform clinicians regarding DPN assessment and treatment.
09: Changing Levels of Cyclin-Dependent Kinase Inhibitors in the Pancreatic Beta Cell During Aging
Daelin Jensen.

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Purpose
Over 400 million people worldwide are affected by Diabetes Mellitus. Functional pancreatic beta cells are necessary for maintaining healthy blood glucose levels through the production of insulin. Both Type 1 and Type 2 diabetes are characterized by a loss of functional beta cell mass and, consequently, decreased insulin production. One potential intervention is the use of beta cell transplantation from cadaveric donors. A major impediment to greater application of this treatment is the scarcity of transplant ready beta cells. Paucity of beta cells could be improved ex vivo by turning on proliferative pathways. Various genes have been identified that induce beta cell replication. A significant caveat to these findings, however, is that these genes induce proliferation in young beta cells and not aged beta cells. Given that most beta cell donations will be from aged donors, understanding why aged beta cells fail to replicate and defining pathways to induce proliferation is essential. Aged beta cells may fail to replicate because they have higher expression of cyclin-dependent kinase inhibitors (CDKI™) which inhibit cell cycle progression. Ink4a (p16) is a CDKI that has been shown to increase with aging. Here we present data from mRNA and western blots to demonstrate changes in the Ink4 and Cip/Kip CDKI™ in 5 week (young) and 5 month (aged) primary rat pancreatic beta cells. Understanding the difference in CDKI expression throughout aging will help developing interventions in transplant ready beta cells.

Methods
CDKI protein and mRNA levels will be analyzed via Western blotting and real time q-PCR. Islets will be isolated following the harvesting of pancreata from young and aged Wistar rats at previously defined time points. Western blotting will be performed using antibodies for our seven CDKI's of interest (Ink4a, Ink4b, Ink4c, Ink4d, Cip1, Kip1, and Kip2). Membranes will be visualized and quantification of protein levels performed on Odyssey-CLx LiCor software.

Results
NA

Conclusions
NA
10: Evaluating the Role of Orphan Nuclear Receptor Nr4a1 in Mice

Brennan Leininger;¹ Kavan Hess;² Jacob Herring;² Adam Wynn;² Jackie Crabtree;² Collin Cristensen;² Matt Austin;³ Courtney Smith;³ Jeffery Tessem.¹

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Purpose
Nkx6.1 transcriptionally regulates a network of genes essential for expanding functional β-cell mass. Studies of Nkx6.1 deletion have defined its function in these processes, as Nkx6.1 ablation causes rapid onset of diabetes and reduced insulin production in mature β-cells across various species. Nkx6.1 induces these changes partially through upregulation of Nr4a1. The orphan nuclear receptor, Nr4a1, is critical for β-cell proliferation, mitochondrial respiration and fuel utilization, and loss of Nr4a1 impedes fuel utilization and insulin secretion. Here, we demonstrate that the loss of Nr4a1 in β-cells leads to diabetic onset through decreased glucose tolerance.

Methods
Wild-type and beta cell-specific Nr4a1 KO mice of both genders were fed a normal or high-fat diet for a 20 week period. Body weight, non-fasting blood glucose levels and glucose tolerance tests were measured over the feeding regime.

Results
Our data show that loss of Nr4a1 results in improved glucose tolerance from 16 to 20 weeks of high-fat feeding in male mice, while female Nr4a1 KO mice have impaired glucose tolerance as early as 12 weeks of high-fat feeding.

Conclusions
This demonstrates that Nr4a1 plays a critical role in the β-cell, and that loss of Nr4a1 has gender-specific effects.
11: Circulating Cell free DNA (ctDNA) as Early Therapeutic Biomarker in Chemotherapy vs. Targeted Therapy in Shammah Induced Oral Cancer.

Samar Saeed Khan.¹

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Purpose
Use of Shammah is one of the most common habitual etiological factor where it is epidemiologically responsible for oral cancer in southern Saudi Arabia. Circulating cell free tumor DNA (ctDNA) fragments present in blood stream are apoptotic or necrotic tumor cells. Present study was thus aimed to assess the significance of circulating ctDNA as an early therapeutic biomarker in patients with shammah induced oral cancer and to validate the effect of chemotherapy vs. targeted therapy by quantitative assessments of ctDNA fragments in plasma of cancer patients with shammah users.

Methods
Blood samples were collected from 20 patients of shammah induced oral cancer receiving chemotherapy, 20 patients of shammah induced oral cancer receiving targeted chemotherapy. DNA extraction was carried out from the plasma samples followed by quantitative and qualitative assessment of extracted ctDNA by Picodrop UV-Spectrophotometer. Assessment of quantity of short & long fragmented DNA was done by amplifying short (102 bp) and long (253 bp) products with two different primer sets for the beta-actin gene and p53 using PCR. All quantitative ctDNA parameters were statistically analyzed to verify their correlation with various clinicopathologic parameters of oral cancer.

Results
Obtained results validate the efficacy of circulating plasma free DNA as a potential early noninvasive therapeutic biomarker in shammah induced oral cancer patients. Present study shows that targeted chemotherapy patients demonstrate less quantity of ctDNA in comparison with chemotherapy patients.

Conclusions
Establishing ctDNA role in therapeutic response for cancer treatment will benefit in modulating drugs, their response and effect in reducing tumor load. Lastly on the basis of results obtained ctDNA might emerge as a Non invasive early diagnostic tool to assess tumor nature, staging, progression, recurrence and treatment response, this all in turn will help in reducing mortality and will enhance quality of life in oral cancer patients.
12: Investigating a Novel Nanofiber Sensor Device for Objective Aromatic Analysis
Maleah Vaughn;¹ Nicole Stevens.²,³

Author Affiliations
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Purpose
Essential oils are plant extracts that contain lightweight, aromatic molecules. Standard Gas Chromatography Coupled Mass Spectrometry (GCMS) has become a widely accepted method for testing essential oil composition and quality, but lacks the ability to analyze aroma. In addition to its composition, an essential oil’s aroma is a key characteristic indicative of quality and is often linked to its benefits. Aroma is currently defined by subjective organoleptic analysis, which is inconsistent and non-quantifiable. This study investigates novel nanofiber sensor device to quantifiably assess aroma.

Methods
Vaporsens Pilot 4.2 is used to analyze the aromatic headspace of different types of essential oil.

Results
Statistical analysis shows that nanofiber technology can be used to objectively characterize the aroma of essential oils and distinguish between similar aromas.

Conclusions
This nanofiber sensor technology shows promise in objective organoleptic analysis while offering other practical advantages over the current technology. Additional studies are underway.
In Silico Investigation of Cinnamon Essential Oil as a Potential Antidiabetic Agent
Nicole Stevens

Author Affiliations
1doTERRA International, USA; 2College of Life Sciences, University of Miami, USA

Purpose
Cinnamon bark has been evaluated as a potential antidiabetic therapy. However, less research has been done on the volatile oil of cinnamon Bark, which may also possess potent antidiabetic properties through various pathways. Prior to in vitro or human clinical studies, we will evaluate cinnamon essential oil as a possible antidiabetic therapy.

Methods
GCMS and in silico modeling techniques (molecular docking and CytoSolve platform) will be used to evaluate cinnamon essential oil.

Results
GCMS of Cinnamon essential oil revealed primary constituents including cinnamaldehyde, eugenol, β-caryophyllene, and linalool. In silico modeling suggests that each of these may posses antidiabetic potential along multiple pathways, particularly in GLUT4 translocation.

Conclusions
Cinnamon essential oil warrants further study as an antidiabetic therapy. Human clinical trials and in vitro studies are currently underway.
14: Deletion of ARID1A in Osteosarcoma Enhances Aggressive Cell Phenotypes
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Purpose
Osteosarcoma is a form of bone cancer that primarily affects children and young adults. 30 years ago survival rates went from 20% survival to 75% survival with the introduction of aggressive chemotherapy combined with surgery. For the past three decades, the survival rate has remained the same despite the increase in targeted therapies to treat other cancers. Our research is aimed at discovering new drugs that can treat patients unresponsive to traditional chemotherapy. With recent cancer discoveries, osteosarcoma has been identified as a genetically complex disease.

Methods
In a forward genetic screen using the transposon piggyBac, we discovered a strong correlation between ARID1A gene repression and increased osteosarcoma rates. The ARID1A protein plays a role in epigenetics by directing chromosomes to unwind from histones. In an attempt to discover whether ARID1A contributes to sarcomagenesis, osteosarcoma cell lines were grown in culture dishes. Using CRISPR/Cas9 gene editing, the ARID1A gene was disrupted from the main sequence and various methods were used to test proliferation rates. Not only are we testing gene disruption in cell lines, but we are also testing mouse models that have had ARID1A knocked out to determine if osteosarcoma growth rates increased. Our long-term goal is to provide a therapy that can be tested in humans with osteosarcoma to help those who do not respond to traditional chemotherapy and provide an alternative therapy with potentially fewer side effects.

Results
[Research in progress]

Conclusions
[Research in progress]
**15: Epigenetic Regulation of the Birc5 Promoter Explains Mechanism of Action of YM-155 in Synovial Sarcoma**

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**Purpose**
YM-155 is an anti-cancer therapy that has advanced into 11 different human clinical trials to treat various cancers. This apoptosis-inducing therapy indirectly affects the protein levels of Survivin (Gene: Birc5), but the molecular underpinnings of the mechanism remain largely unknown. Synovial sarcoma is another cancer with high protein expression of Survivin. We investigated whether YM-155 would be a viable therapeutic option to treat synovial sarcoma.

**Methods**
We, therefore, applied YM-155 therapy to human synovial sarcoma cell lines and a genetically engineered mouse model of synovial sarcoma. We further investigated the mechanism of action of YM-155 by looking at the change of modifications of the histone tails that were near the Birc5 promoter through chromatin immunoprecipitation (ChIP).

**Results**
We discovered that YM-155 exhibited nanomolar potency against human synovial sarcoma cell lines and the treated mice with synovial sarcoma demonstrated a 50% reduction in tumor volume compared to control treated mice. Using chromatin immunoprecipitation (ChIP) we discovered that the histone epigenetic marks of H3K27 for the Birc5 promoter changed upon YM-155 treatment. H3K27me3 increased whereas the H3K27ac decreased, highlighting the decrease of the protein Survivin occurs through epigenetic silencing of the gene promoter. The treatment of YM-155 was accompanied by an increase in NFkB protein expression, which indicates an attempt of the cell to initiate a positive feedback due to the decrease in Survivin expression. This combination of molecular events eventually resulted in Caspace 3/7/8 upregulation and death of the sarcoma cells.

**Conclusions**
NA
16: Microbial Profile in Different Orthodontic Appliances by Checkerboard DNA-DNA hybridization- An in Vivo study

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Purpose
The design of the orthodontic bracket/appliance is one of the most important factors for creating retentive areas for biofilm formation. In orthodontics, this would be the first study to compare the microbial level changes in three different types of orthodontic appliances using checkerboard DNA-DNA hybridization technique. The purpose of this study was to evaluate and compare the extent of appearance of orange and red microbial complexes in patients undergoing orthodontic treatment using aligners, conventional metallic fixed labial appliance and lingual fixed appliance.

Methods
A total of sixty patients, out of which twenty patients undergoing treatment with aligners, twenty patients undergoing treatment with labial fixed appliance and twenty patients undergoing treatment with lingual fixed appliance were included in our study. After 30 days, debonded brackets and rinsed aligners were stored and processed for analysis with checkerboard DNA-DNA hybridization.

Results
Most bacterial species showed moderate count except for Treponema denticola which showed higher count in all the three types of appliances. Fusobacterium nucleatum, Porphyromonas gingivalis and Treponema denticola were present in more percentage in lingual appliance. Fusobacterium periodontium and Prevotella intermedia were present in more percentage in labial fixed appliance. Campylobacter rectus, Tannerella forsythia and Prevotella melaninigenica count was moderate in all three appliances with the first two microbes showing slightly high count in aligners. The association between all the micro-organisms were statistically insignificant except for Fusobacterium nucleatum which showed strong statistically significant association in all three types of appliances.

Conclusions
The microbial contamination was more in metallic brackets than the aligners when used for a month. Lingual fixed appliance showed more microbial contamination than labial fixed appliance followed by aligners. Compared to the red complex, the percentage of micro-organisms under orange complex was more in all the three groups and there was statistically significant association between the expression of orange and red complexes and the three study groups.
17: Fit Evaluation of Pre-Sintered Co-Cr and Zirconia 3-Unit Fixed Dental Prostheses Using Micro-Computed Tomography

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Purpose
Evaluate the fit of pre-sintered cobalt-chromium and zirconia 3-unit fixed dental prostheses using X-ray micro-computed tomography

Methods
Three-unit fixed-dental-prostheses were prepared on metal dies (N=12) using a Typodont model from the maxillary first premolar to the first molar. A standardized preparation with a 1.2-mm chamfer (360 degrees) and a 2-mm occlusal reduction was prepared on abutment teeth. Dies were scanned and randomly divided into 2 groups to receive the fixed dental prostheses (n=6) made of presintered Co-Cr and pre-sintered zirconia. Each framework was seated on its specified model. Each abutment was scanned separately using micro-Computed tomography (n=24). Marginal and internal discrepancies were measured at 9 points, starting from the most distal point from the pontic (points 1-4, mesial; point 5, occlusal; points 6-9, distal) of each abutment. Data were analyzed using the Levene test, t-test, and ANOVA (P = 0.05).

Results
When overall mean discrepancy values were compared, no significant difference was observed between pre-sintered Co-Cr and presintered zirconia (P=0.085). Discrepancy values for points 1, 2, and 3 were significantly different for pre-sintered Co-Cr and pre-sintered zirconia, with the lowest mean values for point 1 and the highest for point 5. On the abutment tooth basis, for the premolar and the first molar, a significant difference was found only in points 6 (P<0.001) and 8 (P<0.003) for both materials. When the premolar discrepancies were considered for pre-sintered Co-Cr and pre-sintered zirconia, the mean values were significantly different only at points 1 (P<0.001), 2 (P=0.007), and 3 (P=0.003) and were smaller for pre-sintered zirconia. For the first molar tooth, a significant difference was observed at point 2 (P=0.002) and point 3 (P=0.008) for both materials, where the mean values were higher for pre-sintered Co-Cr than for pre-sintered zirconia. Pairwise comparison between points showed a significant difference between measurement points within each material (P<0.05). The increase in values between points 1 and 5 was evident for both pre-sintered Co-Cr and pre-sintered zirconia materials

Conclusions
Three-unit fixed dental prostheses made of pre-sintered Co-Cr or zirconia showed similar marginal and internal discrepancy values, with the highest discrepancy values at the occlusal region in both the first premolar and first molar.
Comparison of Adhesion of a Novel Pre-Sintered Cobalt-Chromium to Pre-Sintered Zirconia and Cast Nickel-Chromium

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Purpose
This study compared the bond strength of pre-sintered Ceramill Sintron to pre-sintered zirconia and cast nickel chromium (NiCr).

Methods
Specimens (n = 60) (diameter: 15 mm; thickness: 2 mm) were prepared (n = 20/group) (Ceramill Sintron, Ceramill Zi, and Wirobond 99). Disks were layered with vita VM ceramic (4 mm). Specimens were randomly divided into two subgroups. Only one subgroup was thermocycled. Specimens were tested under shear strength. Energy-dispersive X-ray (EDX) mapping was done on one disk of each material before and after ceramic layering. Chi-square test was used for failure type analysis. Two-parameter Weibull distribution values including Weibull modulus, scale (m) and shape (0), values were calculated. P values less than 0.05 were considered significant in all tests.

Results
Failure types were mostly mixed failures. Significant difference was found between the three materials for Y and Z failure types (p-values: 0.032 and 0.010 respectively). Thermocycling had no major effect on the results reported. Considering Fmax (force-inducing bonding failure) registered, significant difference was found between the control group and milled alloys groups. No significant difference was found between Ceramill Sintron and Zi. The EDX mapping showed a net increase in the control group oxide layer, whereas only a slight increase and decrease were reported for Zi and Sintron respectively. Weibull values obtained were higher for the milled groups compared to cast group for both Fmax and adhesion parameters.

Conclusions
When compared with cast NiCr, novel Ceramill Sintron has higher bond strength, comparable to Ceramill Zi. Thermocycling had no major effects on the results.
Effect of different CAD-CAM Materials on the Marginal and Internal Adaptation of Endocrown Restorations: An in Vitro Study

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Purpose
Recent resin-based and ceramic-based computer-aided design and computer-aided manufacturing (CAD-CAM) materials have been used to restore endodontically treated teeth. Adaptation of the restoration is important for clinical success, but studies evaluating the effect of these materials on the adaptation of endocrowns are lacking. The purpose of this in vitro study was to evaluate the effect of resin-based and ceramic-based materials on the marginal and internal adaptation of endocrowns.

Methods
Forty mandibular molars were divided into 4 groups (n=10); each group was restored with a different CAD-CAM material: group C: hybrid nanoceramic (Cerasmart; GC Corp), group T: fiber-composite material (Trilor; Bioloren Srl), group E: lithium disilicate glass-ceramic (IPS e.max CAD; Ivoclar Vivadent AG), and group V: zirconia-reinforced lithium silicate glass-ceramic (Vita Suprinity; Vita Zahnfabrik GmbH). A digital scan was made with an intraoral digital scanner (TRIOS3; 3Shape A/S), and endocrowns were milled with a 5-axis milling machine (Coritec 250i; Imes-Icore GmbH). The replica technique and a stereomicroscope (Å—70) were used to measure the marginal and internal adaptation of the endocrowns at 32 points. All data were statistically analyzed using 1-way ANOVA and the Tukey honestly significant difference (HSD) test (P=0.05).

Results
Statistical tests showed significant differences among the tested groups (P<.001). The resin-based groups displayed larger discrepancies than the ceramic-based groups. The resin-based groups showed a mean marginal gap larger than the mean internal gap C (P=0.009), T (P<0.001), while the ceramic-based groups showed similar gaps V (P=0.396), E (P=0.936). The largest gap was observed at the pulpal floor (P<0.001).

Conclusions
All materials had clinically acceptable internal and marginal gaps, except for the marginal gap of the Trilor group. The marginal and internal discrepancies of CAD-CAM endocrowns changed depending on the material (ceramic-based or resin-based). Ceramic-based, especially lithium disilicate glass-ceramic, showed the smallest gap, which might improve the clinical survival of the restored tooth.
Effect of Prosthetic Framework Material and Para Functional Forces on Peri-Implant Strain in a Mandibular All-On-Four Implant Supported Prostheses

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Purpose
a) To evaluate the effect of prosthetic framework material on peri-implant strain in mandibular all-on-4 implant supported prostheses under functional loading. b) To evaluate the effect of prosthetic framework material on peri-implant strain in mandibular all-on-4 implant supported prostheses under para-functional loading.

Methods
Models simulating mandibular completely edentulous arch was fabricated in heat-cured acrylic resin. On the acrylic models four implants were placed in the region of 32, 34, 42, 44 simulating all-on-4 implant placement. Implant-supported screw-retained fixed prosthesis frameworks were fabricated using three different prosthetic framework material (cobalt chromium, zirconia, bio-hpp). Prostheses for each material was fabricated both without cantilever and with cantilever length of 15mm. Strain gauges were bonded on to the buccal and lingual to each implant. Forces simulating opposing natural dentition (400N) and parafunctionental habit (1000N) was applied on models. Force application was done for the period 10 seconds and ten times on each model. Peri implant strain in each strain gauge was recorded, tabulated and subjected to statistical analysis.

Results
Under functional loading, mean peri implant strain in prostheses without cantilever was seen in following order (Zirconia (-506.1µstrain) > Cobalt chromium (-378.5µstrain) > Bio-hpp (-251.5µstrain) whereas in prostheses with cantilever Bio- hpp, Zirconia & Co-Cr showed an Increase by 7.2, 2 and 2.2 times respectively. Under para functional loading, mean peri implant strain in prostheses without cantilever was seen in following order Zirconia (-1792µstrain) > Cobalt chromium (-1371µstrain) > Bio-hpp (-1056µstrain). Whereas in prostheses with cantilever Bio-hpp, Zirconia & Co-Cr showed an increase by 9, 3.5 and 3.8 times respectively.

Conclusions
a) Peri implant strain in all-on-four implant supported prostheses was influenced by the choice of prosthetic framework material, under functional and para functional forces. b) In cases with normal occlusal forces, all-on-four implant supported prosthesis with cantilever was acceptable. Zirconia or cobalt chromium framework material should be used in the prostheses fabrication whereas Bio-HPP framework material should not be used in prostheses fabrication. In cases with para functional forces, all-on-four implant supported prosthesis with cantilever was not recommended irrespective of framework material. Only Prosthesis without cantilever was recommended and Bio-HPP should be the material of choice for prostheses.
Meniscofemoral Ligaments: Under Emphasized in Anatomy Literature Despite Being Evolutionarily Preserved and Surgically Repaired

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Purpose
Anatomical literature, including medical hallmarks such as Gray’s Anatomy, variably discuss the location and prevalence of the anterior and posterior meniscofemoral ligaments (aMFL, pMFL). These ligaments can be seen in an intracapsular knee joint dissection emerging from the posterior horn of the lateral meniscus and flanking the posterior cruciate ligament (PCL) anteriorly and posteriorly. Anatomical teaching resources including some of the most widely used textbooks and atlases for students of allied health professions typical make no mention of the aMFL and variably label the pMFL in medical images.

Methods
66 cadaveric knee joints were dissected using a novel approach that improves preservation of the aMFL and pMFL. Prevalence of the meniscofemoral ligaments were recorded individually and together. Current and popular medical resources were reviewed for the presence of information on the meniscofemoral ligaments.

Results
It was determined that 100% of cadaveric knee joints possess at least one of the meniscofemoral ligaments hence, these structures have been evolutionarily preserved to carry out a significant function. One of the most convincing hypotheses on the function of the aMFL and pMFL claims they serve to guide the movements of the lateral meniscus during joint flexion and extension. Other hypotheses state these ligaments may function to oppose the popliteus pull on the lateral meniscus to prevent tears, structurally reinforce the PCL or provide proprioceptive feedback. Large structures that currently do not possess concrete functional descriptions should not be left out of the anatomical literature as this promotes confusion and decreases the potential for future practitioner innovation.

Conclusions
New aMFL and pMFL prevalence data and the hypothesized biomechanical functions of the ligaments should be receiving more attention in the medical research and teaching literature. Select orthopedic surgeons perform surgical repairs of the meniscofemoral ligaments and their associated structures. The posterior horn of the lateral meniscus may also be surgically excised after tear although it is the origin of the meniscofemoral ligaments. A more thorough surgical attempt to repair posterior horn tears prior to meniscectomy should become the gold standard of practice as the fields of surgery and orthopedics advance and make final conclusions on the role of the meniscofemoral ligaments. Currently anatomical literature should more consistently address and discuss the anatomy of these ligaments.
22: Femoral Chondral Lesions Increase in Severity with Aging Equally Between the Sexes and Present in Comparable Locations

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Purpose
The objective of this study was to determine if visible, femoral chondral lesions on cadaveric knee joints exacerbate differently with aging between the sexes.

Methods
85 cadaveric femurs were assessed for chondral pathology overlying the femoral condyles and patellar fossa using a 0-4 qualitative grading scale for gross signs of osteoarthritis (OA). Each specimen was blinded to two raters and the raters scores were averaged to provide each specimen a Disease Severity Score (DSS).

Results
Specimens 80+ years old (N=22) had an average DSS of 3.19 ± 0.69 compared to a DSS of 2.7 ± 0.85 and a DSS of 2.52 ± 0.95 for specimens 70-79 years old (N=42) and specimens below 70 years old (N=22), respectively. The DSS for the 80+ years old population was significantly greater than the DSS of the 70-79 years old population (p < 0.05) and the below 70 years old population (p < 0.01). Specimens that scored a DSS of 2 and above, representing mild OA to severe OA, were assessed for their specific site of most severe degeneration. The most severe degeneration on the femoral articular cartilage was consistently on the patellar fossa. This degeneration was seen in 45% of specimens below 70 years old, 60% of specimens 70-79 years old and 50% of specimens above the age of 80 years old. The lateral condyle was the second most degenerated region in the below 70 years old specimens (27%). The medial condyle became the second most degenerated region in the 70-79 years old specimens (38%) and the above 80 years old specimens (68%). The males and females in the above 80 years old population each displayed a 2:7 ratio for lateral condyle vs. medial condyle as the site of most severe deterioration.

Conclusions
This study displayed increased severity of OA on the femoral condyles with aging yet, there was no difference between the sexes in the severity or location of degeneration. With increased propensity to develop shearing forces in the knee based on cruciate ligament thinning or muscular atrophy around the joint the medial joint can experience increased degeneration. Currently, over 2/3s of the American population is overweight and obesity sways tibiofemoral compression forces to the lateral respects of the joint. When patients are over the age of 80 their muscles supporting the joint have atrophied and can no longer resist degenerative shearing forces at the knee. Whereas patients between the ages of 70-79 appear to represent a split population where approximately half of this population may be affected by obesity and the other half by muscular atrophy. It is recommended that public health advisory committees target these patients earlier in adult life with recommendations to increase their muscle mass around the knee joint and reduce obesity. The most prevalent sites of degeneration per each age group should be considered as research on stem cell therapy for synovial joint pathology continues to increase.
Psychometric Comparisons of Computer-Adaptive Test and Standard Balance and Walking Scales to Assess Functional Mobility in People With MS

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Purpose
Computer-Adaptive Tests (CAT) offer several advantages over standard disease-specific tests due to fewer question items minimizing patient burden, enhanced precision by risk-factor adjustment and computer-estimated scoring which allows better utilization and communication of results. However, the CAT and other self-reported functional mobility scales have never been directly compared in patients with neurological disorders such as Multiple Sclerosis (MS). This study, therefore, compared the floor and ceiling effects, concurrent criterion validity, and construct discriminant validity of patient-reported functional status (FS) estimated from CAT with the Activities-specific Balance Confidence (ABC) scale, and MS Walking Scale-12 (MSWS) in persons with MS.

Methods
Thirteen ambulatory individuals diagnosed with MS [age mean (SD)= 51.2(11.3) yrs, gender= 10F/3M, n=8 reporting no assistive device], without concurrent relapses were recruited and their pilot data is presented as part of a larger study. Data was extracted from the CAT using Focus On Therapeutic Outcomes, Inc, ABC and MSWS scales. Items for CAT were developed from the psychometrically established lower extremity functional scale, which evaluates functional abilities in patients with unilateral or bilateral lower extremity involvement. The ABC and MSWS assessed balance confidence and walking ability, respectively. Floor and ceiling effects were defined as scores of 1-10 and 90-100, concurrent validity was assessed by pearson product moment correlations between FS, ABC and MSWS scores, while construct discriminant validity was analyzed by independent t-tests between faller vs non-faller group FS scores using previously established cut-offs for ABC and MSWS.

Results
No floor or ceiling effects were noted for the CAT FS scores, while 15% and 23% for ABC and 7.8% each for MSWS were found. Significant (p<0.05) correlations between FS and ABC (r=0.61) and MSWS (r=-0.75) were determined. Faller and non-faller FS scores were not significantly different using ABC or MSWS cut-off scores, although the mean difference approached significance (p=ranging from 0.05-0.08).

