Sixteenth Annual
Medical Student
Research Symposium

Pinn Hall
University of Virginia School of Medicine
November 7, 2017
11:30 AM – 2:30 PM

Acknowledgements
We wish to thank Ms. Joyce Fortune, Office for Research, without whom this Research Symposium would not have been possible.

Special thanks to:
UVA Facilities Management for logistic arrangements

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Poster #1
Maternal mortality and morbidity after caesarean section in Rwanda

Shefali Hegde, Marcel Durieux, Department of Anesthesiology
UVa and University of Rwanda

Objectives. There is a dearth of epidemiologic data available on the rates and indications for Caesarean section (CS) in sub-Saharan Africa. The World Health Organization (WHO) recommends CS rates of 10-15% as optimal. In Rwanda, the CS rate has increased as the health system has expanded, and was estimated to be as high as 45% in 2011.
Prior studies demonstrate that a high rate of Caesarean section may contribute to increased mortality and morbidity. In the past decade, Rwanda's maternal mortality ratio (MMR) has decreased significantly to 320 deaths per 100,000 live births. An effort to understand the complications and risks associated with Caesarean section is important to further reduce the MMR in low-income countries.

Methods. This retrospective study was a facility-based review of 340 cases of severe maternal morbidity and mortality that took place in the years 2016-2017 at Centre Hospitalier de Kigali (CHUK), Rwanda. CHUK is the largest public hospital in Rwanda, located in the capital city Kigali. It serves as a tertiary care referral center for primary and secondary health facilities within the country.
Women admitted to the CHUK obstetrics service with severe morbidity following CS or vaginal delivery were included. Patients were identified through review of the surgical ward admissions log and through provider identification of eligible patients. Demographic characteristics and factors related to morbidity (near-miss) and mortality of mothers and infants were assessed.

Results. The study found an 18% mortality rate in women who experienced post-CS complications. Peritonitis was the leading cause of post-CS morbidity in Rwanda. Hemorrhage was the most fatal complication. The most common indications for CS were prior CS, fetal distress, and obstructed (prolonged) labor. The study did not find a significant difference in mortality between those referred from rural hospitals and urban hospitals.

Conclusions. Our results highlight the importance of creating protocols to a) reduce the number of C-Sections performed, particularly in rural areas; and b) work to create protocols to reduce incidence of hemorrhage and sepsis.

Poster #2
An Analysis of Risk Factors for Post-Chemotherapy Fever and Associated Mortality at the Uganda Cancer Institute

Bickey Chang[1*], Riley Hazard[2*], Abrahams Omoding[3], Elizabeth Gulleen[4], Christopher Moore[4]
[1]University of Virginia School of Medicine, [2]University of Virginia College of Arts and Sciences, [3]Uganda Cancer Institute, [4]Department of Medicine, Division of Infectious Diseases and International Health, University of Virginia *Contributed equally

Introduction: In sub-Saharan Africa (SSA), more than 600,000 new cancer diagnoses are made annually, and mortality rates are among the highest in the world. Post-chemotherapy febrile illness (PCFI) is a life-threatening condition for patients undergoing cancer treatment, with a mortality approaching 70% if not rapidly identified and treated. Empiric antibiotic regimens

for neutropenic fever have been created and validated in developed regions, e.g. the U.S. and Europe. However, causes of community-acquired sepsis and antimicrobial resistance patterns are markedly different in SSA. In our study, we aimed to describe the current epidemiology, etiology, management, and outcomes of PCFI at the Uganda Cancer Institute.

Methods: We conducted a retrospective cross sectional study at the Uganda Cancer Institute (UCI), a public, specialized, tertiary care medical facility in Kampala, Uganda. All adult patients presenting to UCI between January 2016 to May 2017 with 1) a diagnosis of acute myeloid leukemia, acute lymphoblastic leukemia, and acute promyelocytic leukemia, 2) neutropenia (ANC < 500 cells /mm^3), and 3) chemotherapy as part of their treatment were included. Two reviewers reviewed the charts of patients who met inclusion criteria, and data fields including patient demographics, clinical history, labs, infectious disease studies, pathology, imaging, and treatment and hospital course were extracted. Data was collected using Epi Info™.

Results: 95 patient charts were identified for screening, of which 51 charts met inclusion criteria. Of the 51 patients, 37 patients were deceased (73% mortality). Patient charts often included more than 1 neutropenic episode. Chart review and data collection is ongoing, and we anticipate more complete data will be presented at the research symposium.

Discussion: Establishing partnerships and relationships with UCI staff was critical to starting this study and our research collaboration. Data from this research and further studies can contribute to future design of PCFI treatment guidelines specifically tailored to patients treated at UCI, which may be generalizable to patients treated at similar institutions throughout SSA.

Poster #3
Fullerol Protects Human Disc Cells from Senescence

Timothy Chastanet, Li Jin, Li Xiao, Xudong Li
Department of Orthopaedic Surgery, University of Virginia, Charlottesville, VA, USA

INTRODUCTION: Lower back pain affects about 80% of people at some point in their life, causing significant lifestyle and economic burdens. Aged and degenerated intervertebral discs (IVD), which are characterized by an increase in senescent cells, are one of the major causes of back pain. Physical therapy, epidural injections of steroids, and pain medications are all options for aged and degenerated IVD, but none are a clear solution due to failure to provide relieve and/or side effects. Fullerol is a rising star for a range of pathological conditions involving in inflammation and oxidative stress, however its role and underlying mechanisms in preventing disc degeneration are unclear. Here, we aim to investigate the molecular mechanisms responsible for fullerol's protective role in IVD degeneration.

METHODS: Human nucleus pulposus (hNP) and annulus fibrosus (hAF) cells were grown in Dulbecco's Modified Eagle's medium (DMEM) and some were pre-treated with fullerol. Cells were treated with hydrogen peroxide (100 μM H_2O_2) to induce senescence. First, beta-galactosidase staining was performed because the enzyme only catalyzes the conversion of beta-galactosides into monosaccharaides in senescent cells. Second, reactive oxygen species (ROS) were detected using 6-carboxy-2',7'-dichlorodihydrofluorescein diacetate. Lastly, western blots are being used to analyze specific signaling pathways such as Sirtuin 1, a cellular anti-senescence marker, but this is still under investigation. Student's t-Test was used to compare

two groups and ANOVA was used to compare more than two groups. A *p*-value of less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION: In hAF**,** the beta-galactosidase staining showed a statistically significant increase in the number of senescent cells in the H_2O_2 condition compared to the control. Fullerol pretreatment counteracted senescence induced by H_2O_2. We observed a similar trend in hNP cells. Consistently, fluorescent microcopy showed a statistically significant increase in fluorescence intensity in hNP cells treated with H_2O_2 compared to the control, and this was attenuated by pretreatment of fullerol. We observed a similar trend in hAF cells. A western blot of SIRT1 showed a decrease in SIRT1 under oxidative conditions, but no decrease compared to the control and fullerol only conditions. The detailed molecular pathways of fullerol protection of disc cell senescence are still under investigation. Beta-galactosidase and ROS results suggest that fullerol protects disc cells from H_2O_2 induced senescence via the SIRT-1 pathway.

SIGNIFICANCE/CLINICAL RELEVANCE: Fullerol may serve as a potential therapeutic agent by protecting disc cells against senescence.

Poster #4
Prognostic Variants in Long Non-Coding RNAs in Low-Grade Glioma Patients

Ajay Chatrath

Low-grade gliomas are primary brain tumors that can cause neurologic symptoms and death, even after treatment. While many studies have focused on the effects of mutations in protein-coding genes in low-grade gliomas, growing evidence suggests that long non-coding RNAs, RNA molecules longer than 200 nucleotides that are not translated into protein, play significant roles in the regulation of gene expression. As a result, mutations in long non-coding RNAs may contribute to differences in prognosis after diagnosis. To test this hypothesis, RNA sequencing data from 530 low-grade glioma patients was downloaded from The Cancer Genome Atlas (TCGA) to identify long non-coding RNAs that were expressed at a level greater than 1 fragment per kilobase of transcript per million mapped reads (FPKM) on average. Whole exome sequencing (WXS) data associated with these long non-coding RNAs was downloaded for 467 paired tumor-normal samples from TCGA. Variant calling was performed using VarDict. The variants were filtered based on base call quality, mapping quality, and coverage using VarDict and SAMtools. Variants found in fewer than 10 patients were excluded from the analysis. Cox regression was run for the remaining variants, controlling for IDH1 mutation status, age, gender, tumor grade, tumor histology, and the top three principal components calculated from the variant statuses of the patients. Variants with an insignificant association with patient prognosis (unadjusted p-value < 0.05) were excluded from further analyses. Cox regression was performed again, after removing patients with a variant status (homozygous reference, heterozygous, or homozygous alternate) found in fewer than 10 patients to prevent the model from being skewed. 134 variants were significantly associated with patient prognosis after diagnosis before p-value adjustment ($p < 0.05$) and 2 variants were significantly associated after adjustment ($p < 3.6E\text{-}5$). Although these two variants were found in regions of overlap between a protein-coding gene and a long non-coding RNA, one variant caused a synonymous mutation in the protein-coding gene and the other was found in the intronic region of the protein-coding gene. 500 KB of WXS reads upstream and downstream of each variant were downloaded. Variants in these regions were tested for an association with patient prognosis, though these

two variants remained the most significant variants in their respective 1 MB windows. As a result of this study, we have identified two prognostic variants that significantly separate patients based on outcome and have identified two variants in two separate long non-coding RNAs that warrant further investigation.

Poster #5
PRAS40 as a mediator of IGF1R induced resistance to EGFR TKIs

Michael Dougherty

BACKGROUND: Despite the known growth-promoting role of the epidermal growth factor receptor (EGFR) in head and neck squamous cell carcinoma (HNSCC), EGFR tyrosine kinase inhibitors (TKIs) have shown low efficacy in this disease. The insulin-like growth factor-1 receptor (IGF-1R) has been shown to induce resistance to EGFR TKIs in HNSCC predominantly through anti-apoptotic pathways. PRAS40 is an inhibitor of mTOR that ceases inhibition upon phosphorylation by Akt. Phosphorylated PRAS40 in turn inhibits FOXO3a and p53, contributing to an overall pro-survival state. This study evaluates the role of PRAS40 in IGF-1R mediated resistance to EGFR TKIs.

METHODS: *In vitro* experiments using alamarBlue, CyQuant, reverse phase protein microarray (RPPA), and immunoblot techniques to evaluate protein expression/phosphorylation and correlate with cell physiologic behavior.

RESULTS: Proliferation assays were used to separate 6 HNSCC cell lines into 2 groups: those rescued from EGFR inhibition by IGF-1R activation and those not rescued. RPPA analysis identified a correlation between PRAS40 phosphorylation and rescue status. Immunoblot analysis confirmed the RPPA findings: in rescued cell lines, PRAS40 phosphorylation decreases with EGFR inhibition, but phosphorylation is restored by IGF-1R activation. However, these treatments have little effect on PRAS40 phosphorylation in non-rescued cell lines. In a representative cell line from each group, p70S6K phosphorylation was found to follow this pattern as well, suggesting possible involvement of mTOR in the rescue mechanism. However the addition of temsirolimus, an mTORC1 inhibitor, to treatment with an EGFR TKI was not sufficient to overcome IGF-induced rescue.