Conclusions
This study highlights the psychometric properties of a time-efficient and precise CAT in comparison with standard ABC and MSWS functional mobility scales. The CAT demonstrated no floor or ceiling effects, good concurrent validity and limited discriminant validity, thus warranting further investigation using larger and neurologically diverse samples.
24: The Effect of Video Feedback on Physical Therapist Student Performance of a Low Back Manipulation Intervention: A Randomized Controlled Trial

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Purpose
Thrust manipulation to the lumbar spine (LSM) is an effective treatment technique for low back pain patients taught in first professional physical therapist (PT) curricula. Video feedback has been shown to be effective for motor skill development in healthcare education. There is no research examining video feedback during instruction of LSM to physical therapist students. Exploring different methods of feedback can improve the effectiveness of teaching LSM to PT students. The purpose of this study was to examine whether video feedback would improve entry-level PT students' ability to perform LSM.

Methods
The study used a prospective, randomized experimental design. Thirty-two first year Doctor of Physical Therapy students were randomized to either the experimental or control group. Following instruction, student performance of LSM was video recorded three times: Baseline (first attempt), Acquisition (after instruction and practice), and Retention (after a week of no practice). Experimental group subjects received video feedback as a part of the practice session; those in the control group did not. Two blinded raters scored each video two times in random sequence using the Manipulation Performance Rating Tool (MPRT). A 2 X 3 repeated measures ANOVA was used to analyze any differences within or between groups. Inter-rater (ICC 3,2) and intra-rater (ICC 3,1) reliability was examined.

Results
Both groups improved from baseline to acquisition and retention ("Experimental" 8% and 5% respectively, "Control" 4% and 2% respectively, P < 0.001). The effect of group was non-significant (P = 0.2) as was the group x time interaction effect (P = 0.196), although the experimental group improved by 8% from baseline to acquisition compared to a smaller improvement of 4% for the control group. Intra and inter rater reliability ranged from moderate to excellent for most ratings.

Conclusions
Instruction in LSM with and without video feedback resulted in statistically significant learning effects. Average performance ratings were "passing" (score above 80% on the MPRT), with acquisition scores being higher than retention scores in both groups. There was not a statistically significant or educationally meaningful difference in performance scores between students who used video feedback compared to those who did not.
25: Waterpipe Smoking Increases the Risk of Head and Neck Cancer

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Purpose
Recent rise in popularity of waterpipe smoking (WPS) among youth and it being a tobacco-related product, the research on its deleterious effects on health and especially in relation to head and neck cancer is sparse. The aim of this systematic review was to quantify the existing literature and assess the association of WPS and head and neck cancer.

Methods
The addressed focused question was “Is there an association between waterpipe smoking and head and neck cancers”? PubMed, EMBASE, Scopus, Web of Science, and grey literature from January 1990 up to and including March 2017 were searched. Two independent reviewers performed the study selection according to eligibility criteria.

Results
A total of seven studies that met the eligibility criteria were included. In four studies that evaluated the associated risk of oesophageal cancer, the odds ratio (OR) ranged from 1.69 (95% CI=0.76-3.77) to 21.4 (95% CI=11.6-39.5). The OR for the association of WPS with nasopharyngeal cancer (14) and oral cancer (19) were reported to be 0.49 (95% CI=0.20-1.43) and 4.20 (95% CI=1.32-13.3) respectively. One study that evaluated risk in different head and neck cancers reported two-fold odds ratio [2.73 (95% CI=1.65-4.41)].

Conclusions
Our findings showed an association of WPS and head and neck cancer. However, larger good-quality studies with standardized methods of WPS exposure measurement and representing geographically varied sample population are needed to identify the health effects of WPS.
26: E-cigarette Knowledge and Usage Among Professional Baseball Players

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Purpose
The use of electronic cigarettes has become increasingly more popular in the United States. Contrary to previous belief, E-cigarettes are no longer considered a healthy alternative to smoking combustible cigarettes. The purpose of this study was to evaluate the minor league baseball players cultural background with knowledge, attitude, and usage of E-cigarettes.

Methods
The minor league professional baseball players (MLPBPs) from four major league franchises participated in this study. Athletic trainers distributed the surveys to their MLPBPs during 2018 spring training physicals. The players completed the surveys voluntarily and anonymously. Data was managed with an excel program and interpreted via standard descriptive statistical analysis.

Results
A total number of 414 minor league professional baseball players (MLPBPs) participated in this study (N=414). The cultural distribution of MLPBPs completing the survey was: Caucasian-53% (n=218), Hispanic-40% (n=163), African American-6% (n=25), Asian-1% (n=5). Among these MLPBPs, 34% thought E-cigarettes caused less harm than combustible cigarettes. Specifically, the cultural distribution of players who were of the opinion that the usage of E-cigarettes was less harmful than combustible cigarettes were the following: Caucasian-46%, African American-32%, Hispanic-21%. Among players who had indicated previously tried/past usage of E-cigarettes were: Caucasian-26%, African American-20%, Hispanic-12%. The distribution of MLPBPs who responded that they have friends/peers who are current users of E-cigarettes were following: Caucasian-50%, African American-44%, Hispanic 34%. Among the total group of MLPBPs who completed the survey, 44% have never heard of Electronic cigarettes. Specifically, the cultural distribution of players who have not heard about E-cigarettes were: Hispanic-65%, African American-64%, Caucasian-29%.

Conclusions
Educational programs regarding E-cigarette hazard awareness need to be preventative in nature for African American and Hispanic MLPBPs. Caucasian MLPBPs were more likely to have the opinion that E-cigarettes are less harmful than combustible cigarettes compare to their African American and Hispanic counterparts. Additionally, there is a higher experimental E-cigarette usage rate among Caucasian players. In consideration of these two findings, E-cigarette hazard awareness programs for Caucasian MLPBPs need to be not only be preventative but also interventional in nature.
Data Collection for Endodontic Diagnostic Tests Utilizing a Newly Created Axium Form: A Student Assessment

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Purpose
Determining pulpal and apical diagnosis of a tooth can be a challenge for undergraduate dental students as they transition into the clinic. Initially, five basic endodontic diagnostic tests are performed. Understanding the scientific basis and interpretation of these tests are of primary importance. Often times, selection of the proper tests is overlooked; the recording and interpretation of the findings can be unstructured and confusing. An innovative Axium form has been created in order to facilitate students with endodontic testing and recording of data. The purpose of this study was to have D2 students assess and compare the recording of endodontic diagnostic testing data into a Traditional SOAP Note Format versus utilizing the newly created Axium Form.

Methods
A PowerPoint of a clinical case requiring an Endodontic Consultation was initially presented to the D2 students. A demonstration of recording the results of the Endodontic Diagnostics Tests into a traditional SOAP note followed by a demonstration of recording the results of the Endodontic Diagnostics Tests into a newly created Axium form. Following these two demonstrations, the undergraduate second year dental students were asked to provide their input in assessing and comparing the two methods via completion of a voluntary and anonymous survey.

Results
One hundred and eighteen (N=118) participated in the survey. 43% (n=51) had never participated in a comprehensive endodontic assessment; 57% (n=67) of the students had participated in a comprehensive endodontic assessment. Regarding the new Axium form providing a more organized way to format results of diagnostic tests compared to the traditional SOAP note: 68% (n=81) - yes, 2% (n=2) - no, 29% (n=34) - unsure, 1% (n=1) - no difference between the two methods. When reviewing a patient’s chart, the students preferred the Axium form had been used over the SOAP note for documentation: Axium form - 69% (n=80), SOAP note - 15% (n=17), no difference - 16% (n=19).

Conclusions
The majority of D2 students preferred the new Axium form over the traditional SOAP note as new comprehensive, concise, and consistent methodology when documenting endodontic test results.
28: 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 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 seven patients (four males, three females) that have had eight 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.
29: Evaluation of Fracture Resistance and Failure Pattern of Endodontically Treated Teeth Restored with Custom Posts and Cores Using 2 CAD/CAM Materials: A Pilot Study

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Purpose
To evaluate the fracture resistance and failure pattern of custom made Computer Aided Design/ Computer Aided Manufacturing posts and cores using a fiber reinforced composite material and a high-density polymer.

Methods
30 extracted mandibular second premolars were selected, endodontically treated and prepared to receive the posts. The specimens were randomly divided into three groups (n=10) according to each material: group 1: fiber posts (Rely X, 3M-ESPE) with composite core build-up (Filtek Bulk Fill Posterior, 3M-ESPE) as a control group; group 2: one-piece milled post and core from fiber reinforced composite blocks (Trilor, Bioloren); and group 3: one-piece milled post and core from hybrid ceramic disks (Ambarino, Creameed). All the posts were cemented using a self-adhesive resin cement (Rely X U200, 3M ESPE). Fracture resistance was tested using a universal testing machine, failure patterns were then observed visually and radiographically, and evaluated under Scanning Electron Microscopy. Data was analyzed using One-way ANOVA followed by Tamhane post-hoc test in order to determine significant differences among groups (P= 0.05).

Results
The mean fracture resistance values were: 426.08 ±128.26 N for group 1, 367.81±72.34N for group 2, and 620.02 ±54.29N for group 3. Statistical analysis revealed that group 3 had the highest mean load to fracture in comparison to the other groups (p=0.000). Failures were cohesive in group 2 and 3 and mixed in group 1 with no catastrophic failures reported in all groups.

Conclusions
Computer Aided Design/Computer Aided Manufacturing posts and cores made from high-density polymer showed a better performance than prefabricated fiber posts. One-piece high-density polymer posts and cores milled by Computer Aided Design/Computer Aided Manufacturing technology are a viable alternative for restoring endodontically treated teeth.
30: 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 presently 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 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-1β and TNF-α), 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.
31: Gingival Cell Invasiveness is Differentially Regulated by E-Cigarette Flavor and Nicotine Levels
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Purpose
OSSC is a common disease affecting around 30,000 people in the United States each year. One of the major causes of such cancer is exposure to tobacco smoke. The development of the electronic cigarette (eCig) has given rise to a new, largely unregulated market within the smoking industry. While generally supposed to be less harmful than traditional tobacco-cigarette smoke, knowledge about the toxicity of the e-liquid consumed via electronic devices is still scarce. Our objective was to determine the impact of eCig flavoring and nicotine on gingival squamous cell carcinoma invasion.

Methods
Ca9-22 and Cal-27 OSCC cells were incubated in the presence or absence of Red Hot or Green Apple flavored eCig solution with and without nicotine. RAGE is a cell surface progression factor that perpetuates inflammatory signaling in cells and tissues exposed to tobacco products. Immunofluorescence of cultured cells determined eCig-induced RAGE expression and the degree of real time cellular invasion was assessed over a 24 hour time course using an RTCA DP instrument.

Results
Compared to controls we observed: 1) increased cell invasion in the Red Hot eCig Ca9-22 treated cells with or without nicotine (2.3-fold, 3.6-fold; p<0.0002); 2) decreased cell invasion in the Green Apple Ca9-22 treated cells with or without nicotine (1.7-fold, 2.66-fold; p<0.0002) 3) decreased cell invasion in the Red Hot Cal-27 eCig treated cells in the presence or absence of nicotine (1.7-fold, 2.7-fold; p<0.002); and 4) no differences in cell invasion for the Cal-27 Green Apple eCig treated cells. We also reveal flavor and nicotine dependent increases in RAGE expression in cells treated with either eCig liquid. Elevated RAGE suggests a plausible mechanism that influences cellular invasion.

Conclusions
From these data, we can conclude that eCig flavorings and nicotine orchestrate differential regulation of OSSC cell invasion. Also, we see that the invasive differences correlate with the expression of the inflammatory receptor RAGE. This study provides and important initial step in dissecting RAGE-mediated mechanisms of cancerous invasion and may be helpful in determining key molecular avenues of invasion employed by OSCC.
32: Association of Geriatric Oral Health and Overall Health: A National Study
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Purpose
With the elderly population projected to triple to 1.5 billion worldwide by 2050, understanding the impact of oral health on the welfare of geriatric people is becoming more important. The purpose of this study was to investigate the association between oral health and the overall health and well-being of geriatric people on a national level in the United States.

Methods
Data used for this study were from the 2015-2016 National Health and Nutrition Examination Survey. Weighted prevalence estimates were reported for the following variables using mean, standard deviation, and percentages: demographics, oral health status, and overall health and well-being. R version 3.4.1 was used to conduct inferential and descriptive statistics with significance level set at a<0.05 at two-tailed. Chi-square tests were performed to look at the association of oral health to physical, mental, and general health conditions. The oral health outcome variable was a self-reported question on the health of teeth and gingiva. Logistical regressions were performed to predict oral health outcome from physical, mental and general health. The odds ratio (OR) and 95% confidence interval were determined.

Results
The total population for adults 65 years or older in the United States was 47.8 million. Many individuals that reported poor oral health demonstrated decreased well-being and limited ability to do work. Statistical analyses showed significant relationships between oral health and general health ($\chi^2= 200; p<0.05$), lower energy levels ($\chi^2= 60; p<0.05$), work limitation ($\chi^2= 50; p<0.05$), depression ($\chi^2= 80; p<0.05$), and poor appetite ($\chi^2= 70; p<0.05$). Good oral health was associated with better general health (OR= 0.480; p<0.05), better mental health (OR = 0.613; p<0.05), higher energy levels (OR= 0.613; p<0.05), and better appetite (OR= 0.559; p<0.05).

Conclusions
Our results suggest that there is an important relationship between positive oral health and overall health and well-being in elderly people. This study shows the need for attention to oral health when attempting to address issues related to geriatric overall health.
33: Creating an Efficient Learning Model: Analysis of Perceptions and Outcomes of a Fixed Prosthodontics Course

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Purpose
Because of the rising cost of tuition, dental schools are becoming increasingly concerned with developing a more efficient learning model. In this retrospective study (completed in 2018), a fixed prosthodontics course was followed for five years as the curriculum transitioned from a traditional lecture-based to a more active learning structure.

Methods
Data was collected from university exams, curriculum hours, national exams, and a student survey in order to assess course efficiency and student performance.

Results
The data showed a 30% reduction in time spent in the classroom and simulation clinic as compared to the previous course model. This modified learning model reduced time spent in lecture, length of the course, and number of projects needed, while student performance remained consistent. Students were able to pass all assessments including practical examinations at the same rate as previous classes. Performance on standardized national exams, including National Board Dental Exam part II (NBDE II) and Western Regional Examining Board (WREB) licensure exams remained consistent among the graduating classes and the scores were comparable to the national average.

Conclusions
Although limited in scope, this study suggests that it is possible to significantly reduce contact time while increasing student engagement through active learning techniques.
34: Stem Cell Markers SOX2 and OCT4 Enable to Resolve the Diagnostic Dilemma between Ameloblastic Carcinoma and Aggressive Solid Multicystic Ameloblastoma

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Purpose
Ameloblastic carcinoma (ACA) is a malignant neoplasm with overlapping histopathological features of benign aggressive solid multicystic ameloblastoma (SMA). This often leads to misdiagnosis with direct implication on the management protocol. The need of the hour is to adopt reliable tissue biomarkers to differentiate these lesions and provide directions towards treatment. Literature based evidence indicates meagre studies due to constraint of cases using single marker to differentiate ACA and SMA. This prompted us to undertake this study. Thereby, this study is aimed at resolving the diagnostic dilemma in differentiating ACA and aggressive SMA using SOX2, OCT4 and CD44.

Methods
Tissue samples involved 40 archival cases of histopathologically confirmed cases of ACA (n = 20) and SMA (n = 20). The sections were subjected to immunohistochemical staining using antibodies to SOX2, OCT4 and CD44. Nuclear staining for SOX2 and OCT4 and membranous reactivity for CD44 was considered positive.

Results
The expression of SOX2 and OCT4 in ACA was statistically significant when compared to SMA (P < 0.001). CD44 showed an insignificant statistical value of <0.077 in differentiating ACA and SMA. SOX2 and OCT4 expression in ACA showed a significant correlation coefficient of 0.616 at P < 0.004.

Conclusions
SOX2 and OCT4 could serve as independent novel markers in resolving the diagnostic dilemma between ACA and aggressive SMA.
Assessment of Biological Behaviour of Oral Squamous Cell Carcinoma by Expression Levels of P-Cadherin and WNT5A: An Immunohistochemical Study

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Purpose
Oral squamous cell carcinoma (OSCC) is a potentially debilitating disease with increased mortality rate. Despite improvements in diagnostic and therapeutic interventions the 5 year survival rate still remains poor. Cancer progression is a multi-step process in which adhesion molecules play a pivotal role in the development of recurrent, invasive, and distant metastasis. Cadherins belongs to family of transmembranous glycoproteins that form adhesive link among the cells for the establishment of a precise cell architecture and tissue integrity. Alteration in the expression and subcellular localization of cell adhesion molecules could play an imperative role in the development and progression of OSCC. So, the need of the present study was to adopt prognostic biomarkers to assess the biologic behaviour of OSCC that will facilitate in deciding the treatment modality by the surgeons.

Methods
A total of 60 selected OSCCs cases (Lymph node metastasis n=30, non-metastatic n=30) and 10 normal healthy controls were quantitatively and qualitatively analyzed by immunohistochemistry for P-Cadherin and WNT5A. Membranous reactivity and cytoplasmic staining for P-Cadherin was considered positive. Nuclear staining and cytoplasmic staining for Wnt5A was considered positive.

Results
The expression levels of P-Cadherin and WNT5A in OSCC groups were statistically significant (p < 0.001). P-Cadherin and WNT5A expression in metastatic (Lymph node metastasis) and non-metastatic cases showed a significant correlation coefficient of 0.753 at (p <0.01). The present study also found that the aberrant expression (high) of P-Cadherin was associated with diminished survival of patients with metastatic OSCC.

Conclusions
The present study results demonstrated that the aberrant expressions of P-Cadherin and WNT5A could serve as an important index for the evaluation of OSCC invasion and metastasis. Therefore, P-Cadherin and WNT5A could be used as significant predictors for the disease outcome and to predict the prognosis post-surgically by surgeon.
Immune Response and Angiogenesis as Prognostic Indicators in Oral Squamous Cell Carcinoma

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Purpose
Globally, Oral Squamous Cell Carcinoma (OSCC) represents 90% of malignancies of head and neck region. The Survival rates in patients with OSCC has decreased significantly over last few years and have resulted in poor prognosis despite advances in therapeutic strategies, surgical techniques and diagnostic techniques. To my knowledge, considering immune response and angiogenesis there are few studies in the literature that have evaluated the inter-relationship of CD3 and VEGF in the same OSCC tissue samples. Therefore, the present study aimed to evaluate the inter-relationship of CD3 and VEGF in metastatic and non-metastatic OSCC and to correlate CD3 and VEGF expression with clinicopathological parameters.

Methods
A total of 40 selected OSCCs cases (Lymph node metastasis n=20, non-metastatic n=20) were quantitatively and qualitatively analyzed by immunohistochemistry for CD3 and VEGF-A.

Results
The expression levels of CD3 (p=0.002) and VEGF (p=0.00) in OSCC groups were statistically significant. The present study also showed that high expression of VEGF and low expression of CD3 that reflected decreased survival of patients with metastatic OSCC.

Conclusions
Henceforth, the present finding lends further support to the immunosurveillance hypothesis and warrant further studies in future to evaluate the role of immune regulation and angiogenesis as a prognostic factor. Therefore, results of the present study suggested that increased number of CD3 T lymphocytes in non-metastatic OSCC than metastatic indicates an immune dysfunction in cancer cells in early stages of OSCC. Also, high expression of VEGF in the metastatic cases of OSCC reveals that angiogenesis is an essential step involved in the process of metastasis and is correlated with tumor aggressiveness.
Correlation of RAGE Signaling and Inflammation in Oral Epithelial Cells Following Exposure to E-Cigarette Flavoring

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Purpose
Over the past several years, the derivation of electronic cigarettes (eCig) has given rise to a new, largely unregulated market within the smoking industry. eCigs rely on vapor produced by heating oil-based liquid (e-liquid) to deliver flavored nicotine, and while initially considered to be less harmful than traditional tobacco cigarette smoke, little is known about the cellular impact of these electronic devices. The oral environment is anatomically positioned as a significant gateway for exposure to environmental toxicants including eCig. We hypothesize that such exposure specifically compromises oral health by orchestrating inflammation via RAGE signaling, an axis previously characterized as commonplace in cells and tissues exposed to traditional tobacco smoke. The purpose of this study was to determine the effects of eCig liquid on oral health by examining the expression of several pro-inflammatory molecules.

Methods
Gingival (Ca9-22) and tongue (Cal-27) epithelial cells were exposed to Red Hot or Green Apple flavored eCig solution with or without nicotine over a broad time course and compared to cells exposed to fresh media only. After exposure, total RNA and protein were isolated and conditioned media was retained.

Results
We discovered quantitative and qualitative increases in RAGE. We also confirmed elevated activity of RAGE signaling molecules such as p38, a key MAPK, and nuclear translocation of active NF-kappaB following exposure. A protein array revealed differential expression of key inflammatory mediators of periodontal disease such as IL-1A, IL-6, IL-8, and a key inflammatory protease, MMP-13. Intriguing differences between cell type, flavor, and nicotine concentration were noted in the array.

Conclusions
Together, these results provide important understanding relative to the inflammatory profile of exposed cells in the oral mucosa. While RAGE signaling coincides with eCig-mediated inflammation, important additional steps must be taken to clearly elucidate to what extent RAGE signaling is required for inflammatory disease progression.
PECAM-1 Overexpression Signifies Aggressive Biologic Behaviour of Oral Lichen Planus - A Pilot Study

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Purpose
The etiopathogenesis of oral lichen planus (OLP) is still debatable. According to literature, many studies have illustrated OLP as a T-cell mediated chronic autoimmune disease. Currently there is increased evidence of chronic inflammation in OLP and its association with vascular adhesion molecules (VAMs) in etiopathogenesis. So, the aim of the present study was to evaluate the expression of vascular adhesion molecule (PECAM-1) in etiopathogenesis of OLP.

Methods
Tissue samples involved 20 archival cases of histopathologically confirmed OLP (n=15) and normal mucosa (n=5) as controls. The sections were subjected to immunohistochemical analysis using antibody to PECAM-1. Brown staining of the endothelial cells of blood vessels was considered positive. The expression of PECAM-1 in OLP was statistically analyzed using Wilcoxon sign rank test.

Results
The expression of PECAM-1 in OLP was statistically significant when compared to normal mucosa (p < 0.05). A statistically significant difference was also observed in PECAM-1 expression between the reticular type and erosive type of OLP.

Conclusions
PECAM-1 was found to be overexpressed in OLP, difference in PECAM-1 expression was noted between the reticular and erosive types. The vascular adhesion molecules could be exploited as a possible therapeutic target in OLP to modulate the disease process thereby reducing the dependency on corticosteroids.
39: Efficacy of Naturally Prepared Stain (Kumkum) From the Extract of Curcuma Aromatica and Slaked Lime in Histostaining of Oral Tissues

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Purpose
Histological staining, be it routine or differential stains employs a variety of chemical compounds that are hazardous to the laboratory personnel on chronic exposure due to its toxic waste products. Recently, researchers have examined the potential use of natural substances like curcumin, beetroot, ginger, pterocarpus osun, rose, henna, hibiscus sabdariffa, etc. in staining tissues & microbes. Kumkum is one such substance, which has been minimally explored for staining oral tissues. The use of Kumkum may facilitate the diagnosis of routine and enigmatic hard and soft tissue pathologies in a risk-free environment. Therefore, the study aimed in evaluating the efficacy of natural substance- kumkum prepared from the extract of Curcuma aromatica and slaked lime in staining the biopsied oral tissues

Methods
A cohort study that used 60 formalin fixed paraffin embedded normal and pathological soft and hard tissue (teeth & bone) specimens from institutional archives were subjected to sectioning and stained using kumkum and Hematoxylin & Eosin (H&E). The stained sections were evaluated for their staining efficacy and results were statistically analyzed using Wilcoxon sign rank test and independent t-test.

Results
The overall parameters assessed for staining efficacy did not show statistically significant difference between the study groups for tooth, bone and soft tissues in normal and pathological specimens. This suggests that kumkum staining efficacy is equivalent to that of routine H&E for oral tissues. However, tooth structures like dentinoenamel junction, dentinal tubules and incremental lines of cementum and bony structures like reversal and resting lines, canaliculi, mature and immature bone could be appreciated better in kumkum stained slides thereby rendering a special staining property to kumkum stain.

Conclusions
To our knowledge this study is the first of its kind to have used kumkum stain obtained from Curcuma aromatica for the differentiation of the components of tooth, bone and soft tissue structures in histostaining of oral tissues. The naturally prepared Kumkum stain possesses dual nuclear and cytoplasmic staining property, routine and differential staining potential, differentiation of bone remodeling phases, diagnosis of fibro-osseous lesions, pathologies of bone, collagen, muscle and forensic investigation.
40: Assessing Human Papillomavirus-Related Health Literacy for Oropharyngeal Cancer Prevention Among Dental and Pharmacy Students

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Purpose
Health care providers need comprehensive up-to-date HPV-related information to be able to provide correct advice to their patients. The aim of the study was to assess the knowledge, attitude and perception of dental and pharmacy students towards HPV and the associated risk of OPC.

Methods
An anonymous self-designed, peer-reviewed and pre-tested questionnaire was distributed to students in dental and pharmacy programs at Roseman University during January-April 2018. Approval of the study was obtained from the institutional review board. The survey was conducted among university healthcare students through random cluster sampling. The objectives of the study were explained to the students, and their participation was entirely voluntary. HPV characteristics among the different groups of students were compared with the level of significance set as p < 0.05.

Results
A total of 300 students participated in the study. While assessing the respondents' knowledge about HPV, 97.5% and 95.05% dental and pharmacy students reported that they had already heard of HPV, respectively. 65.6% and 44.4% dental and pharmacy students reported a link between HPV and OPC, respectively [P = 0.001]. In terms of attitude, 45% dental students and 67% pharmacy students reported not feeling comfortable asking patients about their sexual life [P = 0.001]. In terms of prevention, 74% dental students and 78% pharmacy students stated that HPV vaccine protect against cervical cancer [P = 0.65]. However, only 55% of dental students stated that it can protect against oropharyngeal cancer, in comparison to 60% of pharmacy students [P = 0.06].

Conclusions
Despite the general awareness about HPV among dental and pharmacy students, the survey revealed poor understanding of health problems associated with HPV, its prevention, possible ways of protection, and patients’ education.
41: Tactile vs. Virtual learning: Influence on Student Engagement and Comprehension
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Purpose
Tactile learning, also known as hands-on-learning, is an essential tool for dental education due to much of dental students work being accomplished using their hands. In this study, we compare the difference between utilizing virtual images of teeth and actual teeth to see how they both influence student engagement and comprehension during a dental histology course.

Methods
One hundred first-year dental students were divided into twenty teams of five students. Teams were then divided into Group A and Group B. Group A teams were given five actual tooth models where Group B teams were given access to five virtual images of tooth models. Both groups were given the same worksheet to be completed using their respective teeth or images and each took a formative assessment. For the dentin portion of the course, Group A teams used the virtual images of teeth and Group B teams used the actual teeth. Both groups completed a formative assessment followed by a survey that assesses students learning preference.

Results
Results showed that there was no significant difference between student engagement (p>0.05) and learning comprehension (p>0.05) between Groups A and B. More students preferred learning with tooth images (54%) than the actual tooth (46%).