CONCLUSIONS: PRAS40 phosphorylation is tightly correlated with IGF1R activation in HNSCC cells that exhibit IGF1R-induced rescue from EGFR TKI treatment. This phenomenon is absent in non-rescued cells, suggesting a potential role for pPRAS40 in IGF1R-based therapeutic resistance. While PRAS40 phosphorylation results in mTOR activation, the inability of mTOR inhibition to overcome IGF-induced rescue from EGFR antagonism suggests an important alternative downstream pathway. One possible mechanism is through inhibition of FOXO3a and/or p53, functions of pPRAS40 that have been previously reported in other cell types

Poster #6
Papillary Thyroid Cancer Recurrence: Low Yield of Neck Ultrasound with an Undetectable Serum Thyroglobulin Level

Samantha Epstein

The standard of care for patients with papillary thyroid carcinoma (PTC) is thyroidectomy followed by radioactive ^{131}I (RAI) ablation therapy. Many patients then undergo serial thyroid ultrasounds (US) with serum thyroglobulin (sTg) measurements to monitor for local recurrence. The American Thyroid Association (ATA) generally recommends measuring sTg and anti-TG antibodies 6-12 months after RAI therapy and obtaining thyroid US at 6-12 month intervals. The revised ATA guidelines suggest that a sTg level of 0.2-0.3 ng/mL predicts disease recurrence. However, there is little data on the rate of recurrence when the sTg is undetectable. The purpose of this study was to determine the yield of thyroid bed/neck US when sTg is undetectable (<0.1 ng/mL) in patients with differentiated PTC treated with complete thyroidectomy and RAI ablation.

A retrospective chart review was conducted from 2010 to 2015 to determine US results in patients with undetectable sTg levels within six months of a thyroid bed/neck US exam, after complete thyroidectomy and RAI. During this 5 year period, 119 patients underwent 307 thyroid ultrasounds. There were 20 exams (6.51%) in 18 (15.12%) patients where the sTg level was undetectable and sonography raised the possibility of disease recurrence. Of these 18 patients, none had proven recurrence. Six patients underwent US-guided fine needle aspiration with resultant benign pathology; 8 patients had follow-up neck US exams demonstrating stability of findings; 2 patients had clinical follow-up without additional imaging; and 2 patients were lost to follow up.

Thyroid bed/neck US did not identify any recurrent PTC when the sTg level was undetectable in patients that underwent total thyroidectomy and RAI therapy. Eliminating thyroid ultrasound when sTG levels are undetectable using a highly sensitive test could decrease unnecessary imaging exams, patient inconvenience and anxiety, and patient harm from unnecessary biopsies without negatively affecting the ability to detect recurrent disease.

Poster #7
3D Printing Surgical Training Models for Trochleoplasty

Scott Feeley

Sulcus-deepening trochleoplasty is a procedure performed to improve patellar instability in patients with recurrent patellar dislocation resulting from trochlear dysplasia. The supratrochlear spur is reduced through an open procedure with a surgical burr to remove bone beneath the articular cartilage. A new trochlear groove is created with the spur height reduced to match the anterior femoral cortex, thereby improving patellar tracking. Many other surgeries exist for improving patellar instability, but these will often fail in the setting of trochlear dysplasia. The creation of patient specific models can be used to help visualize the bony anatomy and to train and educate orthopedic surgeons on the procedure, while also having the potential to be used for preoperative planning and rehearsal. By using open source segmentation software to convert computed tomography slices into a 3D printable format, individualized models can be printed through additive manufacturing. Small and large-scale manufacturing processes were

investigated to optimize surgical model creation in terms of time, expense, anatomical accuracy, and materials selection to replicate a model to realistically train surgical techniques for trochleoplasty. Through such methods, a library of six trochleoplasty patients for a total of seven surgical models was created to cover a wide range of the presentations and past surgical history for patients with patellar instability indicated for trochleoplasty. These educational training models are combined with a presentation outlining the clinical presentation and imaging of each patient preoperatively and status post trochleoplasty. Thus, surgeons can better understand the decisions leading up to trochleoplasty and gain an appreciation of the indicators for this operative procedure prior to training with the models.

Poster #8
WITHDRAWN

Poster #9
Evolution of breast periprosthetic infection: *Serratia marcescens* as the emerging pathogen in implant-based breast reconstruction

Jane Gui

The flora of implant based breast infection has changed in the last decade, especially at our institution. There were 561 implant-based breasts reconstruction among 378 patients in a ten year period performed by a single surgeon. We characterized the 32 breast periprosthetic infection requiring explant in a ten year period of a single surgeon and also investigated the risk factors for increased frequency of *Serratia marcescens* breast periprosthetic infection. Risk factors included old vs. new protocol, use of ADM, smoking status, ASA score, genetic mutation carriers (BRCA1, BRCA2 and ATM), prophylactic vs non-prophylactic mastectomy, history of radiation, history of chemotherapy, diabetes mellitus (DM), vascular disease (including peripheral vascular disease, cerebrovascular events, myocardial infarction), coronary artery disease (CAD), hypertension, body mass index (BMI), and age at time the breast reconstruction. We also collect the postoperative dates of the infection. Our results showed that there was an evolution of breast periprosthetic infection, from predominantly gram-positive infection to nearly 50% being gram-negative, especially after the implementation of new protocol focusing on eradicating skin and intranasal bacterial flora. The new protocol was associated with *Serratia marcescens* infection with statistical significance. Preoperative antibiotic, such as gentamycin, should be considered to prevent gram negative infections, particularly *Serratia*. This may be particularly important in patients with BRCA1/2 or ATM mutations, since there was a statistically significant association between *Serratia* infection and patients with BRCA1/2 or ATM mutations. In our patient population, diabetes was associated with MRSA infection and preoperative MRSA decolonization may be essential in diabetic patients. Many patients have late onset breast periprosthetic infection, up to one third of breast periprosthetic infection occurred after 90 days. Regular follow-up and patient education is important to provide timely treatment.

Poster #10
Characterization of trends in medical student indebtedness with current and potentially new repayment options for young physicians

Angel Hsu

Objective: Assess underlying factors leading to decades of increasing indebtedness among medical school graduates; produce optimal repayment models for new physicians; and compare prospective but unlegislated educational debt changes under the current administration with existing repayment options.

Methods: Mean indebtedness of medical school graduates and median tuition and fees across all MD-granting institutions since 2004 were collected from *AAMC Data Books* and *Debt Fact Sheets*. Total medical school revenue components since 2004 were analyzed using the LCME financial questionnaires. Data from the 2011-2016 AAMC Colleges Graduate Questionnaire were collected and stratified by medical specialty choice, race and ethnicity, and amount of debt. Expected future compensation of medical school graduates after training was approximated using the MGMA 2016 Physician and Compensation Production report. Debt repayment models were created to differentiate between indebtedness, training length, income potential, interest rates, and income-based repayment (IBR) plans.

Results: From 2004-2016, in 2016 dollars, the median tuition and fees increased 69% to $36,453 for public schools and 29% to $57,472 for private schools. These annual cost increases were more strongly correlated with increases in mean public graduate indebtedness (32% increase to $180,000, R^2=0.81) than in mean private graduate indebtedness (19% increase to $203,201, R^2=0.65) in 2016 dollars. Despite these increases, the total percent of graduates with debt has dropped by 10% among public and private schools since 2012. There was found to be significant variation of debt among entering medical specialties, but there was no association between amount of debt of a graduate and the income potential of his or her field. Tuition and fees made up 3.8% of all medical school revenue in 2016 and was not closely associated to increases in medical school revenue. In repayment models comparing Pay-As-You-Earn (PAYE) with a 10-year standard repayment for an average debt ($190,000), medical fields expecting less than $300,000 per year will expend higher monthly payments under the 10-year plan for a shorter period and pay less than that of the PAYE. PAYE is in all instances less favorable in higher income and lower principal debt situations. In all scenarios, the newly proposed IBR plan is more favorable than PAYE when compared to standard repayment plans.

Conclusion: The cost of medical school and indebtedness of its graduates has increased greatly in the past decade and shows no signs of decreasing in the future. Under certain circumstances, PAYE can provide lower monthly payments and lower total repayment, but this is less likely with higher incomes and lower principal debt. Future IBR plans could greatly reduce medical school debt stress, but it is uncertain whether these will materialize.

Poster #11
Diagnostic Accuracy of Prostate MRI

April Hyon , Dr. Jason Itri, Department of Radiology

Background: This study assesses the diagnostic accuracy of prostate MRI, which is an important tool for radiologists and referring providers to stratify the risk of clinically significant prostate cancer in men presenting with an elevated PSA. Radiologists interpret and report prostate MRI using the Prostate Imaging Reporting and Data System (PI-RADS) version 2. Prostate lesions are assigned a PI-RADS score of 1-5 based on imaging findings that correspond to the level of suspicion for clinically significant cancer, defined as prostate adenocarcinoma with a Gleason score of 7 or higher. Pathologists grade prostate cancer using a Gleason score, which is based on histologic patterns. PI-RADS 1 indicates that a lesion identified on MRI is highly unlikely to be clinically significant cancer, whereas PI-RADS 5 indicates that a lesion is highly likely to be clinically significant cancer. This study assesses the diagnostic accuracy of prostate MRI by comparing prostate MRI results with pathology results from biopsy and/or prostatectomy.

Methods: We retrospectively reviewed data from patients obtained through the University of Virginia Clinical Data Repository with prostate cancer who had 1) prostate MRI and 2) pathology results from biopsy or prostatectomy available from January 1, 2010 through December 31, 2016.

Results: Out of 62 lesions identified on prostate MRI, 25.8% were PIRADS 3, 54.8% were PIRADS 4, and 19.4% were PIRADS 5. Among each of these categories (PIRADS 3, 4, and 5), the percentage of lesions that were Gleason 7 or higher on pathology was 31.3%, 47.1%, and 75.0%, respectively. This demonstrates a strong correlation between higher PIRADS score and likelihood of clinically significant cancer. In addition, 15 of 25 patients (60%) had clinically significant prostate cancer missed by prior random biopsy that was successfully identified and targeted using prostate MRI.

Conclusions: This study shows a strong correlation between higher PIRADS score and likelihood of clinically significant cancer on biopsy. It demonstrates that prostate MRI is an effective triage tool to risk-stratify patients with an elevated PSA by identifying clinically significant cancer missed by random biopsy. If prostate MRI does not identify a lesion suspicious for clinically significant cancer (PI-RADS 3 or higher), the patient can be followed with MRI. If a suspicious lesion is identified, targeted biopsy is performed using the images to accurately biopsy the lesion.