Conclusions
Findings from this research suggest that active-learning exercises may achieve similar outcomes without the cost and time of needing an actual object to study. More research needs to be conducted in order to determine what type of learning activities would be most beneficial in utilizing a tactile methodology.
Expression of hTERT in Oral Submucous Fibrosis and Oral Squamous Cell Carcinoma - An Immunohistochemical Analysis

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Purpose
Human telomerase reverse transcriptase enzyme, the catalytic subunit of telomerase are seen to be frequently reactivated in cancers including Oral squamous cell carcinoma (OSCC). Increased hTERT expression have been seen in potentially malignant conditions including Oral submucous fibrosis (OSMF). The aim of the study was to evaluate the expression levels in OSMF, OSCC in the background of OSMF and OSCC using immunohistochemistry and also to correlate hTERT expression with clinicopathologic parameters.

Methods
A total of 50 histopathologically diagnosed cases of 20 OSMF, 20 OSCC wherein 5 were OSCC in the background of OSMF and 10 Normal oral mucosa were retrieved from the departmental archives and subjected to immunohistochemical analysis of hTERT.

Results
The expression of hTERT increased from normal, OSMF, to OSCC with statistically significant differences in mean labelling score (LS). We also found a shift in cellular localization of stain where, normal mucosal tissues showed a nuclear stain unlike OSMF, where combined nuclear and cytoplasmic staining as noted. The tumor cells in OSCC showed predominant cytoplasmic staining. There was no correlation between hTERT expression and clinicopathological parameters of OSMF. However, a significant increase of hTERT expression was seen with increasing histological grading of OSCC.

Conclusions
These results suggest the role of hTERT in the early event of malignant transformation of OSMF. Telomerase could be used as a potent diagnostic marker to identify high risk group of OSMF.
43: Prognostic Significance of ALDH1, Bmi1 & OCT4 in Oral Epithelial Dysplasia & Oral Squamous Cell Carcinoma
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Purpose
With the origin of Cancer stem cell theory (CSC), increasing evidences suggest the involvement of CSC in both potentially malignant condition as well as Oral squamous cell carcinoma. Incessant survival of CSCs have been held responsible for the aggressiveness and recurrence of OSCC ultimately contributing to poor prognosis. Among the various CSC markers ALDH1, Bmi-1 and OCT4 have been noted to increase in OSCC. The aim of the study was to analyse the expression levels of ALDH1, Bmi-1 and OCT4 in OED and OSCC and further explore their prognostic significance in OSCC.

Methods
40 cases each of Oral Epithelial Dysplasia and Oral Squamous Cell Carcinoma were retrieved from departmental archives. Expression of ALDH1, Bmi-1 and Oct4 were analyzed using immunohistochemistry and was correlated with clinicopathological parameters. A follow up of 5 years was done and Kaplan Meir survival analysis was carried out. Log rank test was done to note for any significant difference in survival rates.

Results
The expression levels of ALDH, Bmi-1 and OCT4 increased significantly from OED through OSCC (p<0.05). ALDH1 and OCT4 expression showed significant correlation with lymph node metastasis. However, only ALDH1 showed significant correlation with tumor size and no correlation was seen between the markers and other clinicopathologic parameters (p=0.02, p<0.05). Cases that showed a positive ALDH1 expression showed a significantly reduced survival rate compared to cases showing negative expression. Kaplan Meir survival analysis also showed a significant reduction of survival rate (p=0.00, p<0.05) in patients showing a positive expression for all the three markers.

Conclusions
As ALDH1 correlated with a poorer prognosis, they could be used as individual prognostic markers. Further, patients showing a positive expression for all three markers ALDH1, Bmi1 and OCT4 had poorer prognosis which indicate their use as a collective panel of markers that could navigate surgeons in predicting the prognosis of patients and thereby carry out prompt follow up for such cases.
44: Geriatric Systemic Disease and Oral Health

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Purpose
The geriatric population is expected to increase in size worldwide by almost three times by the year 2050. At an older age our bodies are more likely to develop systemic disease which begs the question of how to take care of this population as it continues to increase. This study was designed to explore the relationship between oral and systemic health of the geriatric population in the United States.

Methods
This study was done with data from the 2015-2016 National Health and Nutrition Examination survey. Demographics, oral health outcome (description of one’s oral health including teeth and gingiva) and systemic disease conditions were used and descriptive statistics created using mean, standard deviation and proportion. Chi-square tests were performed to examine the relationship between oral health outcome and ten systemic diseases. Tests were then adapted to be representative of national results.

Results
Of the total geriatric population, 47.8 million people in the United States participated in the study. It was found that six out of ten diseases were associated with oral health outcome including: diabetes (p < 0.05), coronary heart disease (p < 0.05), congestive heart failure (p < 0.05), high blood pressure (p < 0.05), asthma (p < 0.05) and liver condition (p < 0.05).

Conclusions
The empirical data found, determined that patients who have systemic diseases are also likely to have poorer oral health and vice versa. Therefore, in the education process and inter-professional associations with other healthcare providers, we need to encourage open discussions and co-management of both oral health and systemic diseases seeing as they have an impact on each other.
Application of Machine Learning for Recommendation of Dental Care

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Purpose
The state of oral health in the United States is fraught with imbalance in the supply of dental care. The need for a dental care recommendation system is necessary in the consideration of serving less accessible and more sparsely populated areas. The aim of this study was to apply predictive analytics to national oral health data to develop recommendations for clinicians to reduce the disparities seen in the data.

Methods
Data from the 2013-2014 National Health and Nutrition Examination Survey was curated for factors important in clinical practice with a consulting dentist. Most important features were selected with LASSO in R statistical software to determine the best regression model. Supervised machine learning algorithms, including Logistic regression, SVM, random forest, and CART, were used to form the predictive model.

Results
LASSO selected top 7 features associated with recommendation for dental care. The top 3 features include gum health, persistent dry mouth in the past 12 months and health insurance coverage. Gum health shows a significantly higher relative importance compared to other features.

Conclusions
Our study has identified demographic, healthcare access, and general health variables as top features related to receiving adequate dental care, consistent with prior research. A computer-assisted screening tool would allow for a more targeted and efficient screening of patients. Providers, especially newly graduated providers, could follow our model through entering inputs to the predictive model or use of a decision tree diagram to achieve a more efficient resource utilization with regards to dental care.
46: Interleukin-1 beta and Caspase-3 Expression in Oral Squamous Cell Carcinoma with Clinicopathological Correlation and Survival Analysis

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Purpose
The Indian subcontinent has the highest incidence and prevalence of oral squamous cell carcinoma (OSCC). Inflammation and apoptosis are two emerging hallmarks of cancer that might play a significant role in tumorigenesis and metastasis. Concurrent expression of proinflammatory cytokine (IL-1β²) and executioner caspase (Caspase-3) in the same human tissue samples has not been reported in an Indian population. Hence the present study aimed to evaluate IL-1β² and Caspase-3 expression in oral squamous cell carcinoma with clinicopathological correlation and survival analysis.

Methods
A retrospective study was conducted in the department of Oral Pathology and Microbiology from January 2010 to March 2014 utilizing 40 formalin fixed paraffin embedded histologically diagnosed cases of OSCC comprising of 20 metastatic OSCC and 20 non-metastatic OSCC. Normal Oral mucosa (n=10) was considered as control tissue. The sections were subjected to immunohistochemical staining using antibodies to IL-1β² and Caspase-3.

Results
Increased expression of IL-1β² and Caspase-3 were observed in metastatic OSCC. Both markers had significant Pearson’s correlation in metastatic OSCC implicating they could be used to validate each other’s expression in metastatic OSCC. Correlation of expression of IL-1β² and Caspase-3 with clinicopathological parameters revealed a significant association between these markers and staging, nodal status and site of the lesion. Over expression of IL-1β² and Caspase-3 was associated with advanced stage and poor survival of the patient suggesting them to be specific and independent markers in OSCC. IL-1β² overexpression showed significantly lower disease-free survival and disease specific survival as well.

Conclusions
Overexpression of IL-1β² and Caspase-3 in incisional OSCC biopsies could be considered for predicting metastasis and survival outcome.
47: CD 45- A host-immune Responder in Oral Squamous Cell Carcinoma

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Purpose
CD45 (leucocyte common antigen) is a leucocytic cell surface marker located on hematopoietic cells. Disruption of equilibrium between protein tyrosine kinase and phosphatase in CD45 can result in malignancy as these enzymes regulate T and B cell antigen receptor-mediated activation. Oral squamous cell carcinoma (OSCC) is multifactorial in origin, initiated by genetic events, tumor microenvironment and alteration in host immune system with high mortality and morbidity. Genetic instability results in expression of antigens by tumor cells. Hence, these are potential targets of host lymphocytes. Several studies have advocated the association between tumor infiltrating lymphocytes and better survival in different carcinomas. However, to my knowledge, there are meagre studies in literature using CD45 in OSCC. Hence the present study is aimed to evaluate and correlate the expression of CD45 lymphocytic marker in different grades of OSCC with clinicopathological parameters.

Methods
25 FFPE departmental archival tissue blocks of histopathologically diagnosed cases of OSCC were taken (10=WDSCC, 10=MDSCC and 5=PDSCC). Histopathological parameters (lymphocytes distribution pattern) were evaluated using Lund et al (1975) grading system. The tissues were subjected to CD45 antibody and interpretation for the immunostained slides were done using Weiwang et al (2013).

Results
Inverse correlation of CD45 expression and tumor differentiation existed. Statistically significant value (p=0.001) was obtained when comparison between mean scores of WDSCC, MDSCC and PDSCC were done using one way Anova. When correlation between clinicopathological parameters (age, gender, site and staging) and CD45 expression were evaluated, statistically insignificant result was obtained. However, staging was statistically significant (p=0.17). Pearson’s and chi-square test were used to investigate the correlation between CD45 immune expression in different grades of OSCC and among the same group.

Conclusions
The present study sheds light on host-immune response in different grades of OSCC in tumor microenvironment. As the grade increases the CD45 expression decreases explaining the role of immunity in OSCC progression. Highlighting the importance of cellular immunity in the pathogenesis of OSCC, an analysis of lymphocytic markers (CD45) in OSCC patients may be useful for the early diagnosis, prediction of host immune status and prognosis of diseases.
48: Clinical Outcomes and Cost-Effectiveness of Early Preventive Dental Visits of a Single-Provider Preventive Program

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Purpose
This study sought to compare preventive dental cost versus non-preventive dental cost in patients under the age of 18 years old.

Methods
A longitudinal, retrospective study was conducted using data from a pediatric dental provider’s database containing data from years 2003 to 2015. Descriptive statistics on age of first visit, preventive cost, non-preventive cost and total cost were calculated. Pearson correlation between the age at first visit and the total non-preventive cost was reported. Patients were divided into two groups for comparison of total non-preventive cost for those without siblings versus those who had siblings previously treated in the same dental clinic. Independent samples t-test was conducted for this comparison.

Results
The total sample size for this study was 200. Patient’s age at first visit ranged from 0 to 18 years old (mean = 4.4 years; standard deviation = 0.2 years). The average dental cost per patient was $1,574 throughout the years. The average non-preventive procedure cost per patient increased as the age at first visit decreased (r = -0.19, p<0.05). There was a significantly lower average non-preventive cost for patients with siblings ($360) than patients without siblings ($528) (p<0.05).

Conclusions
Having a sibling previously cared under a preventive dental program has the potential to decrease the non-preventive procedure cost for the younger sibling. Future research can be conducted to adjust for inflation and examine various dental costs in details.
49: Head and Neck Flexion Among Dental Hygiene Students and Clinical Faculty Using Two Types of Loupes: A Comparative Study

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Purpose
This study compared the head/neck flexion angles among dental hygiene students and clinical faculty using two kinds of magnification loupes while simulating dental hygiene scaling procedures (DHSP) on a manikin.

Methods
A within-subjects, crossover design was employed with a convenience sample of students and faculty (N=29) from Idaho State University. Head/neck flexion angles were measured while participants simulated DHSP wearing through-the-lens (TTL) and vertically-adjustable-front-lens-mounted (VAFLM) loupes. Three lens conditions (TTL, VAFLM loupes and safety lenses) were compared in a subset of participants (n=10). Static photographs were taken at three time points for each lens condition in maxillary and mandibular arches. Kinovea software was applied to determine head/neck flexion angles. Data were analyzed using repeated measures ANOVA and Cohen’s d.

Results
Mean head/neck flexion angles were significantly lower for the VAFLM loupes in maxillary/mandibular arches (p = 0.000). The subset of participants showed a significant decrease in flexion with VAFLM loupes over safety lens and TTL conditions in both arches (p<0.0001, p=0.0002).

Conclusions
The VAFLM loupe condition greatly reduced head/neck flexion angles over the TTL condition. The magnitude of effect size suggests VAFLM loupes may have a positive impact on poor work posture as a risk factor in work-related musculoskeletal disorders.
50: Precision Oral Health in Detection of Root Caries
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Purpose
Increasing the accuracy of prediction of root caries development may guide treatment decisions at the preventative level, leading to better oral health outcomes. The aim of this study was to develop a computer-assisted tool to detect root caries with selected predictor inputs and to evaluate the accuracy and applicability of this tool to individualize treatment.

Methods
Data were obtained from the 2015-2016 National Health and Nutrition Examination Survey (NHANES) and were randomly divided into training and test sets. Supervised machine learning techniques were applied to construct a classification tool to sort the most important predictors correlated with the presence and absence of root caries. Accuracy, sensitivity, specificity and area under the receiver operating curve were computed with Python 3.7.0 and Weka 3.8.2.

Results
Support vector machine (SVM) demonstrated the best performance with a predictive accuracy of 97.1%, precision of 95.1%, sensitivity of 99.6%, and specificity of 94.3% for detecting root caries. The area under the receiver-operating characteristic curve was 0.997. Age was most strongly associated with presence of root caries.

Conclusions
To our knowledge, this is the first study attempting to predict root caries using machine learning algorithms. Further investigations may focus on parsing the model further and elucidating true negative/true positive results, a critical assessment prior to clinical application.
51: Preferred Active Learning Methods Defined Generationally in on Ground and Online BSN Programs
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Purpose
Purpose: In higher education it is conceivable to have representation from four different generations in one classroom. Those generations may include: Baby Boomers (1946 - 1964), Gen X (1965 - 1976), Millennials (1977 - 1995), and Gen Z (1996 to present). As an educator it is difficult to be conversant with the preferred learning methods of each generation. Educators tend to teach as they were taught, which can be very ineffective to many of the current generations of students. Gathering a selection of activities that meet the learning needs of the various generations in each course is not an identified need of most educators. Many educators have not been taught that the age of a student can define their preferences for learning. Each of these four generations have specific learning styles and traits that contribute to their preferred active-learning methods.

Methods
Methods: A pilot project to determine among Gen Z, Gen X, Millennials, and baby boomers their satisfaction with learning activities and methods. This pilot study will be performed using a qualitative survey with equal representation from each generation. The aim of this study is to provide to educators a clear and concise variety of active-learning methods for them to add to their toolbox. This data can aid in meeting the various generational learning needs.

Results
In progress

Conclusions
In progress
Purpose
The purpose of this study was to identify the pharmacotherapeutic use of cannabinoids. Legalized and recreational cannabinoid use is at an all time high, especially with over the counter products continuing to be marketed and dispensed in states where cannabis has become legalized. Pharmacists and pharmacy students can have a positive or negative outcome on patient therapy depending on how prepared they are to provide patient education on medication use. The proper identification of the pharmacotherapeutic use of cannabinoids is necessary to ensure positive therapeutic outcomes for patients using these products.

Methods
A robust review of the literature was conducted utilizing PubMed and the U. S. National Library of Medicine online databases from July through August of 2018 using the search terms “CANNABINOIDS”, and “ENDOCANNABINOID SYSTEM”. The search was restricted to studies published in the last 10 years, written in English, and free full text articles. Peer reviewed journals, clinical trials, FDA published drug information and research was reviewed. A manual search of related reviews and trials was also completed. Results were grouped to identify what cannabinoids are synthesized from, how cannabinoids affect the endocannabinoid system, and current uses of cannabinoids in medicine.

Results
213 articles were identified through the literature search. Cannabis sativa has been used in medicine for centuries prior to its status as an illegal substance. Cannabinoids, the active components of cannabis, mimic the effects of endogenous cannabinoids (endocannabinoids) by activating cannabinoid receptors CB1 and CB2. CB1 is found primarily in the central nervous system and CB2 is said to be involved in immune system function. Cannabinoid receptors have been found to be involved in anxiety, control of appetite, emesis, motor behavior, and autonomic and neuroendocrine responses but in many of the studies there was no definitive answer as to how. There are currently three drugs containing cannabinoids that are approved by the FDA for patient use. Delta-9-tetrahydrocannabinol (THC), the main derivative of the cannabis plant, has been available as a prescription medication, approved to treat anorexia in wasting states and for nausea and vomiting in patients receiving chemotherapy. Cannabidiol (CBD), another derivative of the cannabis plant without the psychoactive properties contained in THC, was just approved for use in patients with seizures associated with Lennox-Gastaut Syndrome and Dravet Syndrome. While these products are FDA approved and on the market for patient use via prescription, study results were limited.
**Conclusions**

Due to cannabis being a federally recognized illegal substance, published research to identify its full potential for pharmacotherapeutic benefit in patient treatment and outcomes is limited. Future studies are needed to identify safety and efficacy for patients and prescribers as well as provide education and training to pharmacists to identify opportunities to manage patients who utilize cannabinoids. This is especially important as the number of over the counter products, containing cannabinoids, is likely to increase as cannabis becomes recognized as legal in many states across the nation.
53: The pharmaceutical use of Cannabinoids - Pharmacist and Intern Knowledge and Concerns Prior to Legalization

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Purpose
The purpose of this project is to identify active Utah pharmacist and pharmacy intern demographics, knowledge, and concerns regarding the pharmaceutical use of medical cannabinoids. The goal of this study is to provide baseline data before the potential for legalization of medicinal use of cannabis in Utah (on the ballot November 2018). Information gathered will be utilized for dissemination to parties involved in the education of pharmacy professionals. Gaps in knowledge as well as specific concerns are important to address prior to implementation and patient care.

Methods
The participants will include actively licensed pharmacists and interns in the state of Utah, whom were identified through the Utah Division of Occupational and Professional Licensing. Currently there are 4724 records. All consenting participants will receive an email link to an electronic survey, sent online from a secure Qualtrics account. Participation is completely voluntary and may be discontinued at any time. The survey will begin following IRB approval in October 2018 with a follow up email to be sent one week and two weeks after the initial survey email invitation, for the duration of the study, which will be completed prior to the legislative session in November 2018. The research design consists of a 23 question survey that will be conducted online using the Qualtrics survey platform. The survey instrument was adapted from a survey conducted in Minnesota prior to implementation of a statewide medical cannabis program. The survey results will then be analyzed and reported to identify respondents demographic and practice site characteristics, knowledge, and concerns regarding the pharmaceutical use of medical cannabinoids.

Results and Conclusions
Pharmacists, as patient advocates and medication experts throughout transitions of care, are often the most accessible health professionals equipped to educate patients on the appropriate use of their medications. Pharmacists can contribute to positive or negative outcomes in the way they prepare patients and monitor their therapy. As the legalization of the medicinal use of cannabis emerges in Utah, it is of utmost importance that pharmacists and pharmacy interns in all practice settings have the knowledge and tools to educate and counsel patients on safe use and interactions. Implications of this study have the potential to address gaps in preparedness of pharmacy professionals of medical cannabinoid use for patients by providing a baseline of information needed to better understand the existing knowledge and concerns of the medicinal use of cannabinoids as well as identify trends in demographic variables.
54: Beta-lactam Allergies and Its Effect on Antibiotic Use in Surgical Prophylaxis at McKay-Dee Hospital

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Purpose
Use of alternative antibiotics because of a penicillin allergy label has been reported to cause a 50% increased odds of a surgical site infection. The purpose of this study was to assess the impact of a reported penicillin allergy on antibiotic use for surgical prophylaxis in orthopedic surgery at McKay-Dee Hospital.

Methods
In this retrospective study, patients receiving cefazolin, clindamycin, or vancomycin for surgical prophylaxis in orthopedic surgery at McKay-Dee Hospital from January 1, 2017 to December 31, 2017 were included. Manual chart review was performed to confirm which antibiotic(s) each patient received, the presence of a reported penicillin or cephalosporin allergy, and if applicable, the documented reaction. Documented reactions were categorized into severe and non-severe. Severe was defined as a type I mediated reaction, consistent with anaphylaxis and/or hives, and severe non-immunoglobulin E (IgE)-mediated reactions. Non-severe reactions were defined as all other reactions including childhood reactions, undocumented and unknown reactions. Patients with a reported penicillin allergy were then evaluated for appropriateness of antibiotic use. Appropriate use was defined as use of an alternative to cefazolin for severe reactions only.

Results
Among 1,309 patients, 258 (20%) patients had a reaction to beta-lactams listed in the allergy section of the electronic medical record. One hundred and ninety-eight (77%) were allergic to penicillin, 38 (15%) to cephalosporins, and 22 (9%) to both penicillins and cephalosporins. Of these, 144 (56%) patients were documented as allergic to penicillins. The most commonly documented reaction was rash (69, 27%), hives (44, 17%), edema (15, 6%) and anaphylaxis (14, 5%). The reaction was considered severe in 83 (32%) patients. No documentation of a reaction was provided for 60 (23%) patients and 14 (5%) were documented as unknown. Of the patients reporting a beta-lactam allergy, 229 (89%) received alternative antibiotics even though 150 (58%) had undocumented or reported non-severe prior reactions. One hundred and fifty (5%) of patients who received alternative antibiotics could have received cefazolin.

Conclusions
Reported beta-lactam allergy has a high impact on antibiotic use. An antimicrobial stewardship intervention may be warranted to improve allergy documentation and antibiotic choice related to surgical prophylaxis.
Development and Validation of a Stability Indicating HPLC Method for Quantification of Progesterone in Compounded Glycerinated Gelatin Troches

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Purpose
The objective of this study was to develop a validated stability indicating HPLC method that quantifies progesterone in compounded glycerinated gelatin troches.

Methods
The mobile phase was composed of methanol and water (75:25 v/v) while the stationary phase was a Waters Nova-Pak C18 column (3.9 mm x 15 cm x 4.0 µm) with the column’s temperature set to 40 °C. The injection volume was 20µL while the gradient flow rate was maintained at 0.75 mL/min for a run time of 15 minutes. The detection wavelength for progesterone was set to 245 nm.

Results
In the forced degradation study, there was significant hydrolytic, oxidative, UV, and thermal degradation but insignificant photodegradation. However, no degradants co-eluted with progesterone. All method validation parameters met the respective acceptance criteria established by ICH guidelines.

Conclusions
This developed and validated method is suitable for both routine potency/strength testing as well as stability testing of progesterone in compounded glycerinated gelatin troche dosage forms. The method was utilized to successfully quantify progesterone in multiple compounded preparations from two different compounding pharmacies.
56: Development of a HPLC Method for Quantification of Clindamycin Phosphate in Several Topical Dosage Forms

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Purpose
The objective of this study was to develop a HPLC method that quantifies clindamycin phosphate in several compounded topical dosage forms - for acne vulgaris treatment.

Methods
The mobile phase was composed of a pH 2.5 phosphate buffer and acetonitrile (775:225 v/v) while the stationary phase was a Waters XBridge C8 column (3.0 mm x 15 cm x 5.0 Âµm) with the column's temperature set to 45 °C. The injection volume was 10µL while the gradient flow rate was maintained at 0.80 mL/min for a run time of 15 minutes. The detection wavelength for clindamycin phosphate was set to 210 nm.

Results
This developed method is suitable for routine potency/strength testing of clindamycin phosphate in seven several compounded topical dosage forms - one gel, three creams, and three lotions - that all met the acceptable USP criteria.

Conclusions
The method will be validated in order to be further suitable for stability testing of clindamycin phosphate.
Impact of Integrating Position-Specific Roles for Comprehensive Medication Reviews into Community Pharmacy Workflow
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Purpose
The primary objective is to determine the change in Comprehensive Medication Reviews (CMR) completion rates after position-specific workflow integration is executed. The secondary objectives are to examine the quantity and type of interventions generated from the CMRs and to determine the feasibility of this program by identifying the barriers to program implementation and satisfaction with provided services. The study rationale is that though CMRs improve patient care, and strengthen pharmacist-patient and pharmacist-provider relationships, workflow integration is a barrier to CMR completion in community pharmacies.

Methods
The intervention arm of this prospective randomized control study will consist of 10 randomly chosen grocery community pharmacies. These pharmacies will be matched to 10 similar control pharmacies based on prescription volume, previous CMR opportunities, and CMR completion rates. The intervention pharmacies will be provided with training documents, conference calls, and on-site trainings as needed. The proposed workflow will include: 1: Technician/Intern will prepare CMR paper for identified CMR-eligible patients 2: Pharmacist will review materials and identify interventions 3: Technician/Intern will arrange CMR visit 4: Pharmacist will conduct CMR 5: Technician/Intern will document CMR visit and interventions and prepare patient take-away. After the intervention period, a web-based survey link was emailed to control and intervention pharmacy personnel to identify the barriers and satisfaction with position-specific work flow integration. Data analysis will include calculating and comparing counts and percentages between the intervention and control arm.

Results
We expect an improvement in CMR completion rates and pharmacy personnel job satisfaction as a result of the intervention. Pharmacy personnel will gain knowledge, confidence, and experience that will increase the completion of quality CMRs for patients.

Conclusions
For pharmacies to administer CMRs, they need a method that allows them to prepare for, provide, and document the service efficiently. Community pharmacists have the medication expertise and technology resources to improve patient outcomes through CMRs, but it is difficult to implement when pharmacists are solely responsible for this service. This study will help develop a methodology that may be used by other community pharmacies for CMRs and related clinical services.
Pharmacist’s Job Satisfaction in the State of Utah

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Purpose
The purpose of this study is to describe pharmacist job satisfaction in Utah and to identify which specific factors affect pharmacist job satisfaction.

Methods
A cross-sectional survey was sent to all licensed pharmacists in the state of Utah. The questionnaire is patterned after a study completed by Hincapie who also used the Warr-Cook-Wall method of Likert scales to assess pharmacist job satisfaction. The electronic survey was conducted using Qualtrics and was composed of eight questions related to specific components of job satisfaction, two questions designed as broad indicators of job satisfaction, and eight demographic questions. The survey was sent to all licensed Utah pharmacists in Utah beginning on 09/05/2018. Two reminder emails were sent at weekly intervals for a total of three invitations. The survey closed on 09/26/2018.

Results
2,885 pharmacists were sent the survey of which 606 started the survey for a 21 percent response rate. 577 of the 606 pharmacists consented to take the survey and 513 of those 577 practice in the state of Utah and were included in the analysis. 49.9 percent of all respondents were community based, 23.03 percent were institutional, 7.07 percent were ambulatory care pharmacists, and the remaining 20 percent were from other pharmacy areas. 54.66 percent identified themselves as male, 40.17 percent as female, and the remainder preferred not to indicate their gender. 78.47 percent of pharmacists were married, and 87.37 percent were Caucasian. 72.25 percent of the participants were between the ages of 30-49. 53.83 percent of pharmacists have been at their location for 5 years or more. Pharmacists were least satisfied with development and growth opportunities within the company, hours/schedule and flexibility, and work/life balance. Pharmacists were most satisfied with the company’s image and reputation, their relationship with management, and their employer in general. 71.12 percent of pharmacists agree or strongly agree that they look forward to coming to work and 92.32 percent of pharmacists agree or strongly agree that they perform meaningful work.