Poster #12
Intratumoral heterogeneity and tumor-host crosstalk alter drug response in a pancreatic cancer model

Aamir Javaid[1,2], Eveline E Vietsch[1], Marianne Stenstra[1,3], Justine McCutcheon[1], Eric Berens[1], John K Simmons[4], Jeffrey Jenkins[5], Ivana Peran[1], Giuseppe Giaccone[1], Beverly A Mock[4], Jeffrey Huang[2, 6], Anna T Riegel[1], Anton Wellstein[1, 7]
[1] Department of Oncology, Lombardi Comprehensive Cancer Center, Georgetown University
[2] Department of Biology, Georgetown University
[3] Department of Surgery, Erasmus University Medical Center, Rotterdam
[4] Laboratory of Cancer Biology and Genetics, National Cancer Institute
[5] Catholic University

Cancers consist of heterogeneous cell subpopulations that are selected by fluctuations in the microenvironment and drug treatment. These subpopulations can interact with one another and

affect each other's growth behavior. To monitor clonal drug sensitivity, we established a model of tumor heterogeneity with primary clonal cell lines isolated from a *Kras*$^{G12D/+}$; *Trp53*$^{R172H/+}$ murine pancreatic cancer (KPC). We characterized their phenotypes and drug sensitivities and used their unique mutations to quantitate clonal abundance in a mixture of the cell lines. When cells were grown as a reconstituted mixed population, we found that clonal sensitivity to the MEK inhibitor trametinib was altered, whereas sensitivity to gemcitabine was unaffected. The clonal drug response when grown in immune-competent syngeneic mice as heterogeneous tumors revealed a pattern of clonal drug sensitivity that was distinct from the sensitivity in vitro for both trametinib and gemcitabine. Clone specific sensitivity to immune checkpoint blockade in vivo revealed distinct clonal interactions with the microenvironment. Mutant tumor DNA in the circulation reflected distinct impact of treatment on tumor cell subpopulations. We conclude that malignant progression and selection of drug resistant cancer cell subpopulations is impacted by the crosstalk between clonal cell populations present in heterogeneous tumors and the host environment.

Poster #13
A Risk Model for Lung Complication Combining Radiation Therapy and Chronic Obstructive Pulmonary Disease

Roman O. Kowalchuk, Daniel M. Trifiletti, Shiv R. Khandelwal, James M. Larner, and W. Tyler Watkins

Purpose/Objectives: To develop a multi-variate risk model of lung complication for the treatment of locally advanced lung cancer combining radiation dosimetry and patient-specific risk factors including chronic obstructive pulmonary disease (COPD).
Materials/Methods: A retrospective study of 89 locally advanced lung cancer patients included collection of COPD status, age, tumor location, histology, clinical staging, treatment intent, concurrent chemotherapy, total radiation dose, planning target volume (PTV), lung volume, and multiple radiation dose-volume statistics. Overall survival (OS) and local progression free survival (LPFS) were analyzed using the Kaplan-Meier method including log-rank comparisons for these factors. For lung complications, toxicity was estimated in accordance with the RTOG acute radiation morbidity scale, where Grade 2+ (G2+) lung complications included persistent cough requiring narcotic, antitussive agents, and dyspnea with minimal effort but not at rest. Grade 2+ acute radiation pneumonitis (RP) was defined clinically or radiographically. Each observed complication was correlated to the set of patient-specific factors via stepwise logistic regression.

Results: Age was the dominant factor in survival analysis; in patients >70, 2-year survival was 28% (N=18) vs. 59% in patients <70 years old (N=71, HR = 3.9, p=0.004). OS and LPFS were not significantly different based on with COPD status (p=0.2, HR=1.5) or radiation dose (range 40-74 Gy, median=60 Gy, p>0.5, HR<1.3). In predicting all observed lung complications (G2+ and RP), multi-variate step-wise logistic regression revealed two statistically significant variables: COPD status (p=0.01) and a total lung V50 (p=0.02). Age met the initial inclusion criteria (p<0.15), but was not found to be statistically significant (p=0.06) after multiple logistic regression iterations. Concurrent chemotherapy (p=0.7), nodal status (p=0. 6), and total radiation dose (p=0.8) were not statistically associated with G2+ and RP lung complication. Separation of G2+ complications and RP revealed a different trend. G2+ complication excluding RP showed statistically significant association with age (p=0.02) and COPD (p=0.03).

RP alone (excluding G2+) was only associated with total lung volume at 20 Gy (V20). The data suggests a COPD-positive diagnosis increases the risk of G2+ complication by 24% in locally advanced lung cancer patients undergoing radiation therapy and increases an additional 1.4% for each year >50, risk(G2+) 24%*COPD + 1.4%*(Age-50), but was not associated with RP. Risk of RP was significantly associated with total lung V20 (p=0.003), with a resulting model risk(RP) = 1.4(V20-0.21). The linear model suggest zero incidence of clinical or radiographic RP with total lung V20<0.21, and risk increases by 10% for every 7% increase in V20.

Conclusions: COPD status was not associated with survival or radiation pneumonitis. Age was the dominant factor in survival and total lung V20 was associated with risk of RP. COPD patients have increased risk of severe lung complications which are consistent with COPD-related symptoms.

Poster #14
CVD Prevention in Santiago Atitlán, Guatemala

Scott Lancaster, Brittany Heck, Dr. David Burt and Jessica Gonzalez
University of Virginia Guatemala Initiative

Cardiovascular disease (CVD) is an increasingly significant health problem in Guatemala. As Latin American countries like Guatemala develop more advanced infrastructure and technology, rates of infectious disease are falling while rates of non-communicable disease continue to rise. This epidemiological transition is due to an increase in unhealthy lifestyle changes such as decreased physical activity, eating a diet high in fat and sugar, and smoking. These lifestyle changes have led to extremely high rates of cardiovascular risk factors such as obesity, hypertension, and dyslipidemia.