Conclusions
Pharmacists in Utah overwhelmingly agree that the work they perform is meaningful and most look forward to coming to work. Pharmacists in the state enjoy who they work for, the image and reputation of their company, as well as their relationship with management. Pharmacists in Utah desire more development and growth opportunities within their company, better hours and more flexibility, and a better work/life balance.
59: Opioid Prescribing Trends in the Emergency Department and Dental Clinic Before and After Implementation of New Guidelines in a Veterans Affairs System

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Purpose
Opioid overdose is highly prevalent among veterans. The Opioid Safety Initiative (OSI) was implemented in the Veterans Affairs system in October 2013 to decrease opioid prescriptions and subsequent overdose. In March 2016, the Centers for Disease Control and Prevention (CDC) issued opioid prescribing guidelines for chronic pain with the same goal. Since emergency departments and dental clinics are a common source for opioid prescriptions, this study investigated the impact of the 2013 OSI and 2016 CDC guidelines on opioid prescribing trends in the emergency department and dental clinic within the Department of Veterans Affairs in Salt Lake City (VA-SLC), Utah.

Methods
Prescription information was queried from electronic database to identify opioid prescriptions from the VA-SLC emergency department and dental clinic from January 1, 2013 through March 31, 2017. Prescriptions written for buprenorphine-naloxone were excluded from this study. Prescriptions were separated into three groups: 1) pre-OSI - opioid prescriptions written prior to OSI (January 1st to December 31st, 2013), 2) post-OSI - opioid prescriptions written between the OSI and CDC guidelines (January 1, 2014 - June 1, 2016), and 3) post-CDC - opioid prescriptions written after CDC guidelines (June 2, 2016 - March 31, 2017). Due to unequal time intervals between groups, the data was normalized by dividing the outcome measure counts by the number of observation days. The primary outcome was to determine whether opioid prescriptions, overall dose, quantity, and days supply decreased after implementation of the OSI and CDC guidelines. Secondary outcomes included changes in concurrent benzodiazepine and naloxone prescriptions (within 30 days of opioid prescription), and prescriber status (source of prescriptions). Analysis of variance was used (alpha equals 0.05) to determine a difference between study periods regarding number of opioid prescriptions, average morphine equivalent dose per day and per prescription, average quantity, and days supply.

Results
There was a total of 7,339 opioid prescriptions identified. There was a significant difference between three groups in the average number of opioids prescribed per month, morphine equivalents per prescription, days supplied, and quantity (p value less than 0.01). Average number of opioid prescriptions per month decreased from 145 to 106 between the pre-OSI and post-CDC timeline. While days supplied decreased from 9.6 to 8.9 and 6.5 in the pre-OSI, post-OSI and post-CDC groups, quantity prescribed also decreased from 34.6 to 27.8 to 23.71. However, there was no significant difference between the three groups regarding morphine equivalents per day (p value equals 0.24). Between emergency room physicians and dentists, physicians were responsible for the greatest number of opioid prescriptions across each time interval with an average of 76 percent, as compared to dentists with an average of 10 percent. Benzodiazepine prescribing remained the same with 0.22, 0.20, and 0.20 benzodiazepine prescriptions per opioid prescription in the pre-OSI, post-OSI, and post-CDC groups. The number of naloxone prescriptions per opioid prescription increased dramatically from 0 in the pre-OSI group to 0.02 in the post-OSI group, and 0.12 in the post-CDC group.
Conclusions
The purpose of this study was to examine changes in opioid prescribing trends following implementation of OSI and CDC guidelines. The study results demonstrate that the day’s supply, quantity, and morphine equivalent dose per day in post-CDC group were consistent with guideline recommendations. Additionally, concurrent naloxone prescribing increased throughout the time periods. Implementation of OSI and CDC guidelines impacted opioid prescribing trends by decreasing the number of prescriptions and reducing quantity and day’s supply, ultimately lessening potential for abuse. However, there is still need for further improvement with reducing benzodiazepine co-prescribing.
Collaborative Practice Agreements in the State of Utah

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Purpose
The purpose of this study was to describe the utilization of CPAs by licensed pharmacists in the state of Utah.

Methods
A cross-sectional survey was electronically sent to all licensed pharmacists (N = 2,881) in the state of Utah. The survey was conducted online using Qualtrics and included demographics and questions related to CPAs. Data on practice setting, types of services provided, structure and methods of CPA, disease states treated, quantification of number of patients served under CPA, and barriers to CPA utilization were collected. The survey was sent via email on 09/05/2018. Two reminder emails were sent at weekly intervals for a total of three invitations. The survey closed on 09/25/2018.

Results
2,881 pharmacists were sent the survey of which 434 started the survey for a 15 percent response rate. 39.43 percent of all respondents were community based, 40.0 percent were institutional, and 20.57 percent were ambulatory care pharmacists. 54.32 percent were male and 70.43 percent of the participants were between the ages of thirty and forty-nine. 46.23 percent of respondents indicated that they independently implement, modify, and manage drug therapy under a CPA. The most common services provided were change in drug dose, interpreting lab results, monitoring drug therapy, collecting patient histories, and ordering labs (11.66%, 11.49%, 11.33%, 10.67%, 10.34%) respectively. The most common conditions managed under CPA were diabetes, anticoagulation, infectious disease, hypertension, and lipids (15.71%, 14.42%, 11.22%, 10.90%, and 10.26%) respectively. The most common barriers to utilization of CPA were inadequate time, inadequate compensation, employer not interested, inadequate training, and not knowing where to start (19.34%, 18.8%, 17.52%, 14.78%, 11.31%) respectively. 34.92% of the respondents CPAs are protocol-driven, 43.65% are guideline-driven, and 21.43% are scope-of-practice driven. 82.37% of pharmacists indicated that they are aware that state law permits CPAs and 61.51% of respondents anticipate practicing under a CPA in the next 5 years.

Conclusions
Pharmacists in the state of Utah are aware that state law permits CPAs and the majority anticipate utilizing a CPA in the next five years. Nearly half of the respondents already independently implement, modify, and manage drug therapy. CPAs are used to facilitate pharmacist management of patients across a wide range of medical conditions. Reported barriers to increased use of CPAs were inadequate payment, time, and employer interest.
**61: Intern Pharmacist Review of Inpatient Medication Discharge Orders**

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**Purpose**

Errors in medication therapy on hospital discharge can be harmful and costly to patients. Pharmacist review of discharge orders prior to discharge and involvement in transitions of care decreases the frequency of these mistakes, resulting in better health outcomes and cost savings for patients. Currently in our clinical practice, there is not a standardized process for pharmacist or pharmacist intern review of medication orders prior to discharge. We set out to investigate the frequency of mistakes on discharge orders that could be prevented by pharmacist involvement in transitions of care and review of orders prior to discharge.

**Methods**

This was a retrospective analysis of patients hospitalized for various reasons who were discharged from the medicine floors at a large academic medical center between September 4, 2018 to September 20, 2018 for errors in discharge orders including drug interactions, incorrect dosing or duration, or inappropriate drug selection. All patients discharged from an internal medicine service during the specified time periods were selected. Pharmacy students reviewed the orders for correctness and documented errors. Potential cost savings was analyzed based on the total number of interventions. No direct patient interventions were made during this analysis.

**Results**

Eighty-two patients were included in the study. Of the 82 patients, 35 patients had at least one error on their discharge orders. Additionally, 20 patients had several drug interactions for which therapy may not be changed, but medication education would be beneficial to prevent readmission. This is a total of 55 out of 83 patients that could have benefitted from pharmacist or intern pharmacist involvement in transitions of care and review of discharge orders. An estimated total potential cost avoidance for patients was calculated to be $125,895.

**Conclusions**

Pharmacist or intern pharmacist review of discharge orders and involvement in transitions of care would reduce medication errors on discharge, reduce potential harm or adverse effects from medications, and save money for the patient.
62: Pharmacists' Perception of Oral Chemotherapy Dispensing in the Community

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Purpose
To better understand oral chemotherapy dispensing in the community, including pharmacists' perception of oral chemotherapy. Also to gauge pharmacists' confidence and training in dispensing oral chemotherapy.

Methods
Email survey sent to actively licensed pharmacists in the state of Utah using the Department of Professional Licensing database.

Results
One hundred and twenty pharmacists responded to the survey. Forty-eight percent of respondents have not dispensed oral chemotherapy. On a scale of 0-10, confidence in dispensing was an average of 4.4. More respondents agreed that chemotherapy patients asked for more counseling. Average agreement that pharmacists dispensing oral chemotherapy need extra training was 6.8 out of 10.

Conclusions
Pharmacists feel that oral chemotherapy dispensing requires additional knowledge and additional time in the community. About 50% of pharmacists in the community are dispensing oral chemotherapy.
63: An Evaluation of I’M HAPPY: An Interactive Module to Halt Abuse of Prescriptions in Preteens and Youth
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Purpose
In Utah, deaths due to drug poisoning are greater than those due to firearms, falls, or traffic accidents. For the last 10 years, Utah has ranked in the top 10 in the country for overdose deaths, with some of the highest rates occurring in more rural areas such as Duchesne, Juab, and Emery counties. The purpose of this project was to create a drug education program that would have a positive impact on student knowledge and perceptions and that could be deployed even to remote areas by internet.

Methods
An interactive computer module (I’M HAPPY) was created using a combination of e-learning and animation software and distributed online. The module used narrated visuals, animations, and games to explain what OTC and prescription drugs are, how they are used correctly, and what risks they carry. Animated drug refusal scenarios with user-determined outcomes were also incorporated. Sixth-grade students were asked to complete the module and were given a 14-question pre and posttest on the definitions, adverse effects, and proper use of OTC and prescription medicines. They were also asked to rank the perceived helpfulness of several drug refusal strategies. Student opinions about the computer module itself were collected on the posttest.

Results
Students (n= 34) scored better on quiz questions following the module (P= 0.02, paired t-test). They also showed increased favorability toward two of four drug refusal strategies after completing the module, with a greater proportion ranking these strategies Very Helpful (P= 0.04 and 0.03, Fisher’s exact test). Most students indicated they learned new things from the module (79%) and found it enjoyable (88%) and easy to use (97%).

Conclusions
The I’M HAPPY interactive computer module improved student knowledge of OTC and prescription drugs and enhanced perceptions of the helpfulness of certain drug refusal strategies. The computer module was considered enjoyable and easy-to-use and can be easily disseminated to any student or classroom having internet access.
64: Closed-System Transfer Device Cost Saving Analysis
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Purpose
National healthcare expenditures have substantially increased over the years. The United States spends nearly $3.3 trillion annually on healthcare costs. The preparation and administration of chemotherapy drugs are highly regulated to ensure patient and worker safety, especially in regards to hazardous exposure. To limit hazardous exposure, chemotherapy medications are commonly administered using closed-system transfer devices (CSTDs). CSTDs cannot be reused for more than one vial, which may result in costly expenditure. The purpose of this study is to determine the potential cost savings of utilizing the least number of vials/CSTDs, compared to wasting the least amount of drug in milligrams.

Methods
Over a three-month period from February 1, 2018 to April 31, 2018, Intermountain Medical Center (IMC) Infusion Clinic completed a cost analysis of all gemcitabine and irinotecan medication orders. Orders received at the infusion pharmacy were reviewed and verified by two clinical pharmacists. Infusion clinic personnel then prepared the medication and documented the dose and name of the chemotherapy medication in a spreadsheet. The spreadsheet included an analysis of two methods. Method 1 was preparing drugs while attempting to use the least number of drug vials/CSTDs. Method 2 was preparing drugs while attempting to minimize drug waste. Total cost of CSTD use and drug waste was calculated for each method and compared. The spreadsheet did not include any patient information and was saved to a secured drive which was only accessible to IMC infusion clinic staff.

Results
Gemcitabine and irinotecan were both utilized for analysis during the three-month study period. Method 1 resulted in total costs of $489.50 for gemcitabine and $361.78 for irinotecan, resulting in a total of $851.28 spent on product and CSTD supplies. Method 2 resulted in total costs of $690.54 for gemcitabine and $538.29 for irinotecan, resulting in a total of $1228.83 spent on product and CSTD supplies. The amount saved after using Method 1 (the utilization of the least number of vials/CSTDs) yielded a reduction of $377.55, generating a 30 percent decrease in total costs. This projects an annual cost savings of up to $1,510.20 for the IMC Infusion Clinic.

Conclusions
With the overall increase in healthcare expenditure, material resources play a significant role in hospital expenses. Closed-system transfer devices are commonly used for the preparation and administration of hazardous medications, such as chemotherapy drugs, and they can be cost effective if used resourcefully. Using the least number of vials/closed-system transfer devices for hazardous drugs can help decrease drug waste and material costs by up to 30 percent.
65: Closed System Transfer Device Cost Savings Analysis
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Purpose
The purpose of this project was to determine cost savings when comparing two methods of hazardous drug preparation techniques.

Methods
Method 1: Preparing drugs while using the least number of drug vials/CSTDs. Method 2: Preparing drugs while minimizing drug waste.

Results
For Method 1, the projected total cost of vials/CSTDs and drug waste (gemcitabine and irinotecan) was $851.28 while utilizing the least number of vials/CSTDs. For Method 2, the total cost of vials/CSTDs and drug waste (gemcitabine and irinotecan) was $1,228.83 while wasting the least amount of drug. During the three month cost analysis, we observed a $377.55 reduction in total cost when using the least number of vials/CSTDs vs. wasting the least amount of drug. This is a 30 percent reduction in total expenditure if the number of vials/CSTDs is decreased.

Conclusions
Utilizing the least number of vials/closed-system transfer devices for hazardous drugs can help decrease waste costs up to 30 percent.
Identification, Preparation, and Biological Assay of Plant Extracts to treat Type 1 Galactosemia

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Purpose
Inhibition of GALK (galactokinase), the enzyme that catalyzes the first step in the metabolism of galactose, is a promising therapeutic target to treat classic galactosemia, a genetic disorder in which intracellular accumulation of an intermediate in galactose metabolism results in a variety of severe symptoms in afflicted patients. Chemical compounds with GALK inhibitory activity have been identified, but none have advanced to clinical development. Due to the knowledge gap in what chemically-derived or natural products can be used as treatments for galactosemia, this study is aimed at the preparation and evaluation of plant extracts for their GALK-inhibitory effect in vitro.

Methods
As part of a screening program to identify inhibitors of GALK, a selection of validated herbs sourced from Starwest Botanicals was submitted to hot solvent maceration to obtain aqueous and alcoholic extracts. Based on the results of a preliminary inhibitory screening using a luminescence-based assay, four alcohol extracts were selected for semi-purification by solvent extraction. Accordingly, methanol extracts of Ferula Assa-foetida, Agastache rugosa, Fumaria officinalis, and Trigonella foenum-graecum were extracted with heptane. The solvent of the methanol layer was then removed under vacuum and the residue extracted sequentially by ethanol, followed by 1:1 DMSO:ethanol. The heptane, ethanol, and 1:1 DMSO:ethanol fractions were then screened for GALK inhibitory activity.

Results
Of the aqueous herbal extracts, only Aloe ferox and Medicago sativa showed any appreciable inhibitory activity at 36% and 34% respectively. Ethanol extracts of Ferula Assa-foetida, Agastache rugosa, Fumaria officinalis had the greatest inhibitory activity of 59%, 54%, and 46% respectively. Of the heptane, ethanol, and 1:1 DMSO:ethanol fractions resulting from methanol extracts of Ferula Assa-foetida, Agastache rugosa, Fumaria officinalis, and Trigonella foenum-graecum, the greatest GALK inhibitory activity was observed for the ethanol fraction of Ferula Assa-foetida (98% inhibition), followed by the heptane fraction of Agastache rugosa (85% inhibition). Of these two extracts, Ferula Assa-foetida was about four times more concentrated in extracted solids than the Agastache rugosa extract.

Conclusions
Herbal extracts have been identified with potent (>80%) GALK inhibitory activity. Future work may focus on identification of active constituents and characterization of in vivo GALK inhibitory activity.
67: Impact of Dispensing Services in an Independent Community Pharmacy
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Purpose
The objective of this study was to measure the impact of dispensing services in a community pharmacy. Approximately 4.1 billion prescriptions were dispensed in the U.S. in 2017. Prescription dispensing requires entering the prescription into the patient’s profile, checking accuracy, filling, verification, and dispensing the medication with counseling. However, some prescriptions require further activities such as prescription clarification via contact with a physician. These are important activities that prevent harm to the patient and improve medication adherence.

Methods
The objective was achieved by evaluating notes documented at an independent community pharmacy. To represent a normal day in this pharmacy which dispenses approximately 200 prescriptions a day, 200 patients with annotations between July 1, 2018 and August 31, 2018 were selected. The data started with 2310 notes, which were filtered to 937 notes from 588 patients by eliminating notes that were default actions (i.e. counseling), compounded prescriptions, or default reminder texts. From these 588 patients, Excel randomly selected 200 patients, leaving 325 notes. The notes were categorized according to reasons that a physician, insurance company, patient/caregiver, or another pharmacy were contacted. Next, using the Medication Therapy Problem (MTP) categories created by Pharmacy Quality Alliance, each reason that contact was made with the above listed persons was appropriately placed under indication, effectiveness, safety, or adherence. Three notes from the canceled communication attempt category were removed due to subjectivity. Literature review was done to determine cost associated with each MTP category. The total lives and money saved were calculated.

Results
Of the 325 notes, 282 were contact with patient/caregiver (86.8%), 38 with a physician (11.7%), 4 with insurance (1.2%), and 1 with another pharmacy (0.3%). After removing 3 notes, 322 notes were categorized with 176 under adherence (54.7%), 114 under safety (35.4%), 18 under effectiveness (5.6%), and 14 under indication (4.3%). Based on previous studies, the cost saved for avoiding potential adverse drug events for the 200 patients was US$289,536.

Conclusions
Activities associated with safety composed 35.4% of notes and medication adherence composed 54.7%. With progression towards clinical pharmacy increasing, this study reminds us of the positive impact of everyday dispensing services.
68: Implementation of an Advanced Pharmaceutical Practice Experience (APPE) Student Program to Evaluate Medication Reconciliation for Patients Being Discharged From the Hospital

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Purpose
Medication Without Harm: World Health Organization's Third Global Patient Safety Challenge identified medication errors as a leading preventable cause of harm in healthcare practices. Reducing medication errors at the point of hospital discharge is a task that student pharmacists can undertake with pharmacist supervision. With a program of this nature, patients benefit through a reduction in the number of errors on discharge orders. Students benefit by gaining experience and confidence through counseling patients and reviewing orders for errors.

Methods
On a 28-bed floor of the Heart and Lung Center at Intermountain Medical Center, two APPE students reviewed the electronic medical records for each patient being discharged. The student pharmacists looked for any of the following errors: therapy duplication, incorrect drug, inappropriate dose, omission of therapies from prior to admission or hospital stay, and medications with an incorrect status assigned to them by the electronic medical record system.

Results
A total of 124 patients were reviewed; 55.6% were found to have an error. 165 total errors were found, of which 27.3% were human errors vs 72.7% were system-based errors. Of the 45 human errors, 4.4% were an incorrect drug, 8.9% were an inappropriate dose, 8.9% were omitted therapies, 33.3% had missing or extra information, and 44.4% were therapeutic duplication. 120 system-based errors were identified. 1.7% were medication therapies coded by the electronic health system as changed when no therapy change had occurred, 6.7% were incorrectly labeled as a new therapy, 10.0% were medications that appeared on the medication history but were absent at discharge with no indication of whether they should be continued, 19.2% were discontinued therapies shown to be restarted upon discharge, and 62.5% were designated as a therapy change when no change had occurred.

Conclusions
The implementation of a student pharmacist driven discharge reconciliation review identified a significant number of errors for patients at hospital discharge. Roughly 25% of errors had potential to cause harm; however, most had the potential to cause confusion regarding medication therapies. This program proved beneficial for both patients and student pharmacists. Time and resources will help develop a more robust discharge reconciliation program in the future.
69: Cell Sheets Improve Functional Markers Expression in Regenerating Salivary Glands
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Purpose
Hyposalivation can be caused by g-irradiation therapy, microbial infections, and autoimmune diseases such as Sjogren’s syndrome. Hyposalivation is characterized by a decreased quantity and quality of saliva that leads severe consequences in the overall patient’s health and in their quality of life. Currently, there are no effective treatments for hyposalivation. Therefore, the goal of this study was to determine if treatment of wounded submandibular glands with double layer cell sheets improved expression of markers for salivary gland regeneration.

Methods
Mouse submandibular cells were surgically harvested from 6 week old C57BL/6J female mice and cultured on thermoresponsive cell culture dishes. Then double cell-sheets were created and surgically placed into wounded mouse submandibular gland in vivo. After 20 days, mice were sacrificed and submandibular glands removed and sectioned for histological and confocal analyses using H&E and specific antibodies respectively.

Results
Histological analyses show that double layer cell-sheets can improve wounded mouse submandibular glands regeneration after 20 days. Moreover, confocal microscopy studies showed that glands treated with double cell sheets expressed the salivary gland markers including the apical acinar markers TMEM16 and AQP5 as well as the basolateral functional marker Na+/K+-ATPase and the ductal marker cytokeratin 7.

Conclusions
The use of cell-sheet technology is a promising method for improving salivary gland regeneration. Further investigation is necessary to understand the mechanisms by which cell sheets promote glandular regeneration.
70: Comparing Cell Sheets vs Fibrin Hydrogels for Salivary Gland Regeneration
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Purpose
Our previous studies demonstrated that Laminin-1 peptides chemically conjugated to fibrin hydrogels (L1p-FH) promote salivary gland regeneration. More recently, we developed the use of cell sheets (CS) with similar regeneration effects. Therefore, the goal of this study was to determine the advantages and weakness of each technology for translational applications.

Methods
We utilized five microns submandibular gland tissue sections from artificially wounded mice treated with L1p-FH and CS for eight days. Tissue sections were then stained with H&E and probed with various antibodies for confocal studies.

Results
Salivary gland tissue integrity was recovered with both L1p-FH and CS treatments, as indicated by the presence of both acinar and ductal structures. However, confocal studies demonstrated that tissue sections from CS treatment displayed a more organized expression pattern of AQP5, ZO-1 and E-cadherin as compared to L1p-FH.

Conclusions
The results of this study show that tissue regeneration with CS produces a more robust regeneration pattern as compared to L1p-FH when after eight days. However, a benefit from using L1p-FH is that allows to monitor the composition of the scaffold being transplanted while CS still need to be further characterized as we do not know its composition. Future studies are will use longer time frames and CS characterization for translational purposes.
71: VEGF- and FGF9-conjugated to Fibrin Hydrogels Promote Salivary Gland Regeneration
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Purpose
Reduced saliva secretion also known as hyposalivation, is a significant clinical concern that decreases oral health and overall health in many patients. Efficient therapeutic strategies are urgently needed to improve salivary gland regeneration in patients suffering from this condition. The combination of two growth factors (GF), vascular endothelial growth factor (VEGF) and fibroblast growth factor-9 (FGF9) have been shown to play a critical role in promoting vascularization and nerve formation in various organs respectively. Our previous studies demonstrated that laminin peptides (L1p) conjugated to FH (L1p-FH) induce acinar-like formation in vitro as well as submandibular gland (SMG) regeneration in a wounded mouse model. The regenerated SMG displayed both structural and functional recovery close to that observed in healthy controls. However, neovascularization and innervation were inefficient and might have contributed to the low acinar-to-ductal cell ratio in experimental (1:1) vs. sham control animals (2.6:1), possibly compromising long-term tissue homeostasis. To address this challenge, we examined whether chemical conjugation of VEGF and FGF9 in the L1p-FH (LVF-FH) could enhance neovascularization and innervation, thereby increasing gland regeneration in vivo.

Methods
Female C57BL/6J mice were anesthetized with 2% isofluorane with oxygen flow at 2.0 L/min. Submandibular glands (SMG) were exposed and wounded using a 3.0-mm surgical biopsy punch, then the corresponding treatment was injected into the surgical wound. Saliva secretion was measured and SMG harvested both at 20 days post-surgery for functional and structural analyses respectively.

Results
LVF-FH promoted salivary gland vascularization, and neurogenesis. The regenerated tissues displayed functional and structural features comparable to the intact gland.

Conclusions
LVF-FH treatment in a wounded mouse model has been shown to successfully regenerate salivary glands. Future studies will test whether LVF-FH can be used for irradiated glands.
72: AT-RvD1 Reduces Inflammation and Restores Saliva Secretion in NOD/ShiLtJ Mouse
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Purpose
Sjogren’s syndrome (SS) is characterized by chronic inflammation of the salivary glands and loss of secretory function. While causes and cures for SS are unknown, it is clear that disease progression is due to failure of inflammatory resolution in exocrine organs. As such, using specialized pro-resolving mediators targeting inflammation could serve as an alternative option for treating SS. Previous studies demonstrated that aspirin-triggered resolvin D1 (AT-RvD1) prevents chronic inflammation and enhances saliva secretion in a SS-like mouse model when applied before disease onset. However, this therapy cannot be used in SS patients given that diagnosis occurs post disease onset and no reliable screening methods exist. Therefore, we examined whether treatment with AT-RvD1 reduces SS-like features in a mouse model post disease onset.

Methods
Tail vein injections were performed in female and male SS-like mice starting at 12 and 16 weeks respectively, both with and without AT-RvD1 post disease onset for eight weeks. Finally, submandibular glands were harvested and gland function and inflammatory status subsequently determined.

Results
Treatment of a SS-like mouse model with AT-RvD1 post disease onset restores saliva secretion in SS-like mice. Moreover, although AT-RvD1 treatment does not reduce the overall submandibular gland lymphocytic infiltration, it does reduce the number of T helper 17 cells within the infiltrates as well as IL-1β, IL-17 and IFN-β gene and protein expression levels in submandibular glands from female mice.

Conclusions
AT-RvD1 treatment administered post disease onset has been shown to successfully restore salivary gland function in a SS mouse model, with future examination of males thus warranted.
73: Regeneration of Salivary Glands in vivo Using Double Layer Cell Sheets
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Purpose
Temperature-responsive polymer grafted tissue culture dishes release cells as confluent living sheets in response to small changes in temperature, with recovered cell sheets retaining cell-cell communications, functional extracellular matrix and tissue-like behaviors. This technology has been used previously to promote regeneration in various tissues including cartilage, heart, cornea, middle ear, periodontium, and esophageal living sheet transplants. However, the functional effects of cell sheets for salivary gland regeneration has not previously been studied. Therefore, the goal of this study was to determine whether cell sheets promote salivary gland regeneration while restoring secretory function in a wounded mouse model.

Methods
Mouse submandibular gland cells were isolated from 6 weeks old C57BL/6J female mice and harvested primary cells cultured on thermo-responsive cell culture dishes for 8 days. Then, cell sheets were transplanted into wounded mouse submandibular gland. After 8 days, glands were removed, sectioned, and stained for histopathological and morphometric analysis as well as with markers of salivary gland differentiation. Furthermore, quantity of saliva were determined, as well as body weight changes.