The University of Virginia Guatemala Initiative (UVaGI) has worked with the Guatemalan community in Santiago Atitlán to address the growing public health threat posed by non-communicable disease and cardiovascular disease in particular. The project completed this summer was the most recent phase of the work completed by UVaGI in Santiago Atitlán over the past seven years. The goal of this project was to develop and implement effective ways to educate the general population of Santiago Atitlán about both the consequences of cardiovascular disease and the most effective ways to prevent cardiovascular disease. This goal was accomplished in two major ways. First, basic education about the prevention of cardiovascular disease was communicated to the public through multiple media channels. Second, a comprehensive plan for a six-month series of classes targeted towards people already diagnosed with a cardiovascular disease.

Poster #15
An ischemia/reperfusion model and immunohistochemistry staining to detect *in vivo* cell cycle events in cardiomyocytes after myocardial infarction

Paulina Le, Alex Young, Leigh Bradley, and Matthew J. Wolf

Background: Myocardial infarction (MI) occurs in ~800,000 individuals in the US per year and is a leading cause of morbidity and mortality in developed societies. Reperfusion therapies have

significantly improved outcomes in the setting of an MI. However, cardiomyocytes (CMs) are lost even with successful reperfusion. Moreover, many individuals continue to have future re-infarction and/or adverse left ventricular (LV) remodeling that leads to heart failure, arrhythmia, and death, despite current therapies. A major problem is that adult mammalian CMs lack significant regenerative capacity. Thus, new "adjuvant" therapies, given at the time of reperfusion to stimulate transient CM regeneration, represent innovative strategies to potentially reduce infarct size, prevent adverse LV remodeling, and decrease morbidity and mortality associated with MI. Unfortunately, therapeutic targets and adjuvant therapies to stimulate transient myocardial regeneration are not well understood. The goal of this project was to refine ischemia/reperfusion (I/R) mouse models of MI.

Methods and Results: First, 2,3,5-triphenyltetrazolium chloride (TTC) staining was refined to measure the extent of infarct and areas at risk in a mouse model of ischemia/reperfusion (I/R) injury. Adult C57/B6 mice underwent transient surgical ligation of the left anterior descending (LAD) coronary artery for 60 minutes followed by reperfusion for at least 24 hours. After reperfusion, the LAD ligature was rebuilt and 5% phthalocyanine blue dye was retrograde-injected through the aorta to demarcate viable myocardium. Hearts were harvested, placed at -20^{o}C for 1 hour, and then sliced into 1 mm sections. Slices were treated with 1% TTC Tris-buffered (pH 7.4) saline solution for 15 minutes in a 37ºC water bath. The TTC turns a deep red in the presence of dehydrogenases (NADH) and stains viable myocardium – the area at risk (AAR) – inside the infarcted area. The necrotic area of the infarct lacks NADH and stains white. This method will allow quantification of ischemia myocardium in our I/R model of MI to facilitate the interpretation of how manipulation of signaling pathways potentially affect myocardial recovery after injury. Second, an immunohistochemistry (IHC) protocol to detect fluorescence-based in-vivo cell cycle events in cardiomyocytes after an MI injury was developed. α-MHC-CRE/+; CAG-Fucci/CAG-Fucci were generated that differentially express mCherry and mVenus fluorescent transgenes based on the cell cycle. Paraffin embedded sections of hearts from α-MHC-CRE/+; CAG-Fucci/CAG-Fucci P3 mice were used to develop a protocol for IHC staining to detect cell cycle events in cardiomyocytes. This method allows for the detection and quantification of different cell cycle stages (Go/G1, S, and G2/M phases) in cardiomyocytes.

Conclusion: We have (1) refined an I/R mouse model of MI and (2) developed methods to detect *in vivo* cell cycle events in cardiomyocytes. These projects combined will allow future ischemic therapy research to determine whether experimental drugs reduce ischemic burden in cardiomyocytes due to a protective effect on the heart cells or by inducing proliferation of cardiomyocytes after an ischemic event.

Poster #16
Pericyte/Fibroblast sphingosine kinase 2 deficiency reduces kidney fibrosis

Jonathan Lipsey[1], Shinji Tanaka[1], Diane L. Rosin[2], Sophia Ryuh[1], and Mark D. Okusa[1]
[1]Division of Nephrology and Center for Immunity, Inflammation and Regenerative Medicine,
[2]Department of Pharmacology, University of Virginia

Background: Maladaptive repair following acute kidney injury (AKI) can lead to fibrosis, chronic kidney disease (CKD), and eventually end stage renal disease. Pericytes, FOXD1 lineage perivascular cells, are central to AKI-CKD transition; in response to injury, they detach from the vasculature, differentiate into myofibroblasts and lay down the pathologic extracellular matrix that is the hallmark of CKD. Sphingosine 1-phosphate (S1P), a sphingolipid involved in the

regulation of fibrosis, is produced by two different kinases, sphingosine kinase (SphK) 1 and 2. *Sphk2*$^{-/-}$ mice are protected from kidney fibrosis when compared to wild type or *Sphk1*$^{-/-}$ mice in both folic acid (FA) and unilateral ischemia-reperfusion injury models. We sought to determine the protective effect of *Sphk2* deletion in FOXD1 lineage cells, which include pericytes/fibroblasts, mesangial cells, and vascular smooth muscle cells.