Results
Double layer cell sheets acquire acinar- and ductal-like differentiation patterns in vitro. Moreover, double layer cell sheets applied to wounded salivary glands promote a rapid recovery of saliva secretion associated with increased body weight and tissue regeneration in vivo as compared to wounded control.

Conclusions
Treatment with double layer cell sheets promotes salivary gland regeneration while improving functionality in a wounded mouse model and could represent a new therapeutic strategy for patients suffering with hyposalivation.
Laminin-1-Peptides Trimer-Conjugated Fibrin Hydrogel Improves Salivary Gland Epithelial Integrity
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Purpose
Our previous studies showed that rat parotid Par-C10 cells form round cell clusters when grown on a Laminin-111 (L1) gel. However, a L1 gel cannot be used for human applications due to its lack of purity. In contrast, synthetic peptides derived from L1 are beneficial as we can control their concentration and effects. We identified the A99 peptide corresponding to the Ï±1 chain from L1 and the YIGSR peptide corresponding to the ÌÝ1 chain from L1 both of which have roles in cell attachment and migration respectively. A monomer of these two peptides (L1p-FH) increased lumen size and cell cluster number as compared to fibrin hydrogel (FH) alone; however, these improvements were not comparable to L1 gels which allowed formation of bigger lumen sizes and higher cell cluster numbers. Therefore, the goal of this study was to investigate whether trimers peptide conjugated FH (L1t-FH) improve the formation of Par-C10 cell clusters comparable to those formed with L1p-FH.

Methods
We used peptide synthesis and chemical conjugation to create L1t-FH. Rat parotid Par-C10 cells were plated on top of various matrices (L1, FH, L1p-FH and L1t-FH) with cell morphology and lumen formation assessed using light and confocal microscopy. Finally, intracellular calcium signaling was assessed using Fura-2.

Results
We were able to create highly pure L1t-FH sharing physical properties with L1p-FH. Moreover, L1t-FH promoted the formation of Par-C10 cell clusters with morphology and functionality comparable to those formed with L1.

Conclusions
L1t-FH improves Par-C10 cell morphology and functionality. Future studies will use this trimer in primary cells as well as in vivo.
75: Influence of Lifestyle on the Core Oral Microbiome

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Purpose
Microbes are hyper-diverse and are found in nearly every larger organism, making up the microbiome of their hosts. This can be seen in past studies, where oral fungi and bacteria were found even in the mouth of ancient human fossils and were used to deduce historical dietary changes. It is known that fungi and bacteria play important roles in the mouth of humans especially in breaking down and digesting the food we eat. Most current human microbiome research focuses on bacteria in the digestive tract. Very few studies are done on the human mouth alone, even though the microbes found in the human mouth are understood to be more diverse. In order to better understand the core microbial members of the oral microbiome, we have collected and extracted DNA from 188 mouth rinse samples given by voluntary participants who also filled out a survey reporting ethnicity, lifestyle and dietary variables.

Methods
We sequenced the 16S region of the ribosomal encoding nuclear DNA to determine bacterial community structure in these samples and are relating this information to self-reported lifestyle habits including tobacco use, diet, and exercise. This information will help establish a baseline of the core members of the oral microbiome and will provide an initial view of how lifestyle changes may influence these communities.

Results
Our results indicate a core oral microbiome, with Actinobacteria, Bacilli, and Bacteroidia being the most abundant. It would seem that gender, ethnicity, tobacco use, and exercise didn’t majorly affect the microbiome of individuals. A slight variation of the microbiome did exist between diets, however, a larger sample set of diet variations will be needed to have conclusive results.

Conclusions
This study of the impacts that ethnicity, diet, exercise, and tobacco use have on the human oral microbiome may prove to be imperative in further studies of oral health by serving as a base line to understand what bacteria constitute a typical human oral microbiome.
76: Environment Friendly Substitutes For Xylene In Histopathology
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Purpose
Xylene is an aromatic hydrocarbon widely used in histopathology laboratory. However, exposure to xylene is a well-documented occupational hazard. This study intended to find a natural, non-toxic, economical substitute for xylene to minimize its hazardous effects and make the laboratory an eco-friendly environment.

Methods
Commercially available fresh goat tissue was procured. The tissues were cut into equal bits of (0.5 x 0.5 x 0.5) cm each and were fixed in 10% neutral buffered formalin for 48 hours. The tissues were divided into three experimental groups (as Group I, II and III). Hematoxylin and Eosin staining was performed for all the three groups. Group I was processed and stained using xylene as clearing and deparaffinising agent. Group II and III were processed and stained using olive oil and RSO respectively. Evaluation was done by three pathologists and the entire procedure was blinded.

Results
Results showed both the oils had the ability to clear and deparaffinise tissues. Olive oil was comparatively better, it maintained the tissue integrity, and the staining quality was also better when compared to RSO.

Conclusions
To conclude, olive oil and RSO can be used as a biofriendly substitute to xylene in histopathological laboratory.
Roseman University of Health Sciences
Nevada Abstracts
01: Prevalence of Oral Premalignant Lesions in an Orthodontic Clinic
Amin Abdallah;¹ Kishore Chaudhry;¹ Prashanti Bollu.¹

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Purpose
Most oral cancers are considered to be preceded by a long period of Oral Potentially Malignant Lesions. This characteristic along with a high 5-year survival rate, if treated at early stages, is the main reason for the American Dental Association and the United States Task Force on Preventive Services, to recommend screening for such lesions. However, clinics generally do not record such findings systematically. The existing literature does indicate the prevalence of OPMLs in the United States to be as high as anywhere else in the world, despite smoking being the major tobacco habit. Very few studies have been reported on frequency of Oral Potentially Malignant Lesions in the United States. No study has been reported on the subject from any orthodontic clinic, which has the advantage of close follow-up of patients for a long period of time. This study is being conducted to assess the frequency and location of OPMLs in an orthodontic clinic.

Methods
Orthodontic residents will examine the oral cavity for OPMLs for each of their patients during the 8-10 week study period using conventional oral examination. The residents are being trained to perform a standardized examination and data recording. The questionnaire will record the number of lesions, location, laterality, scrapability, potential local etiology, pain or discomfort, size and directionality. Suspected OPMLs will be photographed for the purpose of clinical comparison at the next follow-up visit. The residents will follow the American Dental Association guidelines for follow-up and/or referral to an oral surgeon for biopsy and treatment. All the needed forms have been pre-tested and the project has been submitted for IRB clearance.

Results
The background work does indicate the presence of OPMLs in several patients attending the orthodontic clinic. The prevalence is expected to be at least as high as reported in other studies and possibly similar to countries practicing smokeless tobacco use.

Conclusions
The conclusions will be presented in the poster.
02: Information Portals Used by Roseman Residents to Access AAO and its Resources Over a Period of Their Residency

Mykel Anderson;1 Jahnavi Rao;1 Kishore Chaudhry.1

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Purpose
The purpose of this study is to identify how Roseman residents are getting access to AAO-related material and is the portal changing as they mature through their residency. This study is unique to its own. Outcome evaluation and impact of AAO marketing efforts have yet to be published. This article will be the first of its kind to evaluate the utilization of AAO's information portals by its resident members during the course of their residency. This information will guide the decisions of the AAO in how and where they expend their communication, marketing, and resident membership funding efforts.

Methods
The blind study will utilize Google Forms, a survey platform, to distribute and gather how Roseman residents access AAO resources. Inclusion criteria include Roseman residents currently enrolled in residency. Exclusion criteria include non-current Roseman residents. Criteria for discontinuation is less than 95% of survey participation. Observations to be made from responses include: 1) identifying the information portals Roseman residents are accessing for AAO information, 2) identifying their frequency of access, 3) identifying the topics accessed in their search, 4) identifying if year in residency plays a role in the types of information portals Roseman residents accessed for AAO-related information, and 5) identifying any barriers to accessing AAO-related material. Data will be gathered via a Google Form survey and compiled into an automated Excel spreadsheet. It will be managed by enabling respondents to only answer the survey once. Access to survey responses can be made available via a Google account on any computer/laptop by only the principle investigator and one examiner to protect the integrity of respondents and their responses. A confidence interval of 95% of respondents will be applied to ensure a significant response is gathered to make for a valuable and meaningful outcome. Ethical considerations will be considered. They include upholding the privacy of the names, e-mails, and responses of respondents.

Results
Pending. The study hypothesizes Roseman residents access AAO resources predominantly via word of mouth throughout residency, with a transition to more self-directed access to AAO's main website later in residency.

Conclusions
Pending
Orthodontists' Preference on type of Fixed Functional Appliance for Skeletal Class II Correction: A Survey Study
Sarah Borghei;¹ Karthikeyan Subramani;¹ Kishore Chaudhry;¹ James Broadbent;¹ Richard Stevens.¹

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Purpose
The purpose of this study is to determine which skeletal Class II functional appliance is most commonly used amongst orthodontists to correct Class II skeletal discrepancies and to determine why orthodontists prefer to use specific functional appliances to correct Class II skeletal discrepancies.

Methods
A survey will be developed to collect information about current methods of preference for Class II skeletal correction using functional appliances. The survey will be e-mailed to 2,300 active orthodontic specialists through the member directory of the AAO selected at random from the 2019 Directory of Members of the American Association of Orthodontists. The surveys will be e-mailed in 2019, utilizing Qualtrics, and those returned/answered will be accepted for the study. Anonymity will be assured as names will not be used in the study except in the e-mail. In addition to asking the age, year of graduation from residency and affiliation with an academic institution, each respondent will be asked about their skeletal Class II functional appliance of choice, opinion on functional appliances, and method of skeletal Class II correction. Data analysis will be performed with the Statistical Package for the Social Sciences (SPSS). Descriptive statistics compiled will include frequencies and means (where appropriate) of responses. Discontinuation of this study will take place if less than 5% response rate since that will only include less than 384 responses and will not allow for adequate results.

Results
N/A

Conclusions
N/A
04: Prevalence of Posterior Alveolar Bony Defect in Adults With Posterior Crossbite: A CBCT Study

Jinyoung Choi;1 Ji Hyun Ahn;1 Kishore Chaudhry;1 Edwin Parks.2

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Purpose
Alveolar bony defects, especially fenestrations and dehiscences, are of importance to orthodontists for several reasons. Identifying existing alveolar bony defects before orthodontic treatment is helpful for the clinician. Studies have shown that the incidence of alveolar bony dehiscence and fenestration decreases the bony support for the teeth, and in the presence of plaque-induced gingival inflammation, the lack of bony support during orthodontic movement can be detrimental to the health of the teeth and the periodontium. An undetected and undiagnosed buccal alveolar bone defect poses greater potential for treatment relapse, and gingival recession leading to unaesthetic finish of orthodontic treatment and teeth sensitivity.

When treating patients with posterior crossbite, the treatment modality may involve orthodontic tooth movement through a thin buccal osseous plate and may lead to a dehiscence beneath a thin gingiva. Detection of alveolar bony dehiscences and fenestrations was not possible with traditional 2D imaging. However, with the advent of cone beam computed tomography (CBCT), we now have the means to visualize these defects three dimensionally.

Studies have been done looking at alveolar bony defects using CBCT in children with cleft lip and palate, adolescents undergoing rapid maxillary expansion, and in adults with different vertical skeletal patterns and malocclusion. However, there is no study looking at alveolar bony defects in adults with posterior crossbite. The purpose of this study is to determine the prevalence of posterior alveolar bony defects in adults with posterior crossbite, so that necessary precautions can be taken prior to initiating treatment.

Methods
The study group consisted of pretreatment CBCTs of 30 samples with at least one or more tooth (teeth) in posterior crossbite or edgebite. The comparison group consisted of pretreatment CBCTs of 30 samples with no posterior crossbite or edgebite. All buccal and lingual side of upper and lower posterior segments are measured for presence of dehiscence and fenestration.

In order for the lesion to be counted as a dehiscence, it had to be larger than 2mm in size. This is to eliminate counting normal biological width (approximately 2mm) as a dehiscence. There was no minimum required lesion size for fenestration. Once the defect was confirmed in 3-sequential views in both coronal and axial section, the bony defect was measured on coronal section upto 1 decimal-point using the 2D line tool on Dolphin Imaging.

Results and Conclusions
N/A
05: In Vitro Evaluation of Force Decay of Chlorhexidine Hexametaphosphate Nanoparticle Coated Orthodontic Elastomeric Chains
Joseph Dougherty;¹ Prashanti Bollu;¹ Kishore Chaudhry;¹ Sarah Rafo;² Karthikeyan Subramani.¹

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Purpose
Despite significant advancements in the field of orthodontics localized areas of decalcification around brackets or white spot lesions (WSLs) remain as an adverse outcome. The implementation of Chlorhexidine Hexametaphosphate Nanoparticle (CHX-HMP NP) coated orthodontic elastomeric chains (OEC) may prevent WSLs however the coating's effect on clinical properties such as force decay (FD) has yet to be investigated.

Methods
Five specimen groups (distilled water, 1mM CHX, 5mM CHX, 1mM CHX-HMP NP, 5mM CHX-HMP NP) with a total sample size of 100 six link clear elastomeric chains. Specimen coating was verified by SEM and were held on acrylic block jigs 25mm apart. Force measurements were taken at six-time points (initial, 1 day, 7 d, 14 d, 21 d, 28 d) by a Lutron force gauge.

Results
No significant influence of OEC FD was observed at most time points.

Conclusions
CHX-HMP NP coated OECs represent a clinically acceptable tool in the prevention of WSL and the viability of coating must be investigated further.
06: A Qualitative Assessment on Marketing Effectiveness in Orthodontic Offices
Michelle Hsiao, 1

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Purpose
Practicing orthodontists rarely have the time or marketing training to effectively evaluate marketing activities within their offices. It is unclear whether orthodontists closely track marketing performance or not. With changes in consumer demographics and increased professional competitions, there is a need for a qualitative study to investigate any shift in marketing activities. Our study aimed to recommend effective strategic decisions to increase the value of associated marketing activities.

Methods
Qualtrics was used to electronically distribute a 19 questions survey to randomly selected active AAO members using the AAO Partners in Research listserv. A Chi-square test was conducted for association analyses on marketing practices and orthodontist age. Statistical analysis was done using SPSS software version 25.0.

Results
Our study determined there is a statistically significant association between the age of the orthodontist and the marketing practices they use. Chi-square tests showed millennial orthodontists use non-traditional marketing practices more than non-millennial orthodontists. Among different marketing practices, 52.78% of respondents perceived internal marketing, such as patient referrals and employee referrals, as the most effective method of generating new patients. External marketing was perceived to be the second most effective method. Univariate analysis revealed a statistically significant association between a respondent's gross revenue and conversion rate compared to their marketing budget. Lastly, 57.89% of respondents indicated that they have no formal protocol in place to measure the effectiveness of their marketing activities.

Conclusions
Most orthodontists use subjective perceptions to evaluate the effectiveness of their marketing programs.
Purpose
The increasing cost of dental school and post-graduate education and the effects of student indebtedness are becoming major concerns for the current dental profession. These factors can influence the decisions of current students on their post-graduate plans. With the rise of student tuition occurring faster than dental salaries, students are put in a difficult situation in deciding what is best for them once they graduate. Very few studies have reported whether it is more beneficial to be a statutory employee versus an independent contractor. This study is being conducted to better understand the financial aspects of an orthodontist being a statutory employee versus an independent contractor in income tax and non-income tax states.

Methods
The study will examine the benefits of an orthodontist being a statutory employee versus an independent contractor in income tax and non-income tax states. In order to begin the study, a standardized questionnaire will be created to get more data on what an orthodontist's daily rate is. Once the questionnaire gets IRB approval, various corporate representatives will be contacted and asked the standardized questions on what the daily rate is for an orthodontist and whether there is any employee compensation package included. Once that information is gathered, the study will look at the financial and tax benefits in an income and non-income tax state and will allow us to see what is more beneficial for an orthodontist.

Results
The background work does indicate that full-time orthodontists who are independent contractors in an income tax state such as California will benefit more because of all the expenses they can deduct from their taxes. Full-time orthodontists who are statutory employees in non-income tax states such as Nevada will benefit more because of the employee compensation package they receive through their employer.

Conclusions
The conclusions will be presented in the poster.
08: CBCT Evaluation of Maxillary Transverse Dimension Net Changes in Patients with Hyrax-Type Palatal Expanders

Eugene Kim; Prashanti Bollu; Kishore Chaudry; Edwin Parks.

Author Affiliations
Roseman University, AEODO/Orthodontics

Purpose
The purpose of this retrospective cohort study is to measure the net maxillary transverse dimension changes: skeletal and dental, of patients treated at the Roseman University orthodontic clinic with Hyrax-type palatal expanders using 3D cone beam (CBCT).

Methods
Patients treated with Hyrax-type palatal expanders will be selected with appliances stabilized for at least 3 months that had CBCT scans from T0 (pretreatment), T1 (time of appliance removal or within 3 months prior to appliance removal), and T2 (completion of all orthodontic treatment). The scans will be utilized to measure: T1-T0 (realized expansion), T2-T1 (short-term relapse), and T2-T0 (net expansion). The scans will be imported and cross-sectional slices will be made with Dolphin dental software. The slices will be coronal bisections through the most apical region of the palatal roots of the maxillary first molars and the most apical region of the roots of the maxillary permanent canines. The CBCT images will be oriented in the frontal, sagittal, and transverse planes on the Dolphin imaging software and the following measurements are found: external maxillary width, internal maxillary width, and angular measurements. Statistical analysis will be performed using SPSS 25.0.

Results
Study is in progress. Patients with maxillary transverse expanders may be expected to demonstrate a significant realized expansion, as well as a significant short-term relapse, but would be expected to have greater net expansion than patients treated without any maxillary expanders.

Conclusions
N/A
09: Financial Analysis of Purchasing an Existing Orthodontics Practice or Starting One From Scratch
Guneet Kohli Kainth;¹ Christopher Rodgers;² Richard Stevens.¹

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Purpose
This purpose of this study is to address gaps in existing evidence, rather currently accepted thinking, that it is easier and/or more cost-effective to purchase a practice due to systems for patients, materials, etc. being in place, rather than building one from the ground up.

Methods
This study will be completed using a financial analysis of a hypothetical orthodontics practice in Henderson, NV. The study will create a proxy business and will compare it to an existing practice of the same size and capacity over a 5-year business model. All expenses for operation management will be inserted into an excel business model, with certain variables kept constant (i.e. rent). This will help standardize numbers in comparing purchasing a practice or starting a new practice. This would include data from potential banks with loan rate estimates, dental supply companies.

Results
N/A

Conclusions
N/A
10: Economic Analysis of Service Commitment Programs for Financing Dental School Education

Raphael Liy;¹ Christopher Rodgers;² Richard Stevens.¹

Author Affiliations
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Purpose
The purpose of this study is to assess the economic return of committing to service based programs in order to finance dental school educational costs.

Methods
This project is a descriptive study that will utilize an economic projection model to calculate the Net Present Value (NPV) and Internal Rate Return (IRR) of cash flows over a 10-year period associated with the following pathways: Health Professions Scholarship Program, National Health Service Corps Scholarship Program, Public Service Loan Forgiveness, and traditional government loan financing. The cost of dental school education will be calculated using published total cost of attendance for public and private institutions as well as the opportunity cost associated with four years of forgone income during school. The geometric annual growth rate for each pathway will be calculated utilizing published private practice earnings data, dental school faculty salary data, and military pay charts. Conservative predictions for cost of capital (discount rate) and inflation will be incorporated. Regression analysis will be conducted to evaluate the correlation between changes in the projected earnings among fields.

Results
N/A

Conclusions
N/A
Evaluation of manufacturing tolerance in American Orthodontics® Orthodontic Latex Elastics in Different Sizes: An In-Vitro Study
Harvey Luu.¹ Glen Roberson.¹

Author Affiliations
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Purpose
Orthodontic latex elastics are a mix of natural rubber with stabilizers like zinc oxide which are heated to specific temperatures into a homogeneous final product. There is no standardization in the composition of latex elastics, resulting in products with different properties. Tight tolerances are difficult to control due to compounded ingredients for curing, swelling/shrinking during the manufacturing process, and the source of latex. Previous research has shown inconsistencies in the slot size of orthodontic brackets, the quality of healthcare latex products, and the forces generated in orthodontic elastics. There are no published studies investigating the manufacturing uniformity within packets of orthodontic latex elastics of different sizes.

Methods
20 samples of 4.5 oz American Orthodontics latex elastics from one pack of Wolf (1/8"), Gorilla (3/16"), Eagle (1/4"), and Panda (5/16"). Dimensions will be measured for internal diameter, external diameter, and depth by photographing elastics against grid paper with 2.54mm by 2.54mm boxes for reference. Static, dry testing of latex elastics will be used to measure force level at 3x internal diameter. Force delivery will be measured using a Digital Force Tester at 5 seconds and after 4 hours. Mean, standard deviation, and range of measured dimensions and force delivered will be generated. A T-test for two independent samples will be used to compare manufacturer's specified dimensions to measured dimensions. T-test for two independent samples will be used to compare manufacturer's specified forces to measured forces.

Results
The expected results are that there will be variations in morphological dimensions among American Orthodontics latex elastics with greater variation in smaller sizes and that there are variations in force delivery among American Orthodontics latex elastics.

Conclusions
Will be presented in the poster.
12: Survey on Awareness and Preference of Ceramic Bracket Debonding Techniques Among Orthodontists

Aileen Ngan;¹ Richard Stevens;¹ Kishore Chaudhry;¹ Prashanti Bollu;¹ Karthikeyan Subramani.¹

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Purpose
Different techniques have been studied for removal of ceramic brackets. However, there lacks information in the literature on the most used method of debonding ceramic brackets as well as the awareness of alternative debonding techniques amongst orthodontists. The purpose of this study was to conduct a survey on the awareness level and preference of debonding techniques of ceramic brackets amongst orthodontists in the American Association of Orthodontists.

Methods
An email with Qualtrics survey link was sent to members of the American Association of Orthodontists (AAO). Clinicians who participated in the study were characterized by professional experience. Retired orthodontists and residents were excluded from the study. All data were collected and analyzed with Qualtrics program. Statistical tests were done using SPSS software.

Results
The majority of orthodontists are unaware of electrothermal, ultrasonic, and laser debonding of ceramic brackets. Orthodontists who are affiliated with universities part time or full time are somewhat aware of alternative debonding methods. Orthodontists with more than 10 years in practice are somewhat aware of alternative debonding techniques compared to orthodontists with fewer years in practice. The orthodontists who are somewhat aware of an alternative debonding method use mechanical debonding of ceramic brackets. The reasons selected included cost and unfamiliarity of technique. The most common method of debonding ceramic brackets is mechanical debracketing.

Conclusions
Mechanical debonding of ceramic brackets is the most selected method amongst orthodontists. The majority of orthodontists are unaware of electrothermal, ultrasonic, and laser debonding of ceramic brackets.
13: Orthodontists' Usage and Opinions of Non-Traditional Referral Sources
Aimee Nguyen;¹ Christopher Rodgers;² Richard Stevens.¹

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Purpose
Orthodontists depend on creating and maintaining referrals in order to acquire new patients and preserve healthy practices. The traditional sources of referrals have been general dentists and current and former patients. Recent changes in the competitive landscape, including the decline of referrals from general dentists and the rise of direct-to-consumer marketing, suggest that traditional referral sources may not be adequate for orthodontists to maintain their influx of new patients. The dental and business literature, along with dental marketing, consulting, and transition firms suggest that patient referrals can be generated by seeking alternative, non-traditional referral sources. These non-traditional referral sources include: the community chamber of commerce or business bureau, neighboring business owners, other medical professionals, community sponsorship, school involvement, and strategic partners such as landlords, lawyers, accountants, and insurance companies. There is a gap in the research on orthodontists' usage of these potentially valuable referral sources. This study will be conducted to explore orthodontists' awareness, usage of, and opinions toward non-traditional referral sources.

Methods
This study will be a retrospective cross-sectional study using an online survey. The survey will be distributed to the American Association of Orthodontists Membership Directory using Qualtrics. The survey will assess demographic information, usage prevalence of non-traditional referral sources, and opinions towards non-traditional referral sources. Descriptive statistics and chi-square tests will be used to analyze the data.

Results
N/A

Conclusions
N/A
14: The Relationship Between Salivary Estrogen, Testosterone with Height, Weight, and Skeletal Maturation in Orthodontic Patients

Payal Patel;¹ Kayla Bateman;¹ Casey Luu;¹ Prashanti Bollu;¹ Manas Mandal.²

Author Affiliations
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Purpose
Introduction: Understanding skeletal growth is crucial to determine optimal treatment timing and modality in orthodontics and dentofacial orthopedics. Cervical Vertebral Maturation Staging (CVMS) utilizes the morphology of an individual's cervical vertebrae C2, C3, and C4 in a lateral cephalogram to predict growth potential. However, research shows inconsistencies with the reliability of CVMS. Studies have shown that Salivary Insulin-like Growth Factor-1 (IGF-1) correlates with growth development. Estrogen and Testosterone have been shown to correlate with IGF-1. Salivary biomarkers may be used to improve the current diagnostic method for predicting skeletal growth in orthodontics.

Purpose: To determine the relationship between changes in salivary estrogen and testosterone with changes in height, weight, and initial CMVS over one year.

Methods
Saliva samples and Cone Beam Computed Tomography were obtained from orthodontic patients at initial records appointment at Roseman University's Orthodontic Clinic. Saliva sample, height, and weight measurements were obtained from the same patients six months and one year after initial collection. 39 female and 26 male patients, ages 8-23 years, were included. Salivary Estrogen and Testosterone concentrations will be determined by using enzyme-linked immunosorbent assay (ELISA). Changes in salivary estrogen and testosterone will be compared to initial CVMS, and to changes in height and weight. Statistical analysis will be performed using SPSS 25.0. The study was initiated with Roseman University IRB approval.

Results
Distribution for CVMS I, II, III, IV, V is 28%, 13%, 18%, 18%, 23% for females and 23%, 12%, 19%, 38%, 8% for males, respectively. Changes in height decreased at each sequential CVM Stage, except between CVMS I and II for females. Increase in patient weight decreased at each sequential CVM Stage, except between CVMS I and II for females. Determination of salivary estrogen and testosterone is in progress.

Conclusions
Will be made upon completion of research and final data analysis.
15: In vitro Comparison of Force Delivery of Interarch Latex Elastics from Different Manufacturers.  
Stephanie Steiner;¹  Glen Roberson;¹  Karthikeyan Subramani;¹  Kishore Chaudhry.²

Author Affiliations
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Purpose
The purpose of this in vitro study is to assess whether the force level delivered by a given elastic matches the manufacturer's stated force level. The study will also compare the force levels generated by different manufacturers' latex elastics.

Methods
Static, dry testing of the latex elastics will be performed to measure force level. One end of each latex elastic will be placed on a metal post on an acrylic block jig, and the other end will be extended to another metal post at a distance of 3xID of the elastic. After 5 seconds, the elastic will be measured for force delivery using the Lutron FG 5005 Digital Force Tester (Taipei, Taiwan) for initial force level. The latex elastic will then be placed back on to the metal post and remain stretched for 4 hours. The 4-hour force level will then be measured for each elastic. Forces will be reported in units of Newton.