Methods: FA (250 mg/kg; in 0.3 M $NaHCO_3$ (vehicle); n=11-13 for fibrosis; n=4-6 for acute injury) or vehicle (n=4 for fibrosis) was injected i.p. in 12-14 wk old male *Foxd1Cre*+ *Sphk2*$^{fl/fl}$ and *Foxd1Cre*– *Sphk2*$^{fl/fl}$ (WT control) mice. Plasma creatinine (PCr) and blood urea nitrogen (BUN) were measured at 24, 48, and 72h after injection to determine the acute phase of injury. In addition, at 24h, tubule injury was assessed by qPCR (*Kim-1* and *Ngal*) and histology (H&E staining). 14 days after injection of either FA or vehicle, PCr and BUN were measured and kidneys were analyzed for fibrosis by histology with picrosirius red staining. Expression of markers of fibrosis in kidneys was also quantified with qPCR.

Results: Initial injury was similar between *Foxd1Cre*+ *Sphk2*$^{fl/fl}$ and WT control groups; PCr and BUN on days 1-3, as well as markers of kidney injury (*Kim-1* and *Ngal*) and histology on day 1, revealed no difference in acute injury. However, by day 14, all FA-treated mice had increased fibrosis by histology compared to vehicle-treated mice, but *Foxd1Cre*+ *Sphk2*$^{fl/fl}$ mice had less fibrosis than WT control mice. Similarly, BUN at day 14 was increased in FA-treated mice compared to vehicle-treated mice while *Foxd1Cre*+ *Sphk2*$^{fl/fl}$ mice had less BUN relative to WT control mice (39.6 ± 4.0 vs. 55.5 ± 4.9 mg/dL, $p<0.05$). PCr at day 14 showed no difference between the FA- and vehicle-treated groups. Expression of fibrosis-related genes (*Col1a1*, *Col3a1*, *Acta2*, *Fibronectin*, and *Vimentin*) was elevated in FA- compared to vehicle-treated groups with smaller increases in expression in *Foxd1Cre*+ *Sphk2*$^{fl/fl}$ mice compared to WT control.

Conclusions: *Sphk2* deletion in FOXD1 lineage cells attenuated kidney fibrosis in the FA model, indicating that the protective effect of global *Sphk2* deletion is at least partly due to the function of SphK2 in pericytes and highlighting the importance of both pericytes and S1P in the regulation of kidney fibrosis.

Poster #17
Metabolic, structural, and functional changes in the spontaneous hypertensive rat

Dingxiang Luo, Kundu lab
Radiology and Medical Imaging

When subjected to an ever increasing amount of pressure, the left ventricular myocardium undergoes a series of metabolic, structural, and functional changes that precede the eventual transition into left ventricular hypertrophy (LVH) and heart failure. Here we use dynamic positron emission tomography (PET) imaging and magnetic resonance imaging (MRI) in vivo to examine how metabolic changes precedes structural and functional changes. We compared metabolic and structural parameters in spontaneously hypertensive rats (SHRs) to control normotensive Wistar-Kyoto (WKY) rats. Our results indicated a significant metabolic and structural differences but no change in cardiac function. In conclusion, our findings suggest that metabolic and structural remodeling go hand in hand to maintain cardiac function.

Poster #18
A pilot study evaluating the effects of diluted apple cider vinegar on atopic dermatitis skin.

Lydia A. Luu, Richard H. Flowers, Barrett J. Zlotoff, Julia A. Wisniewski
Deparrtment of Dermatology, Division of Allergy, Asthma, and Immunology, University of Virginia

Background: Atopic dermatitis (AD) is a common chronic inflammatory skin condition that affects up to 20% of children and 10% of adults worldwide. AD skin is associated with high transepidermal water loss (TEWL), high skin pH, *Staphylococcus aureus* skin colonization, and low skin microflora diversity compared to healthy skin. The defects in AD skin are functions of abnormalities in the epidermal barrier, mediated in part through poor epidermal acidification. Apple cider vinegar is an emerging natural therapy used by patients for a variety of dermatologic maladies. Dilute vinegar soaks have been proposed as a potential therapy for improving skin barrier integrity in AD patients, but their safety and efficacy have not been well studied.

Objective: To determine the safety and skin barrier effects of soaking AD and healthy skin in apple cider vinegar.

Design/Methods: 11 AD patients (4 M, 7 F, median age: 23.0 years, SCORAD: 30.50 ± 18.58) and 11 healthy control volunteers (5 M, 6 F, median age: 25.0 years) were recruited at UVA. Subjects soaked one forearm in dilute apple cider vinegar (0.5% concentration acetic acid) and the other forearm in water for 10 minutes daily for 14 days. Subjects were randomized as to which forearm received which treatment. Skin swabs, TEWL measurements, and pH measurements were taken from forearms at the following timepoints: pre-treatment; 0, 15, 30, and 60 minutes post-treatment day 1; and at follow-up post-treatment day 14.

Results: TEWL increased at 0 minutes post-treatment day 1 of vinegar soaking compared to baseline for both healthy subjects (20.69 ± 6.79 g/m^2/h vs 7.71 ± 3.41 g/m^2/h) and AD subjects (31.76 ± 10.16 g/m^2/h vs 13.85 ± 9.69 g/m^2/h), then returned to baseline after 60 minutes. Skin pH decreased at 0 minutes post-treatment day 1 of vinegar soaking compared to baseline for both healthy subjects (4.26 ± 1.09 vs 4.85 ± 1.13) and AD subjects (4.34 ± 1.07 vs 4.87 ± 1.10), then returned to a level slightly below baseline after 60 minutes. After 2 weeks of treatment, skin TEWL and pH were relatively unchanged from baseline. Among all study subjects, 73% (16/22) reported side effects from vinegar treatments. Of the AD subjects, 27% (3/11) reported pruritus. All side effects resolved after discontinuing the vinegar soaks.