Mean, standard deviation, and range of measured dimensions of elastics will be generated. Average measured inner diameter length will be compared to the manufacturer's specified inner diameter length using a t-test for two independent samples (P<0.05). Mean, standard deviation, and range of force values will be generated by the elastics when stretched to 3xID. Initial force generated by the elastics when stretched to 3xID will be compared to the manufacturer's specified force using a t-test for two independent samples (P<0.05). Mean, standard deviation, and range of force values will be calculated when the elastics are stretched to 3xID after 4 hours. 4-hour force levels generated by the elastics when stretched to 3xID for 4 hours will be compared to the manufacturer's specified force using a t-test for two independent samples (P<0.05).

Results
N/A

Conclusions
N/A
16: Maximizing Orthodontist Returns on Non-Practice Investments using Interest Rate Movements order to Construct an Optimal Investment Portfolio

Dennis Tran;¹ Christopher Rodgers;² Glen Roberson.³

Author Affiliations
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Purpose
With the increasing amount of student debt incurred by dental school and orthodontic residencies, it is of utmost importance that Orthodontists become financially literate. This study will prove useful for Orthodontists seeking ways to offset debt by creating an investment strategy that will maximize returns.

Methods
Using the United States Federal Interest Rate values from the timepoints between January 1st, 1980 to Dec 31st, 2017 for a period of 38 years, I will track the growth of an initial investment allocation of $1000 in several different investment portfolios. The interest rate values will be obtained from the United States Federal Reserve. The following investment portfolios will be included: a S&P 500 Index Fund (VFINX), a Long-Term Bond Fund (VWESC), a Money Market Fund, a Balanced Fund (VWESC), and a portfolio that uses the Money Movement Strategy founded by Charles J. Givens. The Money Movement Strategy is an investment strategy that suggests one can maximize returns by moving investment allocations in response to changes in the United States Federal Interest Rate within these different funds: a S&P 500 Index Fund, a Bond Fund, and a Money Market fund. This study will examine and compare these different investment portfolios.

Results
N/A

Conclusions
N/A
A Survey of Protocols and Trends in Maxillary Expansion for Patients With Maxillary Transverse Deficiency

Alvin Trinh; Kishore Chaudhry; Ji Hyun Ahn.

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Purpose
Maxillary expansion is a form of treatment used to correct transverse deficiency of the upper jaw. Skeletal constriction of the maxilla can lead to posterior crossbite, a form of malocclusion in which the maxilla is narrow relative to the mandible and occlusal interferences are likely present. The methods and protocols employed for correction of maxillary transverse deficiency by orthodontists are influenced by patients' age and skeletal maturation and severity of maxillary transverse deficiency. With the advent of new maxillary expansion methods, such as microimplant assisted rapid palatal expansion (MARPE) and surgically assisted rapid palatal expansion (SARPE), various expansion protocols are used without consensus among orthodontists. The aim of this study is primarily to determine the most common method and protocol for correction of maxillary transverse deficiency by orthodontists and secondarily to assess patient roadblocks of non-traditional expansion treatment acceptance in the United States.

Methods
A survey will be sent to all members of the American Association of Orthodontists (AAO) via email. The survey will be a questionnaire with multiple choice, fill-in-the-blank, and short answer responses regarding expansion treatment for patients with maxillary transverse deficiency. Survey responses will be evaluated, and statistical analyses of the responses will be conducted using SPSS Statistics (version 24). All AAO orthodontists not actively practicing will be excluded from the study.

Results
Expected results: Rapid palatal expansion utilizing a Hyrax appliance with a jackscrew activation rate of 2 turns per day is the most common expansion method and protocol for orthodontic patients with maxillary transverse deficiency. Financial limitation is the primary patient roadblock of non-traditional expansion treatment acceptance.

Conclusions
N/A
Role of CYP3A5 in Modulating Androgen Receptor Signaling and its Relevance in African American Prostate Cancer Patients

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Purpose
African-American men (AA) often present with aggressive Castration-Resistant Prostate Cancer (CRPC), due to highly active Androgen Receptor (AR). AR is a ligand-activated transcription factor that promotes expression of genes responsible for cell proliferation and growth. Previously, we have shown that CYP3A5 promotes AR nuclear translocation and activation leading to increased prostate cancer (PC) growth. 73% of AAs carrying wild type CYP3A5 (*1/*1) express full length functional CYP3A5 whereas, 95% of Caucasians carry mutant (*3/*3) variant producing truncated non-functional protein. Difference in CYP3A5 expression leads to highly active AR and aggressive disease in AAs. Additionally, most of the PC patients are prescribed concomitant medications to manage age-related comorbidities. Many of these drugs are known modulators of CYP3A5, modulation of CYP3A5 may alter efficacy of ADT in these patients. Our work is focused on characterizing the effect of CYP3A5 modulating drugs on AR signaling in AAs.

Methods
q-RT-PCR based profiler assay was used to study effect of CYP3A5 modulation on AR regulated genes using cDNA from non-target (NT) and CYP3A5 siRNA treated cells. Confocal microscopy and cell fractionation assays were performed to evaluate and confirm the effect of CYP3A5 modulating drugs on AR nuclear translocation. Genes shortlisted from q-PCR based profiler assays were analyzed for change of expression in response to CYP3A5 modulating drugs. MDAPCA2b (AA origin, *1/*3) and LNCaP (Caucasian, *3/*3) cell lines were used for above experiments.

Results
CYP3A5 siRNA pool treatment downregulates AR regulated genes identified using q-PCR based profiler assay, performed with cDNA from CYP3A5 siRNA pool and NT treated MDAPCA2b cells. These downregulated genes include SCL45A3, FKBP5, NCAPD3, MYC, MME, ELL2, PIK3R3, HPRT1 and SPDEF with p-value of ≤0.005. These genes are known to regulate AR nuclear translocation, cell cycle progression and cell growth.

CYP3A5 siRNA treated MDACPA2b/ LNCaP cells showed decreased AR nuclear translocation and PSA production. Commonly prescribed drugs which are either CYP inhibitors (amiodarone, ritonavir) or inducers (phenytoin, rifampicin) were tested for their ability to alter AR signaling. The results show that the CYP inducers promoted AR nuclear migration and downstream signaling whereas CYP3A5 inhibitors blocked it. Further, CYP3A5 siRNA treated MDAPCa2b cells do not show any increase in AR nuclear migration with phenytoin treatment (CYP3A inducer) confirming that the activation of AR activity is specific to changes in CYP3A5 activity.
Conclusions
Concomitantly prescribed CYP3A5 modulating drugs can alter downstream AR signaling, cell growth and ADT efficacy in men, more so in AAs expressing wild type CYP3A5. We propose to further characterize drug induced CYP3A5 modulation of AR signaling to develop a guideline for physicians co-prescribing CYP3A5 modulating drugs to treat comorbidities in elderly patients undergoing ADT.
19: International Clinical Immersion for Undergraduate Nursing Students: The Concept of Service Learning

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Purpose
Introduction: Community engagement, often called "service learning", is the combine learning goals and community service as opportunities to enhance both student growth and the common good. Typically, community engagement is incorporated into a course or series of courses by way of a project that has both learning and community action goals. This give students' experiential opportunities to learn in real world contexts and develop skills of community engagements, while affording community partners opportunities to address significant needs. The service learning usually occur at the local or national setting for most U.S. nursing schools. It is not a standard practice for nursing schools to offer opportunities for undergraduate nursing students to experience service learning at an international setting or in a foreign country. In light of this clinical immersion, a group of undergraduate nursing students at Roseman University College of Nursing traveled to foreign countries providing community outreach and completing the clinical requirements of the nursing program.

Methods
Service Learning Concept: The National Service Learning Clearinghouse defined service learning as "a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teaching civic responsibility, and strengthen communities." It also identified that service-learning is described as a concept in which nurse educators are taking responsibility to create opportunities for students to develop their critical thinking skills and provide meaningful service to communities locally, internationally and globally. Engaging students in service learning experience helps them to develop their awareness of civic responsibility and improve cultural competence. Students who participate in global clinical immersion have enriched experiences and increased cultural sensitivity as they learn to address health disparities and engage in cross-cultural interactions.

Results
Implications for Nursing: Service learning is one of the most significant teaching methodologies gaining momentum on many campuses. If done well, teaching through community engagement benefits students, faculty, communities, and institutions of higher education. Further studies on how international clinical immersion can be successful in promoting global healthcare in nursing is warranted. How the partnership with healthcare providers in other countries may address the gap in global healthcare is yet to be realized.
Conclusions
By the end of the presentation, the participants will:
1. Identify potential opportunities for international service learning at their school or work setting.
2. Initiate a plan to start partnership with community agencies to create opportunities for students' service learning at the international level.
20: Healthy Monday and Role of Media in Health Promotion and Wellness
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Purpose
Introduction: Health education has been an essential component of action to promote health and prevent disease. Campaigns to prevent diseases were based upon a simplistic understanding of the relationship between communication and behavior change. Health education programs have evolved in their sophistication, reach and relevance to a wider range of groups in population.

Methods
Healthy Monday Concept: Healthy Monday is a national initiative to help end chronic preventable diseases by offering weekly prompts and programs to support people and participating organizations in starting and sustaining healthy behaviors. Healthy Monday is based on a research study that people view Monday as the day of the week to kick start healthier choices and behaviors. The study concluded that respondents chose Monday to make healthy lifestyle improvements.

Role of Media: Social media has dramatically changed the health promotion and wellness strategies for healthcare providers and educators. Social media platform has been used to promote healthy behavior and overcome barriers in the delivery of healthcare. Asian American Pacific Islander Nurses Association of Nevada (AAPINA of NV) launched its first radio program in August 3, 2018 in partnership with PHLV Radio in Las Vegas. The radio program is broadcast every Mondays and available via podcast on iTunes and Spotify.

Results
Objectives:
By the end of this presentation, participants will:
1. Understand the importance of the relationship of communication and behavior change to promote health and wellness.
2. Identify the advantages of structured health information system using Healthy Monday concept and media to facilitate positive outcomes in health promotion and wellness.

Conclusions
Implications for Nursing: This platform is among the first to introduce an innovative concept and delivery for health promotion and wellness to API population in Nevada and beyond. A structured health information system and an effective communication means can facilitate positive outcomes that nurses can participate.
Evaluating the Role of G protein Coupled Receptor Kinases 2 and 5 in Mediating Chemotherapeutic Resistance of Cervical Cancer HeLa Cells

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Purpose
One of the biggest issues with chemotherapeutics is that some cancer cells may show resistance to them. This limits its effectiveness to treat these cancers. Here, we explore the function of G protein coupled receptor kinase (GRK) 2 and 5 in mediating chemotherapeutic resistance in the cervical cancer HeLa cells line

Methods
HeLa cells with and without GRK2 or GRK5 protein expression were treated with various chemotherapeutics used to treat cervical cancer for 72 hours and the extent of cell loss was assessed by a cell proliferation assay kit, Cell Counting Kit-8 (CCK-8, Dojindo Molecular Technologies). If a particular chemotherapeutic showed a difference in effect between the different cell lines using this assay, the drug effect is then further analyzed using the trypan blue exclusion method, quantifying cell death caused by this particular chemotherapeutic.

Results
Using the CCK-8 kit to screen different chemotherapeutics, GRK2-null HeLa cells showed decreased sensitivity to cisplatin compared to the other cell lines. However, using trypan blue exclusion to observe cell death, no differences were observed with cisplatin between all cell lines tested. This suggests that, since the CCK-8 proliferation assay kit is dehydrogenase-dependent and does not directly count total number unlike trypan blue exclusion, GRK2 null HeLa cells are reacting differently to cisplatin at the level of dehydrogenase activity but are dying at the same degree as the other cell lines in the presence of cisplatin.

Conclusions
The results in this study suggest that GRK2 may modify different cellular pathways, compared to GRK5, that control the reaction of cancer cells to cisplatin. This difference may give cancer cells that have low levels of GRK2 different behaviors in response to cisplatin, potentially giving them special survival advantages.
22: A Qualitative Analysis of the Impact of Changes to Student Evaluation of Teaching

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Purpose
Roseman University College of Pharmacy (RUCOP) had generally low response rates for Student Evaluation of Teaching (SET) thus changes were made in 2016 to increase the response rates of SET. The purpose of this study is to identify and analyze how changes in the SET process led to improved response rates and to understand how it can be further improved.

Methods
Students from the class of 2018 were recruited via email to participate in focus groups, by a convenience sample, to share their experiences with the old and current SET. There were four focus groups, two from each campus, and each was coordinated and audio recorded by the primary investigator. Focus group participants were given the old and current SET to refresh their memory on changes that were made, and asked questions to prompt reflection on how the changes influenced them to complete SET. Each recording was independently transcribed and cross-verified by two pharmacy students. Two students and two faculty investigators independently coded and categorized the transcripts into themes, then met to discuss with one another until consensus was reached.

Results
A total of 27 students, with 63 percent females, participated in the focus groups. Four themes were identified in the study: motivators, barriers, proposed solutions, and the importance of SET. Motivators included reducing the number of questions, simplifying the Likert scale to 5 questions, and adding a financial incentive to the new SET. Survey fatigue remained a barrier to completion of SET, however decreasing the number of questions positively influenced students' willingness to complete the new SET. Improving timing of SET administration and dedicating classroom time for SET completion were some of the proposed solutions identified by the students. Lastly, students believed the SET is important to help faculty improve their teaching and to help administrators with faculty performance evaluations.

Conclusions
Other colleges of pharmacy may improve SET response rates by utilizing motivators identified in this study such as reducing the number of questions, simplifying Likert scale responses, and providing a financial incentive.
23: Analyzing Different Black Pepper Essential Oils for their Anti-Oxidant Properties
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Purpose
Anti-oxidants could be of interest to protect individuals from the damaging effects of oxygen radicals. Some essential oils are claimed to have this ability but it is unclear as to the active ingredient within it or which preparation could be the best for this purpose. In this report, we explored the ability of different commercial preparations of black pepper essential oils to protect the nematode Caenorhabditis (C.) elegans from the oxidizing effect of juglone.

Methods
Young adult C. elegans were exposed to the oxidant juglone with or without pretreatment with different commercially available black pepper oils. Their survival was then assessed over several hours. Each black pepper oil was then analyzed for their basic constituents by HPLC.

Results
Most brands of essential oils tested displayed at least some ability to act as an anti-oxidant, with the exception of one which was prepared by using super-critical fluid CO₂ extraction. Analysis of that preparation displayed little to no basic anti-oxidant constituents.

Conclusions
The results in this report demonstrate that black pepper essential oil displayed anti-oxidant activity, as demonstrated by survival assays using C. elegans, but varied by the method of preparation of the oil.
**24: Association of Salivary Biomarkers with Skeletal Maturation in Orthodontic Patients**

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**Purpose**
The purpose of the current study is to find a correlation/association of salivary IGF-1 (sIGF-1), salivary estradiol (sE2), and salivary testosterone (sT) to skeletal maturity in orthodontic patients as determined by CVMS. Secondary objective of this study is to correlate age, height and weight of the patient with CVMS.

**Methods**
A cross-sectional clinical research was initiated with IRB approval that included 105 new patients from Roseman University of Health Sciences Orthodontic Clinic of age 8-25 years. Patient's age, height and weight were recorded at the initial records appointment. Cephalometric radiographs via CBCT were graded for CVMS by two observers independently at two different time points. Saliva samples were obtained via passive drool technique and kept frozen at -80°C until analyzed by enzyme-linked immunosorbent assay (ELISA) to determine the concentrations of IGF-1, sE2 and sT. Analysis of variance (ANOVA) and linear regression were used to determine the association between sIGF-1, age, height, and weight of the patient.

**Results**
Study subjects included 60 females (mean age 13.11±3.13 years) and 45 males (mean age 14.5±2.88 years). Distribution of CVMS in male patients differed significantly from female patients in stages III (male 20%, female 28%), IV (male 30%, female 13%) and V (male 11%, female 20%). sIGF-1 concentrations were higher and reached peak in male patients at CVMS IV and in female patients at CVMS III, which was statistically significant for female patients between CVMS II-III. sIGF-1 concentration peaked around age 13.5 year for male and 12.5 year for females that coincided with CVMS III in both genders. sE2 concentration was highest between CVMS IV-V for male patients and CVMS IV for female patients.

No statistical significance was observed for sE2 concentration with any specific CVMS in either gender. SE2 concentrations increased with age in males (>15 year) and females (~11.5 year). sT concentrations peaked at CVMS IV in male and female patients around age 16 and were statistically significant between CVMS I and IV in both the genders.

**Conclusions**
sIGF-1 showed weak correlation with higher CVMS and age. sE2 levels were not significant for male or female patients in association with chronological age and CVMS. sT in males strongly correlated to chronological age, while females showed a moderate correlation with chronological age. Mean age of male patients was slightly higher than female patients in specific CVMS category indicating female patients attaining earlier skeletal maturation. Increase in patient height correlated with increase in age and CVMS. A larger prospective study is needed to validate these observation.
25: In Search of the Mechanism of Rapid-Acting Antidepressant RO-25-6981: Glutamatergic Antagonist Activity versus Serotonin Transport Inhibition

Christen Cain;1 Angela Torosian;1 Tatiana Erives;1 Lisa Nguyen;1 Andrew Carapucci;1 Tina Nguyen;1 Kristen Laymon;1 William Leung;1 Robert Kirsh;1 Danielle Valls;1 Christopher So;1 Jeffrey N. Talbot;1 David B. Rawlins.1

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Purpose
The small molecule RO-25-6981 (MI-4) has been shown to have antidepressant activity that has both a rapid onset and a sustained duration of action. This is attractive since current antidepressants can take more than 2 weeks to show efficacy. MI-4 has been shown to inhibit monoamine transporters, such as serotonin and norepinephrine transporters, and the NR2B subunit of the NMDA glutamate receptor. We are working to understand the mechanism of this molecule more fully and what inhibition is important for its antidepressant activity.

Methods
Analogs of MI-4 were synthesized and assayed in vivo using models of depression in mice and also in vitro using a cellular-based fluorescent assay to determine inhibition of the serotonin transporter. Wild-type C57BL/6J mice were used in models of depression (the tail suspension and locomotor activity tests) to assay MI-4, synthetic analogs of MI-4, and traditional antidepressant drugs as controls. HEK293 cells that stably express the serotonin transporter were created in which MI-4 and synthetic analogs of MI-4 were assayed for inhibition of transport. The neurotransmitter transporter uptake assay kit from Molecular Devices Corporation was used.

Results
MI-4 analogs did not display the same level of activity as MI-4 in the tail suspension test. Several of the analogs showed some activity, with TR-5 being the most potent. TR-5 displayed a reduction in immobility of 67% when 30 mg/kg was administered compared to 74% when 10 mg/kg of MI-4 was administered. Similarly, in the serotonin transporter assay, MI-4 analogs showed less potent activity than MI-4.

Conclusions
We have shown that the glutamatergic antagonist activity of MI-4 and analogs does not correlate with the observed activity in the tail suspension test. Serotonin transporter inhibition demonstrated better correlation with in vivo models, but was still not predictive of antidepressant behavior. Further work is necessary to examine both norepinephrine and dopamine transport inhibition with these analogs to understand the mechanism of action.
26: Using *Caenorhabditis Elegans* as an Experimental Model to Test the Importance of G Protein Coupled Receptor Kinases in Controlling the Heart's Responses to Oxidative Stress

Selina Crivello;¹ Tina Nguyen;¹ Stacy Henry;¹ Johnathen Woodward;¹ Nasma Awada;¹ Nazgol Emami;¹ Christopher So.¹

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**Purpose**
It is well known that the protein expression of G protein coupled receptor kinase 2 (GRK2) is significantly increased in humans during early stage heart failure. The pharmaceutical applicability of this is unknown. Here, we will use the nematode, *Caenorhabditis (C.) elegans*, to determine how important G protein Coupled Receptor Kinases (GRKs) are in dealing with oxidative stresses that are similar to what the heart is exposed to during reperfusion injuries.

**Methods**
Different strains of young adult *c. elegans* will be treated to the oxidant, juglone, from 1-4 hours and their response assessed.

**Results**
Mutant *c. elegans* without GRK2 showed increased resistance to oxidative stress. Mutant *c. elegans* without GRK1 showed similar sensitivity to oxidative stress as the wild type N2 worms.

**Conclusions**
These results in this report suggest that inhibiting GRK2 in *c. elegans* increases their viability during oxidative stress. This may indicate that GRK2 may have a negative impact on survival because of its ability to activate signaling pathways that lead to death in response to oxidative stress. This suggests that, in humans, GRK2 inhibitors may be important to reduce the likelihood of heart failure.
27: Cryptococcal Neoformans Meningoencephalitis in HIV/AIDS
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Purpose
Cryptococcal meningoencephalitis is an opportunistic infection caused by Cryptococcus neoformans or C. gattii in HIV/AIDS patients. Failure to administer aggressive cryptococcal treatment and address non-adherence to antiretroviral therapy (ART) may lead to increased mortality.

Methods
This case series retrospectively describes patient demographics, diagnostic data, treatment, and outcomes of cryptococcal meningoencephalitis in patients with poor compliance HIV/AIDS who were admitted to Valley Hospital Medical Center from 2013 to 2018.

Results
Briefly, patient 1 had a HIV-1 viral load and CD4 count of 134,399 and 9, respectively. His CSF and blood cultures grew Cryptococcus neoformans and was treated with liposomal amphotericin and fluconazole for three weeks then discharged on fluconazole. Two months later, he was readmitted after non-compliance and left AMA after six days. Patient 2 had a viral load of 580 and CD4 of 50. His CSF cultures grew Cryptococcus neoformans and was treated with liposomal amphotericin and flucytosine for 3 weeks then stepped down to fluconazole. Four weeks later, the patient was discharged. Patient 3 had a viral load was 184,660 and CD4 was 5. His CSF and blood cultures grew Cryptococcus neoformans and was treated with amphotericin B and fluconazole. He left AMA five days later. Patient 4 had a viral load and CD4 of 1,918 and 39, respectively. His CSF and blood cultures grew Cryptococcus neoformans and he was treated with liposomal amphotericin and flucytosine for one week then discharged on fluconazole. Patient 5 had a viral load of 234,640 and CD4 of 13. The patient's CFS and blood cultures grew Cryptococcus neoformans. The patient was treated with liposomal amphotericin and flucytosine for four days then switched to fluconazole. Ultimately, he was switched to hospice care.

Conclusions
We report five non-compliant HIV patients with cryptococcal meningoencephalitis, who were treated with liposomal or conventional amphotericin B and either flucytosine or fluconazole as induction therapy. This data emphasize the importance of ART compliance and testing for C. neoformans in patients with history of poor compliance, HIV and signs of meningitis. Further studies are needed to optimize treatment and compliance in cryptococcus meningoencephalitis to reduce mortality and morbidity.
28: Evaluation of Tanshinone IIA for the Treatment of Wet Age-Related Macular Degeneration

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Purpose
Tanshinone IIA is a popular drug currently used in China for treating cardiovascular diseases such as myocardial infarction. Tanshinone IIA is well-known for its antioxidant, anti-angiogenic, and anti-inflammatory properties. Tanshinone IIA has also shown to down regulate both vascular endothelial growth factor (VEGF) and hypoxia inducible factor - 1α (HIF-1α) in various cancer cell lines. Despite these interesting findings, the effect of tanshinone IIA on treating wet age-related macular degeneration (AMD) remains largely unknown. The current work intends to study the activity of tanshinone IIA as a novel treatment for wet AMD.

Methods
The cytotoxicity of tanshinone IIA was tested in human retinal pigment epithelial cells (ARPE-19) and bovine corneal endothelial cells by MTT assay. Cells were exposed to various concentrations of tanshinone IIA with and without cobalt chloride (150 µM) for 12 and 24 hours respectively. Cells were then incubated with MTT reagent for 3 hours at 37°C and cell viability were quantified by measuring the absorbance at 570 nm. ARPE-19 cells were incubated with different concentrations of cobalt chloride (100, 150, and 200 µM) for 12 hours and levels of expressed HIF-1α and secreted VEGF were quantified through Western blot and ELISA, respectively.

Results
Tanshinone IIA at concentrations 5, 10, 15 and 18 µM did not show cytotoxicity in both ARPE-19 and bovine corneal endothelial cells. However, concentrations of 25 and 30 mM were found to significantly (p<0.05) cytotoxic (after 12 hours incubation) and 20 mM showed cytotoxicity after 24 hours. Chemical hypoxia induced by cobalt chloride (at concentrations of 100, 150 and 200 mM) caused a significant increase in VEGF level in a dose dependent manner (p= 0.039, 0.021 and 0.012, respectively). The highest secretion of VEGF was at 200 mM of cobalt chloride, which was 1.9 folds compared to normoxic cells. Cobalt chloride at 100, 150 and 200 mM concentrations increased the level of HIF-1α by 7, 8, and 6 folds respectively. Based on the data, the cobalt chloride concentration was maintained at 150 mM for further studies.

Conclusions
This study is the first report on the effects of tanshinone IIA on VEGF secretion and HIF-1α level in ARPE-19 cells. ARPE-19 cell line is commonly considered as an in vitro model for RPE cells for studying the effects of hypoxia in RPE physiology. The exposure of ARPE-19 cells to various concentrations of cobalt chloride for 12 hours significantly increased the expression of HIF-1α compared to normoxic condition. These preliminary findings suggest the potential of tanshinone IIA as a promising agent in wet AMD therapy.
29: Using *Caenorhabditis Elegans* as an Experimental Model to Test the Importance of G Protein Coupled Receptor Kinases in Controlling Reactions to Hyperosmotic Stress

**Nazgol Emami;¹ Nasma Awada;¹ Johnathen Woodward;¹ Christopher So.¹**

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**Purpose**

The ability of an organ to adjust to hyperosmotic environments is important for the well being of an individual with various diseases that may lead to high salt retention, such as kidney disease. In this report, we explored the effect of G protein coupled receptor kinases (GRKs) in modifying reactions to high salt environments using the nematode *Caenorhabditis (C.) elegans*.

**Methods**

Different GRK strains of young adult *C. elegans* were exposed to different regimens involving high concentrations of NaCl, causing either long-term hyperosmotic stress or short-term hyperosmotic shock, and their responses probed afterwards. The egg laying abilities of various *C. elegans* strains after long-term hyperosmotic stress were also assessed to determine their abilities to recover developmentally from hyperosmotic stress.

**Results**

Mutant *c. elegans* without GRK1 or GRK2 showed increased resistance to long-term hyperosmotic stress, with this effect more observed for mutant GRK1 worms. More GRK2 mutant *C. elegans* survived short-term hyperosmotic shock compared to the other strains. Hyperosmotic stressed mutant *C. elegans* without GRK1 or GRK2 showed similar egg laying abilities compared to unstressed worms. Stressed wild type N2 worms, on the other hand, laid significantly less eggs compared to unstressed N2 worms.

**Conclusions**

The results in this report demonstrate that *C. elegans* GRKs are involved in hyperosmotic stress reactions. Since the GRK knockout worms showed increased resistance to hyperosmotic stress, GRKs may have a negative impact on survival. This maybe is because of its ability to activate signaling pathways that lead to death in response to this stress. This implies that, in humans, GRK inhibitors may be important clinically to reduce the likelihood of organ damage associated with high salt stress situations.
30: Printing Hydrogels With a 3D Printer as a Method to Deliver Ophthalmic Drugs
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Purpose
A major challenge in the treatment of ocular diseases is the delivery of drugs to the eye. The most common method for delivery in the anterior segment of the eye is through topical administration since it is non-invasive and allows for patient administration. However, the delivery of eye drops is inefficient and rarely accurate. The purpose of this study is to use common 3D printing techniques to print hydrogel films similar to contact lenses. The incorporation of drug molecules on the monomeric pieces will allow for the printing of a lens or film for drug delivery on the eye. The covalent attachment decreases the initial elimination of the drug in the eye seen with topical drops, and will allow for the control of dosing and drug release to the anterior of the eye.

Methods
A commercially-available stereo lithographic (SLA) printer manufactured by Peopoly was used with polyacrylate resins to print either disks, or contact lens-shaped solids. The SLA printer uses a laser that emits at 405 nM wavelength, and is suitable for the polymerization of acrylate monomers. By varying the incorporation of tetraacrylate crosslinker in the mixture, the flexibility of the printed disk could be varied. The incorporation of a small molecule drug was mimicked using dansyl chloride modified 2-hydroxyethyl methacrylate resin and analyzed using fluorescence spectroscopy.

Results
The ratio of the tetraacrylate crosslinker was shown to influence the rigidity of the printed layer. When 75% w/w of pentaerythritol acrylate (PETA) was used, the layer was brittle and cracked upon removal from the printer bed. Reduction of the amount to 40% w/w gave a well-behaved solid, while further reduction to 10% w/w gave a flexible layer. Reduction of the percentage of PETA required an adjustment of the printing speed of the laser or no layer was obtained. 2-hydroxyethyl methacrylate was modified by the addition of dansyl chloride to form the dansylate derivative. This was added to the printing resin to demonstrate the incorporation of a small molecule.

Conclusions
We have successfully developed resin mixtures that can be printed with the Peopoly Moai SLA printer. By varying the concentrations of the components of the resins, we have demonstrated that we can influence the properties of the printed solid. Further studies will explore the incorporation of a small molecule drug into the printed layer.
31: Computer Aided Medication Counting
Allen Johnson.¹

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Purpose
One of the central tasks of Pharmacists is medication inventory control. A primary step in this task is the delivery of counted medications to the user, as well as the execution of regular audits of not yet dispensed inventory. This presentation will show a method based on image processing to expedite and improve medication dispensing and inventory control.

Methods
NIH IMAGE, now ImageJ, is over 30 year old, and has served as a general purpose image processing programming and analysis system for biological and other purposes since that time. It has been used to analyze SEM images, gels, autoradiographs, and CT, MRI and PET images. In particular routines for counting bacterial colonies in petri dishes were developed. These routines and methods serve as a base for our counting method.

Results
We will demonstrate our method, and indicate the improvement in counting time, generality and low cost of the method, and improved chain of custody and record keeping for medications of interest (e.g. opioids).

Conclusions
NA - however:
I wish to do a live demonstration(s) of the method. I can either do it from a podium, or using a computer and document camera at a poster board.
32: Using Word Clouds to Identify Trends in Paclitaxel Resistance Research

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Purpose
Research trends could vary from year to year as new scientific advances and concepts are adopted. The challenge is then to identify them in order to convey the most up to date pertinent research information to a clinical audience as well as help anticipate future needs within the medical and scientific fields. In this study, we evaluate the use of Word Clouds to help identify trends in research concerning cancer cell resistance to paclitaxel (Taxol), a major issue within cancer treatment.

Methods
Publications from 5 years of research (2013-2018), identified using Pubmed inputting terms "paclitaxel" and "resistance", were identified and their associated keywords were collected, if available. Word Clouds for each year were then generated by Tagcloud (https://tagcrowd.com/) with words "paclitaxel", "resistance" and "cancer" omitted. Word Clouds were then analyzed visually to identify trends that vary from year to year.

Results
Some keywords are continuously prevalent through the five years. However, there are certain keywords which have become more prevalent or less prevalent as years progress. This implies potentially an increase or decrease, respectively, in popularity of research within this particular area pertaining to paclitaxel resistance.

Conclusions
Using Word Clouds, it may be possible to identify trends in particular areas of research. This may be useful in the future to anticipate needs of the health care industry and for patient care.
33: The Role of Glutamatergic Antagonism in the Antidepressant-like Activity of the Rapid-Acting Antidepressant Ro-25-6981 and Its Analogs

Kristen Laymon; Jiratchaya Suriyachottakul; BaoLing Yu; Bora Shim; Ahrom Ham; Danielle C. Valls; Robert D. Kirsh; Christopher H. So; David B. Rawlins; Jeffery N. Talbot.

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Purpose
Rational design of lead compounds targeting glutamatergic receptors is critical to developing novel therapeutics for treating psychiatric disorders. The glutamatergic antagonist, RO-25-6981, has previously been shown to exert both rapid and sustained antidepressant-like activity. The purpose of the current study is to delineate its putative antidepressant mechanisms of NR2B-selective NMDA receptor antagonism and monoamine reuptake transporter inhibition.

Methods
Heterozygous transgenic mice deficient in expression of the NR2b subunit of the NMDA receptor (Grin2b+/-;Grin2a) and wild-type C57BL/6J mice were housed with same-sex littermates and behavioral testing was conducted during the light phase between 12:00pm - 5:00pm. To assess antidepressant-like behaviors, the tail suspension test and locomotor activity tests were performed using RO-25-6981 and traditional antidepressant drugs, including the serotonin selective reuptake inhibitor fluoxetine and the tricyclic antidepressant desipramine, as positive controls for monoaminergic reuptake activity. All procedures were approved by the local Institutional Animal Care and Use Committee.

Results
In the tail suspension test, four RO-25-6981 analogs (TR-2, TR-4, TR-5, and TR-6) were found to exhibit antidepressant-like activity in wild-type mice following acute administration (30 mg/kg, i.p., 30 min) with maximal reductions in immobility by approximately half compared to vehicle-treated controls. By contrast, RO-25-6981 (10 mg/kg, i.p., 30 min) reduced immobility by approximately 90%, an effect comparable to that exhibited by the traditional monoaminergic antidepressants fluoxetine and desipramine. However, unlike RO-25-6981, TR-2, TR-4, TR-5 and TR-6 profoundly limited generalized locomotor activity suggesting increased activity in the tail suspension test was related to psychotropic vs. generalized drug effects. In contrast, other TR analogs tested showed no antidepressant-like activity in the tail suspension test, despite possessing robust NMDA receptor antagonist activity via mid- to low-nanomolar binding affinity at the NR2B subunit. Interestingly, RO-25-6981 and TR-5 exhibited similar antidepressant-like activity in wild-type and NR2B-deficient mice, despite possessing low-nanomolar NR2B binding. In addition, cellular serotonin transport assays showed functional inhibitory activity of both agents.

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 monoamine reuptake inhibition contributing to the overall antidepressant-like activity of RO-25-6981 in animal models of mood.
34: Molecular Pathology, Diagnostics, and Therapeutics of Fatty Liver Disease
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Purpose
Molecular Pathology, Diagnostics, and Therapeutics of Non-alcoholic Fatty Liver Disease (NAFLD).

Methods
We describe the applications of novel molecular imaging and proteomic profiling technologies to the studies of NAFLD.

Results
Specifically, we describe the capability of an advanced Raman spectroscopic imaging technology for ultrasensitive detection of microvesicular steatosis in early-stage NAFLD. In addition, we describe the capability of nanofluidic proteomics for rapid detection of perturbations to protein post-translational modifications (PTMs) in early- and late-stage NAFLD. Furthermore, we describe the use of perturbations to protein PTMs in NAFLD to evaluate liver function, monitor drug treatment effects, and guide the rational designs of therapeutic intervention.

Conclusions
Advanced molecular imaging and proteomic profiling technologies allows novel approaches toward the molecular pathology, diagnostics, and therapeutics of NAFLD.
The Effect of Chemotherapeutics on G protein Coupled Receptor Kinase Expression Levels in Human Cardiomyocytes

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Purpose
One of the biggest issues with chemotherapies is some may be cardiotoxic to the heart, potentially exacerbating heart diseases in patients with pre-existing cardiovascular issues. One particular class of protein kinases whose function could be of concern if the levels of its expression are affected are the G protein coupled receptor kinases (GRKs), whose main function in the heart is controlling the activity of beta1 adrenergic receptors. Therefore, any changes in the protein expression of these kinases due to chemotherapy treatment can lead to long term functional changes to the heart. In this report, we explore changes in GRK expression in human cardiomyocytes after treatment with various cardiotoxic and non-cardiotoxic chemotherapeutics.

Methods
Human cardiomyocytes were treated with cardiotoxic and non-cardiotoxic chemotherapeutics and the expression of GRK2 and GRK5 were queried by Western Blotting. In addition, the expression of other proteins that are important for viability was also queried as well.

Results
Certain chemotherapeutic drugs showed a higher propensity to cause decreases in GRK2 and GRK5 expression levels over others. Furthermore, the recovery of GRK levels also varied depending on the chemotherapeutic used.

Conclusions
The results in this study suggests that different chemotherapeutics have different effects on GRK expression levels. This implies that some could be more safe for use in treating patients with previous underlying heart conditions than others.
36: Predicting G Protein Coupled Receptor Kinase Interactions With Proteins within the Tgfbeta Pathway

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Purpose

In addition to their role in mediating the desensitization of G protein coupled receptors, G protein coupled receptor kinases (GRKs) can also control non-receptor functions in cells that could be important in moderating cancer development. In this study, we use online databases Phosphonet (Kinexus Corporation) and Group-based Prediction System, Version 3.0 (The CUCKOO Workgroup) to identify new GRK substrates in the transforming growth factor beta (TGFbeta) signaling pathway, which is involved in cell growth and apoptosis of cancer cells.

Methods

Certain signaling proteins within this pathway were queried using the proprietary kinase prediction modules within Phosphonet and GPS 3.0 to determine the likelihood of being phosphorylated by GRK2 or GRK5.

Results

Some proteins within the TGFbeta pathway have an increased likelihood of being GRK substrates compared to other proteins according to Phosphonet. This may suggest that if a select GRK has a role in controlling this pathway, these proteins could be the ones that could be phosphorylated by GRKs. However, the rankings of some of these proteins within the pathway differed when using GPS 3.0, suggesting differences in predictions depending on the algorithm utilized.

Conclusions

Using phosphonet and GPS 3.0, it may be possible to pinpoint potential GRK substrates within signaling pathways implicated in cancer development. These GRK-protein interactions could be targeted in the future by drugs to control the activity of these pathways.
37: Biological Therapy in Immune-Mediated Inflammatory Diseases (Imids): Comparative Analysis and Forecast of the Market Trend

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Purpose
Immune-mediated inflammatory disease (IMID) is a group of disorders such as rheumatoid arthritis and psoriasis is characterized with over expressed inflammatory cytokines such as tumor necrosis factor alpha (TNF-α), interleukin 6 (IL-6) and interleukin 1 (IL-1). We wanted to determine the current market value as well as projected potential market share for TNF-α, IL-6 and IL-1 targeting biologicals in rheumatoid arthritis (RA) and psoriasis arthritis (PsA). A comparative analysis of market share of the key players would help formulate policies regarding treatment and drug development.

Methods
Incidence of RA and PsA within the population and the number of patients with these disease were calculated by analysis of the published data. The market value of each drug was evaluated based on the number of patients multiplied by the average treatment cost. Accurate number of patients with average cost of treatment will closely project the market value compared to the actual market value. The regression analysis using SPSS will be performed to project the potential market value. Time series forecasting methodology will be applied to calculate the continuous market value for next 5 years based on Python platform. The confidence level and margin of error will be defined. The history data and market value report would help to define the compound annual growth rate (CAGR) in order to mediate the data projection.

Results
It is estimated that RA affects ~1% of the adult population (>1.5 million), while psoriasis and PsA affect ~2% of the adult population (~7.5 million) in US. The average cost to treat RA is around 30K-60K per patient based on the specific drug. The main anti-TNF drugs for rheumatic disease have combined sales of more than US$ 30 billion in 2015 and 32 billion dollars in 2016. The global TNF-α inhibitors market is growing and expected to grow at a CAGR of 7.1% from 2018 to 2023.

Conclusions
The ongoing study is expected to provide a comprehensive patient data, cost of treatment, current market share and future market trend of the targeted biologicals in the treatment of IMID.
Predicting G protein coupled Receptor Kinase Interactions with Proteins within the AKT Pathways

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Purpose
In addition to their role in mediating the desensitization of G protein coupled receptors, G protein coupled receptor kinases (GRKs) can also control non-receptor functions that could be important in moderating cancer development. In this study, we use online databases Phosphonet and GPS 3.0 (Group-based Prediction System, Version 3.0) to identify new GRK substrates in the AKT signaling pathway, which promotes survival and growth of cancer cells.

Methods
Certain signaling proteins within these pathways were queried using the proprietary kinase prediction modules within Phosphonet and GPS 3.0 to determine the likelihood of being phosphorylated by GRKs.

Results
Some proteins within the AKT pathway have an increased likelihood of being GRK substrates compared to other proteins. This may suggest that if a select GRK has a role in controlling this pathway, these proteins could be the ones that could be phosphorylated by GRKs. However, the rankings of the proteins within the pathway differed when using either Phosphonet or GPS 3.0.

Conclusions
Using phosphonet and GPS 3.0, it may be possible to pinpoint potential GRK substrates within signaling pathways implicated in cancer development. These GRK-protein interactions could be manipulated in the future by drugs to control the activity of these pathways.
Increased Sensitivity of GRK5-Null Cervical Cancer HeLa Cells to Actinomycin D-Mediated Cell Death

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Purpose
One of the biggest issues with chemotherapies is that some cancer cells may show resistance to them. This limits its effectiveness to treat various cancers. Here, we explore the function of G protein coupled receptor (GRK) 5 in mediating Actinomycin D sensitivity in the cervical cancer cell lines, HeLa cells.

Methods
HeLa cells with and without GRK5 protein expression were treated with actinomycin D or doxorubicin for different concentrations and different times. Extent of cell death was assessed by cell counting.

Results
Assessing cell death showed increased sensitivity of GRK5-null HeLa cells to actinomycin D. This was not observed in GRK2-null HeLa cells. Faster cell death mediated by Actinomycin D is observed in GRK5-null HeLa cells compared to control transfected HeLa cells. A similar increased sensitivity was also observed to doxorubicin in GRK5-null HeLa cells, which shows a similar mechanism of action as actinomycin D.

Conclusions
The results in this study suggest that GRK5 in HeLa cells controls its sensitivity to actinomycin D.
The Accessory Protein RanBPM Alters Extracellular Signal-Regulated Kinase Activation by Mu Opioid Receptors

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Purpose
Most clinically relevant opioid drugs mediate their effects through mu opioid receptors (MORs). Chronic activation of MORs leads to long term adaptations characterized by tolerance and dependence. RanBPM was previously identified as a putative scaffold protein functionally associated with the MOR-interacting protein. Functionally, RanBPM blocked agonist-induced MOR internalization without altering adenylyl cyclase inhibition. In the current study we examined whether RanBPM altered MOR-stimulated mitogen-activated protein kinase (MAPK) activation.

Methods
Heterologous expression models were used to assess RanBPM effects on MOR function in HEK293 cells. Endogenous levels of RanBPM expression were compared to RanBPM overexpression and various levels of RanBPM knockdown using RanBPM-selective RNAi. MOR function was assessed by activation of the MAPK cascade and receptor internalization in response to opioid agonists.

Results
We found that RanBPM overexpression inhibited ERK1/2 phosphorylation by MOR agonists while knockdown of endogenous RanBPM augmented MOR activation of MAPK. RanBPM also attenuated Ras activation, suggesting RanBPM regulates MAPK upstream of ERK1/2. Interestingly, inhibition of ERK1/2 phosphorylation by RanBPM and by concanavalin A, an inhibitor of receptor internalization, was found to be additive. Moreover, RanBPM effectively inhibited ERK1/2 activation by morphine, a MOR agonist which promotes negligible MOR internalization in HEK293 cells, indicating its inhibitory mechanism is independent of receptor internalization.

Conclusions
The current study suggests RanBPM's role as an adaptor protein for MOR may involve inhibition of MAPK activation by MOR. Overall, these data point to RanBPM as a novel mechanism of regulating clinically-relevant components of MOR signaling.
41: Evaluation of CXCR4 Targeting Drugs on Cancer Cell Behaviors
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Purpose
The clinical findings that the chemokine CXCR4 antagonist AMD3100 (Plerixafor) is able to sensitize cancer cells to chemotherapy suggests that the CXCR4 receptor pathway could be an important target for drug development towards cancer treatment. In our current study, we explored the effects of various drugs targeting this receptor on cervical cancer cell migration, adhesion, and cell growth. This would offer insight into whether targeting the CXCR4 signaling pathway is a promising strategy for future cancer therapeutics.

Methods
HeLa cells were treated with the CXCR4 endogenous agonist CXCL12, CXCR4 antagonist AMD3100 and three new CXCR4 drugs. Cell migration, cell proliferation and cell adhesion assays were conducted to determine the outcome of these drugs. Each drug was also tested for their ability to activate the Gi-protein-linked ERK pathway.

Results
The different CXCR4 ligands showed varying effects on cell migration, cell adhesion and cell proliferation. CXCL12 and all three new CXCR4 drugs showed positive effects on cell migration, unlike AMD3100. Two of the new drugs and AMD3100 showed inhibitory effects on cell adhesion. All of the new drugs and AMD3100 inhibited cell proliferation. One of the new drugs and AMD3100 did not activate the ERK pathway.

Conclusions
All the new CXCR4 drugs tested showed different effects compared to the endogenous ligand and AMD3100. This implies that each new drug has its own unique bias towards activating signaling pathways. Selective targeting for certain pathways over others could limit adverse side effects associated with CXCR4 ligand-based treatments.
42: Comprehensive Evaluation of USP 797 and 800 Compliance After Implementation of an IV Workflow Management System at an Acute Care Teaching Hospital
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Purpose
Hospitals are facing complex state and federal requirements related to USP 797 and 800. Noncompliance not only places hospitals at risk for significant financial impacts and reputational losses, but also can affect patient safety. Valley Hospital Medical Center is moving from a containment aseptic isolator (CAI) to a laminar air flow hood (LAFH) with an IV management system into a new clean room. The purpose of this study is to assess the current USP 797 and 800 compliance and IV workflow process in a CAI compared to the compliance and workflow process in a LAFH with an IV management system.

Methods
This study will be a prospective, observational study evaluating the impact of changing from a CAI to a LAFH in a clean room on the overall compliance with the USP 797 and 800 standards. The study will also evaluate how effective the IV management system is in detecting and preventing IV compounding errors. The Critical Point USP 797 and 800 Gap Analysis was performed in August of 2018, and will be performed a second time in February of 2019 after converting to a LAFH with an IV management system. The gap analysis will provide the outcome of percent compliance prior to and after implementing policies, procedures, and training in the new LAFH. The percent compliance total takes into account quality management, environmental surface and air sampling, and personnel training. In addition, the number of errors (wrong drug, wrong IV solution, wrong amount of drug, wrong amount of IV solution, expired drug vial, and calculation error) will be recorded for 2 months prior to transitioning to the LAFH by pharmacists verifying IV medications prepared in the CAI. This same error data will be recorded for 2 months after the transition using the analysis reports provided by the IV management system.

Results
N/A

Conclusions
N/A
Correlation of Internal and External Characteristics With Depressive Symptoms in Pharmacy Residents Over the Residency Year

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Purpose
Recently published data indicate pharmacy residents experience high levels of depressive symptoms. These symptoms have not been correlated with any specific factors. This data presents specific correlates of depressive symptoms and highlights changes over the residency year.

Methods
A nationwide online survey of pharmacy residents gathered demographic data and assessed rates of depressive symptoms using the 9-Question Patient Health Questionnaire (PHQ-9) at 4 time points throughout the 2017-2018 residency year. Factors within the residency and external factors were correlated with PHQ-9 scores greater than 10, indicating high likelihood of depression, using logistic regression controlling for concomitant diagnosis and treatment of depression.

Results
Surveys sent to 2,131 programs nationally yielded 633 responses on average at each time point. In July, the only significant correlates of depressive symptoms were working outside of residency (p=0.031) and director support (p=0.004). By November, exercise, being in a relationship, adequate sleep, and higher income levels were protective from depressive symptoms (p<0.01), while director/preceptor support, hours worked, effective teaching methods, program organization, and stress level related to the residency were strongly correlated with depressive symptoms (p<0.001). These factors persisted through March, and added the likelihood of having made a major medical error (p<0.001), while income level was no longer protective. In June, director support and having made a major medical error were the only residency related factors associated with depressive symptoms.

Conclusions
Exercise, sleep, and close personal relationships were protective of depressive symptoms throughout the residency, while residency-specific factors including hours worked, effective teaching methods, program organization, and stress level were associated with depressive symptoms in November and March, but largely resolved in June. Director support was the only significant internal correlate throughout the residency year.
44: Second-year Data Regarding Rates and Correlates of Depressive Symptoms in Pharmacy Residents

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Purpose
Recently published data indicate rates of depressive symptoms in pharmacy residents approach 40% in March of the residency year. However, these data are limited and have been collected over only one residency year. Presented here are additional data from the 2017-2018 residency year utilizing a similar survey instrument. The objective of this study was to more accurately establish rates and correlates of depressive symptoms in pharmacy residents, and identify novel correlates.

Methods
A time-series study was conducted during the 2017-2018 residency year in which pharmacy residents nationwide were invited to participate in a series of online surveys administered in July and November 2017 and March and June 2018. Survey participants reported demographic data, information regarding residency characteristics, factors external to the residency, and completed the validated 9 Question Patient Health Questionnaire (PHQ9). PHQ9 scores of 10 or greater, which indicate a high likelihood of depression, were correlated with the collected factors and characteristics using logistic regression, controlling for concomitant diagnosis and treatment for depression. Descriptive statistics were used to estimate rates of depression and depressive symptoms.

Results
Surveys sent to 2,131 programs yielded 633 responses on average at each time point. Demographics reflected the nationwide profile of pharmacy residents and included all US regions. Rates of PHQ9 scores greater than 10 were 17 percent (95 percent CI 13.6 to 20.6) in July, 34 percent (95 percent CI 33.1 to 37.6) in November and March, and 38 percent (95 percent CI 33.5 to 42.0) in June. Rates of severe depression increased from July through March (2.1 percent to 6.1 percent, p less than 0.05), and remained elevated in June (5.6 percent, p less than 0.05). External factors protective of depressive symptoms in March include family support (OR equals 0.70), being in a relationship (OR equals 0.82), and adequate sleep (OR equals 0.44), while living far from or directly with family increased odds of depressive symptoms (OR equals 1.70). Residency-specific characteristics related to depressive symptoms included an unsupportive director/preceptor, ineffective teaching methods, a poorly structured program, high number of hours worked, high stress levels related to the residency, and inpatient setting (p less than 0.001). These rates and correlates are consistent with previously published data.

Novel correlates not related to depressive symptoms included income, pharmacy school GPA, or being a parent with children living at home. Exercise (OR equals 0.85, p equals 0.006) was protective of depressive symptoms.
Conclusions

This study produced data consistent with previously published literature regarding rates and correlates of depressive symptoms in pharmacy residents. These data help confirm that pharmacy residents suffer from high rates of depressive symptoms and that residency-specific factors including director support, effective teaching, program organization, and hours worked can influence resident depressive symptoms. These results also may help prospective residents evaluate various factors including sleep and exercise habits, family support, and residency location when selecting a residency program, and assist directors and programs in identifying residents who may be at risk for developing depressive symptoms.
45: Influence of Media on Hand Hygiene Compliance

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Purpose
Hand hygiene compliance is a common problem associated with preventable harm during patient encounters. During 2016, GME healthcare professionals at Valley Hospital Medical Center demonstrated 39.7% compliance to hand-washing during patient encounters. Given the influence of social media on our everyday lives, the purpose of this study was to evaluate whether social media in the form of internet trends, such as the Mannequin Challenge, can significantly improve hand-washing compliance.

Methods
GME residents participated in a Mannequin Challenge video project designed to promote hand hygiene awareness. The video was presented each month for GME residents and medical students at our Journal Club meetings throughout the 2017 calendar year. Residents' and students' hand-washing compliance data was collected anonymously by the staff of VHMC Infection Prevention and Control during routine safety rounds each month. Finally, a survey was conducted evaluating the influence of the Mannequin Challenge video in comparison to other traditional motivating factors, including hand-washing signs, examples set by peers, examples set by attending physicians, concern for reprimand and verbal reminders.

Results
GME hand-washing compliance in 2017 was 69.5%. Of the six motivating factors in comparison on the survey, the Mannequin Challenge video was the sixth strongest factor.

Conclusions
In 2017, GME residents at VHMC joined a hospital-wide effort to raise awareness on the importance of hand-washing compliance. While various departments in the hospital enlisted different approaches, GME residents created a Mannequin Challenge video based on current internet trends at the time. Overall, GME witnessed an increase in hand-washing compliance from 39.7% to 69.5%. However, the survey revealed the Mannequin Challenge video did not contribute to our hand-washing compliance as strongly as more traditional influences. Instead, hand-washing signs and examples set by fellow peers and attending physicians ranked as the strongest motivating factors responsible for our overall improvement.
46: The Master Masquerader
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Purpose
Malignancy has a high variability of presentation, commonly misconstrued for infectious, traumatic, and iatrogenic etiologies. We discuss a patient sent for inpatient management of an acute fluctuant mass over her ICD site, thought to be cellulitis with abscess formation having failed oral antibiotics. After prolonged hospital stay and intense pocket debridement, cultures revealed no growth and cytology was confirmatory for malignancy. This case highlights the masquerading nature of malignancy and the importance of prompt recognition

Methods
N/A

Results
Case presentation:
A 74 year-old-female with hx of ICM with rEF s/p dual chamber ICD placement, presented with increasing erythema, calor, edema, and development of a fluctuant mass over ICD site. CT showed a 4x5 cm fluid collection around pacemaker site with evidence of inflammation, and the patient was transferred to a facility for full system extraction with surgical back up for suspected pocket infection. Pt tolerated the procedure and surgical specimen was sent for analysis. Cultures were negative. Cytology showed strongly CK7+ poorly differentiated cells.

Conclusions
This case presented as a skin lesion over a foreign body with typical infectious appearance, misdiagnosed as cellulitis with abscess formation. Along with multiple IV antibiotics, patient underwent pacemaker/AICD extraction and extensive pocket debridement. Upon tissue analysis with culture and cytology, the lesion was found to be of metastatic and not infectious derivation. This case identifies some masquerading symptoms of metastasis and the urgency of proper diagnosis to avoid unnecessary complications and propagate antibiotic stewardship.
47: Concomitant etiologies of Rapidly Progressive Renal Failure  
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Purpose  
AKI's are commonly considered multifactorial via a combination of prerenal, intrinsic, and/or obstructive causes. Aside from HTN, DM, and nephrotoxic agents, multiple concomitting etiologies of intrinsic AKIs are rarely reported. With emerging evidence of complement inhibitors and interpretation of serum studies, it is important to consider more than one intrinsic nidus in the setting of rapidly declining kidney function, despite confounding lab results. We present a patient with an anuric aki requiring emergent HD found to have concomitant PSGN, ATN, and IGAN on renal biopsy.

Methods  
N/A

Results  
A 44-year-old-male with no prior kidney dysfunction, is sent to ED for acute elevation of serum creatinine. He initially presented to his PCP with dark colored urine, lower extremity swelling, fevers and chill for 3 days. Labs were drawn and he was started on ciprofloxacin for suspected UTI. Two days later patient was sent to ED for serum creatinine of 2.5. Upon arrival, he reported decreased urine output, difficulty breathing, and worsening rash of lower extremities. Serum creatinine was 6.18. CXR showed pulmonary edema. UA was significant for 2+ protein, RBCs, and granular casts. Diuresis was attempted with IV lasix. Creatinine rose to 8.55 the following day, he became anuric. HD access was obtained and performed daily as tolerated. ASO was found to be elevated. The lower extremity rash was found to be worsening streptococcal cellulitis. Renal biopsy showed PSGN, ATN, and IGAN. The underlying condition was treated, IV lasix was resumed, and renal function improved.

Conclusions  
We discuss a patient with no prior kidney dysfunction, sent for inpatient evaluation of oliguric AKI found to be of intrinsic predominance. Renal biopsy revealed coexisting patterns of tubular and glomerular disease due to ATN, PSGN, and IGAN. Prior analysis of serum titers, complement levels, and UA were confounding to biopsy results due to concomitant tubular and glomerular injury of independent etiologies. Independant injury to renal tubules and glomeruli via PSGN, IGAN, and ATN is a rare occurrence. Considering such in a patient with rapidly worsening kidney function is crucial for prompt diagnosis and renal salvage.
48: Confounding Outflow Obstruction

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Purpose
Despite evidence that venous stasis and insufficiency is the primary cause of chronic LE ulcers w a 90% predominance in recent european and us studies, guidelines for evaluation and treatment remain archaic. Evaluation of arterial flow/ PAD in non-healing wounds and recurrent cellulitis has been accepted as standard of care. However, appropriate assessment of venous competency is not widely implemented.

Methods
We discuss two cases presenting with a confounding clinical picture for venous stasis ulcers given diminished pulses, hairless distal extremities, and subjective claudication. Both patients underwent evaluation of peripheral arterial disease and venous insufficiency via aortogram w b/l LE runoff and venography respectively. Both patients were thought to have concomitant arterial disease per US. Angiographic imaging deemed the lesions noncontributable to the ulcers' etiology. Significant venous obstruction was deemed primary culprit. Rectification of outflow obstruction resulted in marked clinical improvement and wound healing.

Results
N/A

Conclusions
The intent of this article is to highlight a frequently overlooked etiology of non-healing skin lesions requiring hospitalization and address inadequate guidelines for evaluation of such.
49: Coronary Embolism as a Consequence of Untreated Atrial Fibrillation: A Case Report

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Purpose
Coronary embolism is an uncommon cause of myocardial infarction (MI), comprising only 3% of all cases. The authors present the case of a 69-year-old male who suffered non-ST segment elevation myocardial infarction (NSTEMI) as a consequence of untreated atrial fibrillation (AF).

Methods
69-year-old African-American male presented to emergency room with excruciating substernal chest pain associated with dyspnea and palpitations. Diagnosis of NSTEMI was made based on initial troponin-I of 1.37 ng/mL, which trended up to 112 ng/mL within a few hours, and no ST-segment elevation on electrocardiogram (ECG). ECG demonstrated irregularly irregular rhythm without discernable P waves, significant for AF with a normal ventricular rate. The patient was unaware of his AF and had never been on anticoagulation. Left coronary angiogram confirmed the presence of thrombus at the midsegment of the second diagonal branch off of the left anterior descending artery that supplied a large segment of the anterior wall of the myocardium. Mechanical thrombectomy was performed and removed the thrombus burden completely. Revascularization was achieved without balloon angioplasty or coronary stenting.

Results
The patient tolerated the procedure well without complication. The next day, he endorsed the complete resolution of his symptoms, including chest pain, dyspnea, and palpitation. The patient was safely discharged home with Metoprolol, Lisinopril, Aspirin, Atorvastatin, and Eliquis.

Conclusions
Anticoagulation is mainstay therapy for AF as primary prevention of systemic embolization associated with the condition. CHAD2DS2-VASc scoring system has been widely used to identify a high-risk group of patients who need to be on lifetime anticoagulation. Acute MI due to cardioembolic source from left atrial or left atrial appendage thrombus is exceedingly rare. There are cases of MI due to thromboembolism, but data to support the association between AF and MI are lacking. REGARDS cohort study with a population of 24,000 patients demonstrated AF as an independent risk factor (hazard ratio 1.70) of MI, but the mechanism of the correlation is uncertain. Transesophageal echocardiography remains as the gold standard for detecting cardiac sources of an embolus. Coronary angiogram with catheter-directed mechanical thrombectomy is the first-line therapy for this coronary embolism.
Multicentric Reticulohistiocytosis: A Very Rare Case of Cutaneous Lesions Associated With Severe and Rapidly Destructive Polyarthritis

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Purpose
Multicentric reticulohistiocytosis (MRH) is a rare systemic condition with 300 reported cases worldwide, mainly in middle-aged adults, characterized by destructive polyarthropathy with cutaneous lesions. Though symptoms can wax and wane, rapid progression can lead to arthritis mutilans in nearly one-half of patients. 1/3 of cases are associated with underlying malignancy, most notably carcinoma of lung, stomach, breast, cervix, colon, and ovary.

Methods
50-year old female presented with one month of symmetric wrist, hand, and knee swelling and pain. She had multiple prior ER visits due to debilitating pain and was treated with antivirals, antibiotics, intravenous, topical, and oral steroids without improvement. This episode was preceded by two months of scattered pruritic skin lesions on the upper body. Exam revealed grossly edematous carpometacarpal, distal and proximal interphalangeal joints, warm and tender to palpation. Reddish brown 1-5 mm in diameter papulonodular lesions scattered bilaterally on wrist extensor surfaces, upper chest, back, malar/periorbital regions, ear helices, and periungal areas.

Results
MRH is a rare multisystem disease with an unknown cause with predominance of histiocytic infiltration in the dermis with papulonodular skin findings and systemic inflammatory polyarthritis. Diagnosis is confirmed with biopsy of skin nodules showing intradermal infiltrate with histocytes and multinucleated giant cells. MRH is potentially disfiguring disease and early diagnosis and treatment with corticosteroids, hydroxychloroquine, and methotrexate is essential to prevent progression to arthritis mutilans.

Conclusions
Multicentric reticulohistiocytosis is a rare condition with approximately 300 reported cases worldwide. Given its rapid progression to arthritis mutilans, early detection and therapy may prevent development of permanent debility and disfigurement. Despite controversy regarding its classification as a true paraneoplastic disorder, 1/3 of cases are associated with malignancy, and therefore vigilant cancer screening is recommended in these individuals.
Nonbacterial Thrombotic Endocarditis (NBTE) as the First Sign of Malignancy in a Patient With Small Cell Lung Cancer

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Purpose
Nonbacterial thrombotic endocarditis (NBTE) is rare and is associated with non-infectious lesions of the heart valves. Its clinical presentation can be similar to bacterial endocarditis making it difficult to differentiate between the two. NBTE is usually found on autopsy in advanced stages malignancy but in rare cases can be seen in patients who present with signs of systemic embolization. NBTE is important to consider as it can be the first indication to malignancy and although its clinical presentation may be similar its management differs from infectious endocarditis.

Methods
63 year old female who was sent to the emergency room for altered mental status. CT head was negative for any acute intracranial bleed. Patient was noted to be tachycardia with a leukocytosis. Pancultures and CXR were ordered. CXR showed nearly complete opacification of the left hemithorax. Antibiotics for post-obstructive pneumonia were started. Blood cultures were drawn prior to antibiotic initiation. EKG showed atrial fibrillation and the patient had mildly positive troponins. TTE showed a large mitral valve vegetation. Antibiotics were adjusted to cover empirically for infective endocarditis. MRI brain revealed bilateral areas of restricted diffusion in cerebellum likely due to emboli. Bronchoscopy showed large left sided hilar mass. Biopsy results showed squamous cell carcinoma.

Results
Initially, the patient was started on heparin for Atrial fibrillation, however anticoagulation was held due to concern for bleeding as the patient became hypotensive and developed hemoptysis. Furthermore, the patient was presumed to have infective endocarditis and risk of intracranial hemorrhage was considered. Three sets of blood cultures were noted to be negative. A change in neurological exam showed anisocoria. CT head demonstrated subdural hematoma with right to left midline shift and lesions suspicious for necrotic masses. Subsequently, patient went into asystole and expired.

Conclusions
NBTE diagnosis can be made after valvular vegetations are seen on echocardiogram and an absence of systemic infection is established. NBTE treatment is anticoagulation and treatment of malignancy. In early stages of malignancy, surgery with valve debridement or excision can be considered.
52: Pulmonary Embolism Leading to PEA Arrest in an 8 Weeks Pregnant Female
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Purpose
Pulmonary embolism (PE) is the 5th leading cause of pregnancy related deaths. Although it is common, it can often become deadly because it can be missed due to it's variability in each clinical presentation. Difficulty of early diagnosis of pulmonary embolism in pregnancy arises from the notion that the patient is just experiencing the normal changes associated with pregnancy. PE should always remain high on the differential as it can cause rapid decomposition.

Methods
35 year old female presented to the emergency department with shortness of breath and dizziness worst with exertion saturating 97% on room air. Ultrasound revealed single intrauterine gestation with estimated age 8weeks 3days and positive fetal heart rate. She was diagnosed with bronchitis and discharged home from with an inhaler. Twelve hours later she presented to ED after a syncopal episode with continued dyspnea. She was hypotensive, tachycardic, and saturating 96% on2L nasal cannula. D-dimer was 24.87 and troponin was .665. She was taken for CT angio and found to have multiple bilateral massive pulmonary emboli.

Results
A heparin drip was started. Patient became increasingly hypoxic, bradycardic, and had PEA arrest. She was successfully resuscitated by ACLS protocols and subsequently developed multi-organ dysfunction requiring pressor support.

Repeat ultrasound of bilateral upper and lower extremities revealed DVT of right common femoral vein and right brachial vein. She was taken to cath lab that afternoon by interventional cardiology where she underwent mechanical thrombectomy, intra-arterial TPA administration, and had an IVC filter placed. She developed vaginal bleeding and repeat ultrasound demonstrated absent gestational sac indicating spontaneous abortion.

Conclusions
Many symptoms associated with pulmonary embolism can be caused by the normal physiological changes seen in pregnancy. 70% of women report shortness of breath during pregnancy, there is a higher rates of baseline tachycardia and even most healthy women develop lower extremity edema during pregnancy. The standard of care is heparin drip however the use of thrombolysis (TPA) and thrombectomy should not be delayed in unstable patients with persistent hypotension and signs of end organ damage.
53: Rare case of Disseminated Coccidioidomycosis Causing Meningitis

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Purpose

Coccidioidomycosis is a rare cause of Meningitis. It can be an acute or chronic infection that often can be very difficult to treat and often requires a long treatment course. If untreated it can lead to severe morbidity and mortality. We present a case of a Patient who presented to our hospital with altered mental status, which eventually lead to the diagnosis of Pulmonary and Meningeal Coccidioidomycosis.

Results

A 48 year old male presented to our hospital complaining of headache, fever and altered mental status. He complained that the headache had been going on for 3 weeks. He claimed that his Neurologist instructed him to come to the hospital due to concerns for meningitis. The patient also complained of stiff neck, double vision, blurry vision, nausea and vomiting. The CT Head was negative. An LP was performed; which showed: Color - colorless, CSF WBC - 326, CSF (Neutro 5%, Lymph 46%, Mono 52%) , RBC - 5719, CSF glucose 25, CSF Total Protein 333. Initially Bacterial or Fungal Meningitis were suspected. Treatment with Dexamethasone, Ceftriaxone, Vancomycin, Ampicillin, Acyclovir and Diflucan was started empirically. Ampicillin and Acyclovir were discontinued shortly after initial CSF studies returned. MRI brain was negative. Extensive CSF studies were done, including a Bacterial Antigen Panel, West Nile, Histoplasmosis, Coccidiomycosis, HSV and West Nile studies. Many of these tests were send-outs at our facility. CSF cultures returned negative and treatment was de-escalated to Ceftriaxone and Diflucan. During this period, the patient had multiple mental and psychological symptoms such as bizarre affect, amnesia (which waxed and waned), disorientation and mood symptoms. He was seen by Psychiatry but no clear psychiatric diagnosis was made. Several weeks later the serum Coccidioidomycosis antibodies returned positive for both IgG and IgM. The CSF was positive for both Coccidioidomycosis IgG and IgM antibodies. This suggested an acute on chronic infection with Coccidioidomycosis. CT Chest was done, which showed a nodule at the posterior lateral right lower lobe with an adjacent thin-walled cavitary component and adjacent reticular nodular changes. It had an infiltrate pattern on CT. The lesion was biopsied. The pathology report showed: "benign lung tissue with non-caseating granuloma that contains coccidioides fungal spherules". The workp suggested that the patient had coccidiomycosis which disseminated from the lung to the meninges causing meningitis. It was believed that the coccidioidomycosis meningitis was the cause of his mental and psychological symptoms. He was treated with IV Fluconazole for 2 weeks and then was transitioned to oral Fluconazole. He was instructed to follow up with ID after discharge and to continue oral Fluconazole for at least 5 years. Interestingly the patient had no pulmonary symptoms and did not have any signs of immunosuppression.
Conclusions
Although Disseminated Coccidioidomycosis is a rare cause of meningitis, it should be considered in patients that present with meningitis if CSF studies support a potential fungal etiology. Even in patients that lack pulmonary symptoms or immunosuppression, Disseminated Coccidioidomycosis is a potential cause. The length of treatment can be very long and sometimes lifelong. If treatment is stopped prematurely it may cause symptoms to come back or even lead to death. Therefore although it is uncommon, it should be considered in a patient's that present with meningitis and not be missed.
54: Evaluation of Dual Antipseudomonal Therapy for Inpatient Treatment of Pneumonia Through the Development of a Combination Antibiogram Stratified by Risk Factors

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Purpose
Recent Infectious Disease Society of America (IDSA) Pneumonia guidelines suggest empiric dual antipseudomonal coverage in patients with specific risk factors for multidrug-resistant (MDR) pathogens, including Pseudomonas aeruginosa. The purpose of this project is to create a combination antibiogram stratified by guideline-based risk factors to assess the susceptibility of Pseudomonas to combinations of empiric antibiotics. The results from this project will help delineate when, and if, dual antipseudomonal therapy is needed based on risk factors included in current and previous guidelines on pneumonia.

Methods
This study will be submitted to the Institutional Review Board for approval. The Laboratory Department will generate a list of patients who had at least one positive respiratory or sputum culture for Pseudomonas aeruginosa between September 2014 and September 2018. For patients with more than one positive culture in 30 days, only the first positive culture will be considered. The following data will be collected: patient age, gender, ethnicity, culture type, susceptibility results for antipseudomonal antibiotics, and risk factors for MDR Pseudomonas. They include: intravenous antibiotics within the last 90 days, occurrence of mechanical ventilation, septic shock, or acute respiratory distress syndrome at pneumonia onset, at least 5 days of hospitalization or acute renal replacement therapy prior to pneumonia onset, bronchiectasis, cystic fibrosis, hospitalization of at least 2 days within the last 90 days, residence of nursing facility or extended care facility, receiving home infusion therapy, home wound care, chronic dialysis, or being immunosuppressed. No patient identifier will be included in data analysis. The primary outcome is the susceptibilities of Pseudomonas to combinations of antipseudomonal antibiotics. Descriptive statistics will be utilized and multivariate regression analysis will be performed to identify the risk factors, if any, that impact the susceptibility.

Results
N/A

Conclusions
N/A
Case of Malaria (Plasmodium falciparum) in a 40 Year Old Male at an Urban Las Vegas Hospital

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Purpose
Malaria is an uncommonly encountered illness in the United States. Per the CDC, only about 1,700 cases are diagnosed in the US every year. Untreated, it can lead to severe complications and even death. We present a case of a Brazilian male presenting with fever of unknown origin. Further investigation led to a diagnosis of Malaria (Plasmodium falciparum).

Methods
N/A

Results
A 40-year-old Brazilian male presented to an urban hospital in Las Vegas complaining of fever and vague complaints of chills, abdominal pain and sore throat. The patient traveled to the United States two days prior to admission. The patient on presentation complained of generalized abdominal pain, fever and chills for one day. He denied any sick contacts. Patient however did report living in a rural area where mosquitoes are prevalent. He denied headache, dizziness, cough, shortness of breath, chest pain, palpitations, diarrhea, hematemesis or gross blood in his stool. On admission, vital signs showed temperature 38.7, heart rate 137, respiratory rate 22, BP 152/87. CBC showed platelet count of 28, with WBC 3.74, hemoglobin 14.8 and hematocrit 40.7. The renal panel was unremarkable. Due to the low platelet count, a peripheral smear was ordered. The peripheral smear was negative for schistocytes but showed the presence of parasites. The blood smear was then reviewed by the in-house pathologist who confirmed the diagnosis of Plasmodium falciparum. The patient had cyclical episodes of fevers, chills, tachycardia and multiple episodes of dark colored urine during the hospitalization. He was started on hydroxychloroquine and primaquine and was then transitioned to Malarone thereafter (due to greater efficacy with treating P. falciparum). Platelet count increased to 38 the day after admission. Other causes of infection were ruled out with negative chest x-ray, U/A, pan cultures and the lack of signs or symptoms of any other infectious causes. DIC panel was reassuring. The decreased haptoglobin and elevated LDH supported a hemolytic process as well. The patient was not taking any drugs known to cause thrombocytopenia. Therefore the thrombocytopenia was attributed to the acute malaria infection. Thrombocytopenia is typically an indicator of poor prognosis. However this patient responded well to oral therapy.

Conclusions
Although malaria is an uncommon diagnosis in the United States, if left untreated it may cause severe complications and even death. Therefore it should be considered in patients with a febrile illness especially those who are tourists or individuals who have traveled to endemic regions. If the case of malaria is uncomplicated, it is relatively straightforward to treat with oral antimicrobials. However if left untreated, it may lead to significant morbidity and mortality.
56: Tumor Lysis Syndrome in Localized Breast Cancer: A Case of Tumor Lysis Syndrome Presenting in a Patient With HER2+ Stage I Breast Adenocarcinoma

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Purpose
Tumor lysis syndrome is a disease commonly associated with leukemia and lymphoma. TLS is usually not associated with solid tumors, with an occurrence of less than 1% of cases. Case reports available describe the syndrome occurring in solid tumors with multiple distant metastasis. In this report, we describe a case of TLS occurring in a female with Stage I breast cancer.

Methods
N/A

Results
A 67-year-old female with a significant medical history of HER-2 positive stage I breast adenocarcinoma presented 9 days after her first chemotherapy session with nausea, vomiting, weakness, and headache. She had received docetaxel, carboplatin, trastuzamab, and pertuzumab (commonly referred to as TCHP) for induction chemotherapy. Her labs revealed acute renal failure, hyperuricemia, and hyperphosphatemia. She had no previously known kidney failure or hyperuricemia. In fact, the patient had no criteria stratifying her in anything but low risk for TLS according to literature (Cairo et al). The patient met both the clinical (Grate 3) and laboratory definitions of TLS by Cairo-Bishop Definition. The patient was subsequently treated with copious fluids, alkalinization, and rasburicase. Her acute kidney injury rapidly improved, and her uric acid levels returned to normal. She was discharged four days after presentation with normalized creatinine, phosphate and uric acid.

Conclusions
Review of the literature shows that solid tumors rarely exhibit TLS. A review published by Mirrakhimov et al. in 2014 found 13 reported cases of breast cancers exhibiting TLS. Of the 13 patients mentioned, all 13 had metastatic breast adenocarcinomas. However, this case report demonstrates a stage I breast adenocarcinoma which was not metastatic. Although TLS is rare in solid tumors, this case demonstrates that even a nonmetastatic tumor could potentially exhibit the syndrome. Therefore, we believe that TLS should remain part of the differential of acute kidney injury despite a patient having localized cancer.
Multisystem Organ Failure From Native-Valve Endocarditis: A Case of Enterococcus Faecalis Endocarditis From Suspected Recreational Intramuscular Human Growth Hormone Injections

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Purpose
The incidence rate of infective endocarditis is roughly 10,000-15,000 new cases per year in the United States. Illicit intravenous drug use is a major risk factor for bloodstream seeding with skin flora and bacteria, and IV drug use has been historically associated with heroin. Heroin use is most associated with methicillin-resistant S. aureus infection of the tricuspid valve. However, many young adults inject various drugs through other routes besides intravenously. We present a case of native-valve endocarditis from suspected recreational intramuscular human growth hormone injections.

Methods
N/A

Results
A 31-year old male with no significant medical history presented with hemoptysis and persistent chest pain for 3 days. Multiple blood cultures grew Enterococcus faecalis, and a transthoracic echocardiogram revealed severe aortic regurgitation, severe mitral regurgitation, and vegetations on both valves. History was negative for intravenous drug use, and physical exam was unremarkable for needle track marks. However, the patient admitted to recreational use of intramuscular HGH into the gluteal region. Shortly after presentation, he developed cardiogenic and septic shock, requiring emergent surgical replacement of both aortic and mitral valves. In addition to surgery and IV antibiotics, his hospital course was complicated by ARDS, DIC, septic infarcts, gangrene of all extremities, liver failure, and renal failure requiring daily hemodialysis.

Conclusions
Review of the literature show that a common mechanism for contracting infective endocarditis in young adults is intravenous drug use. However, this case presentation demonstrated that other routes of drug administration can pose an equal risk. Intramuscular injection into the gluteal region can contaminate blood with gastrointestinal flora, and we suspect that inexperienced IM injection users are at an increased risk for contamination. Thus, should physicians take more caution in prescribing and educating patients about intramuscular drugs? Further research into this area should be considered.
A Rare Case of Paraneoplastic Immune Thrombocytopenia in Esophageal Carcinoma: A Potential Indicator for Early Malignancy Workup?

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Purpose
Thrombocytopenia is commonly seen in cancer patients, with the leading cause being chemotherapy and/or radiation. Immune thrombocytopenic purpura (ITP) is an acquired thrombocytopenia caused by autoantibodies towards platelets with an annual adult incidence of 1-3 cases per 100,000.

Methods
A 61-year old male with history of diabetes presented with two days of hematemesis and dysphagia. Initial vitals and basic laboratory studies were within normal limits except for a platelet count of 1000 platelets/µL. Follow-up hematology studies were also unremarkable. A complete blood count from a previous hospitalization 28 days prior was within normal limits with a platelet count of 300,000 platelets/µL. CT chest/abdomen/pelvis with contrast showed distal esophageal stricture with diffuse mediastinal, mesenteric, and retroperitoneal lymphadenopathy. Patient underwent EGD which showed an ulcerated necrotic esophageal mass extending from the incisors down to the gastroesophageal junction with nearly complete obstruction of the distal esophagus. Esophageal and lymph node biopsies were consistent with metastatic carcinoma of pancreaticobiliary/upper GI origin. After ruling out other causes of thrombocytopenia, hematology was consulted and started intravenous steroids and intravenous immunoglobulins. Platelets improved to 157,000 platelets/µL after 4 days of treatment, but he was a poor surgical candidate for removal of the esophageal mass.

Results
N/A

Conclusions
Review of the literature show that ITP in association with solid tumors is extremely rare, with only 68 documented cases. Of these 68 cases, only 1 case was associated with esophageal malignancy. This is the second documented case of esophageal carcinoma-associated ITP. While ITP can present in patients with known malignancies, the literature also demonstrates that ITP can present before the initial diagnosis of cancer. Thus, can ITP serve as a potential trigger for early malignancy work up? Further research into this area should be considered.
A Doubly Daunting Dilemma: Duplicated Femoral Vein Deep Venous Thrombosis Complicated by Bilateral Iatrogenic May-Thurner Syndrome

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Purpose
We present a rare case of duplicated femoral vein DVT complicated by bilateral iatrogenic May-Thurner syndrome which demonstrates both the diagnostic and therapeutic dilemma surrounding the not so uncommon prevalence of duplicated veins and May-Thurner Syndrome. The case also explores the utility of manual thrombectomy, mechanical thrombectomy, and catheter directed thrombolysis in the treatment of DVT and prevention of post-thrombotic syndrome.

Methods
Femoral vein duplication has a prevalence of 10-40%. Increased incidence of DVT in duplicated vein segments due to turbulent flow. Difficult to diagnose due to increased false-negative rate by ultrasound. Patients often are often asymptomatic as multiplicity allows for collateral flow. May-Thurner Syndrome (MTS) has a prevalence of 22-24% and is associated with DVT in 2-3% of cases. Also difficult to diagnose due to location high in the pelvis. High incidence of post-thrombotic syndrome in patients with duplicated segments or MTS. There is a paucity of evidence guiding the treatment of DVT to prevent post-thrombotic syndrome. Reported incidence of post-thrombotic syndrome ranges from 20-80% in contemporary studies. Risk factors: symptomatic DVT, recurrent DVT, proximal DVT, and residual thrombus within the first 6 months. Higher when associated with anatomical anomalies

Results
N/A

Conclusions
This case brings to light the complexities surrounding the diagnosis and treatment of DVTs associated with the not so uncommon anatomical abnormalities of duplicated femoral veins and May-Thurner Syndrome. There is a definite need for high quality studies to help guide treatment for such cases. In our presented case, DVT was complicated by both femoral vein duplication and May-Thurner Syndrome and was successfully treated with a combined pharmacomechanical approach.
60: Accidental hair conditioner ingestion causing acute tubular necrosis: A rare case of sodium bromate intoxication

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Purpose
Sodium bromate is a strong oxidant commonly used as a neutralizing solution in hair permanents. Clinical symptoms include vomiting, diarrhea, hemolytic anemia, oliguric/non-oliguric acute kidney injury, and deafness. There are few documented cases of sodium bromate intoxication, and physicians may not understand the severity of hair product ingestion. We present a case of acute tubular necrosis and anuric renal failure requiring hemodialysis after ingestion of 180 cc of hair conditioner.

Methods
A 69-year old female with no history of renal disease presented with abdominal pain, nausea, and vomiting after accidentally ingesting approximately 180 cc of Hawaiian Silky Neutralizing Solution 2 hours prior. On admission, serum creatinine was 1.46 mg/dL with a baseline of 1.0 mg/dL from previous admissions. However, her creatinine increased to 3.01 mg/dL with anuria within 12 hours of admission. Renal ultrasound was unremarkable; urinalysis showed 1+ blood, 2+ protein, and hyaline casts; and urine studies were consistent with intrinsic renal disease with a fractional excretion of urea of 91.8%. She required emergent hemodialysis, with her creatinine peaking at 5.28 mg/dL and urine output improving to 1200 cc/24hrs by day 7. She was discharged home with normal urine output and a creatinine of 3.64 mg/dL by day 12. She was followed up in the outpatient clinic with eventual return to baseline of her creatinine.

Results
N/A

Conclusions
Although the patient ingested a minimal amount of hair conditioner, she developed serious complications. The literature on sodium bromate intoxication is limited, but it suggests that treatment includes gastric lavage with 2% sodium bicarbonate, administration of intravenous sodium thiosulfate, and emergent dialysis within 3-4 hours of ingestion to prevent the reduction of bromate to bromide. We present this case to raise awareness of the severity of hair conditioner ingestion because serious sequelae include renal failure and deafness.
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