Conclusions: Dilute apple cider vinegar treatments caused side effects in a majority of subjects and did not change skin barrier integrity. Vinegar had no effects on TEWL or skin pH. Further studies should investigate whether different manufacturers of apple cider vinegar or alternate dilutions of the vinegar produce the same side effects.

Poster #19
Effects of microbiome-modified metabolites on circadian rhythms of intestinal cells

Paul Mitchell and Dr. Sean Moore

Circadian rhythms are endogenous, entrainable biological processes that oscillate on a 24-hour schedule via differential gene expression regulated by light and the suprachiasmatic nucleus.

When altered or disrupted (through shift work or jet lag), these rhythms can lead to several metabolic, infectious, or neoplastic illnesses such as metabolic syndrome, obesity, and glucose intolerance in animal models (Liang *et al.,* 2015). The human microbiome is a diverse collection of different organisms that live symbiotically within the human body, mainly in the gastrointestinal tract. These species produce and modulate several intestinal metabolites in humans that have important implications on health and physiology. One of these metabolites, short chain fatty acids (SCFAs), are produced when bacteria in the microbiome ferment dietary fiber. Their levels vary depending on the species makeup of the microbiome, thus making them an interesting marker for disease and bacterial overgrowth. Our work dealt with exploring how these microbiome-modulated bacterial metabolites would affect the circadian rhythm gene expression of an intestinal cell model. We utilized enteroids, which are mouse 3D epithelial organoids that contain crypts and villus domains that resemble the normal epithelium of the gut (Mahe *et al.,* 2015). Enteroids are a reliable model system because they incorporate all mouse intestinal cell types while other cell lines only contain epithelial cells. The enteroids were exposed to physiologically relevant concentrations of three SCFAs (acetate, butyrate, and formate) to determine their effect on circadian clock gene expression. To measure expression of clock genes, enteroids that had been transfected with a Per2 promoter gene linked to a Luciferase reporter were utilized. Luciferin was added to the culture in addition to the SCFA to measure the expression of the Per2 gene using a luminometer. Both acetate and butyrate caused a phase advance in the rhythmic expression of Per2, while formate did not significantly alter rhythmicity. We also performed an MTT assay to measure viability under differing concentrations to understand the influence of SCFAs on host physiology; butyrate at higher concentrations was found to decrease cell viability while acetate and formate did not produce significant alterations at any tested concentration. These results indicate that, at certain concentrations, SCFAs are capable of altering cell viability and intestinal cell circadian clock gene expression. In the future, it would be useful to repeat these assays to determine if results are consistent. If they are, the next step would be to investigate how circadian clock expression affects the immune response in the context of intestinal infection and whether altering circadian gene expression with bacterial metabolites could benefit patients with these illnesses.

Poster #20
Cardiothoracic Surgery T32 Training Grants Are Vital to the Development of Academic Surgeons

Adishesh K. Narahari, Eric J. Charles MD, J. Hunter Mehaffey MD, Sarah A. Schubert MD, Victor E. Laubach PhD, Curtis G. Tribble MD, Richard B. Schuessler PhD, Ralph J. Damiano Jr. MD, Irving L. Kron MD

Division of Thoracic and Cardiovascular Surgery, University of Virginia Health System
Division of Cardiothoracic Surgery, Washington University School of Medicine

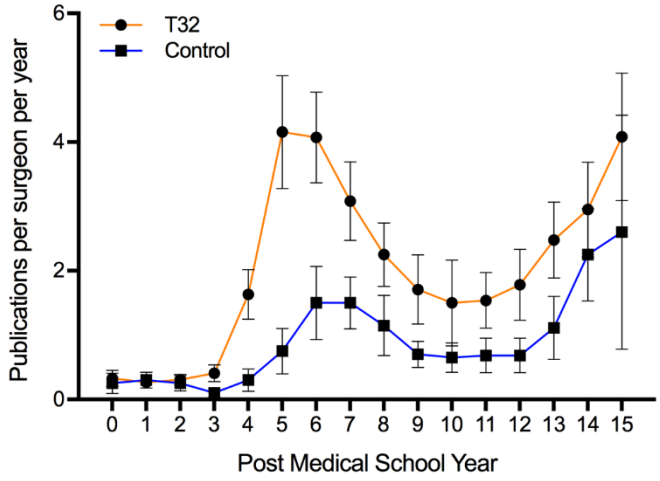
Objective: The Ruth L. Kirschstein Institutional National Research Service Award (T32) provides institutions with the financial means necessary to prepare predoctoral and postdoctoral trainees for careers in academic medicine. After the Cardiac Surgery Program of the National Heart, Lung and Blood Institute (NHLBI) was phased out in 1990, T32 training grants became crucial sources of extramural funding to support cardiothoracic (CT) surgical research, providing residents the opportunity to pursue and cultivate research interests. We hypothesized that institutions with a CT surgery T32 training grant have produced more academically-prolific surgeons compared to institutions without such funding.

Methods: Information on all trainees supported by CT T32 training grants at two academic surgery programs (T32) were obtained, along with information on trainees from two similarly sized training programs without CT T32 grant funding (Control). Data collected included medical school graduation year, residency start and end years, current academic rank and institution, fellowship details, additional degrees, and all research publications. Non-surgery residents and residents who did not pursue CT surgery after residency were excluded from the analysis. Residents at programs with T32 grants were compared with residents at programs without T32 grants.

Results: Data on 101 current trainees or practicing CT surgeons (T32: 81 vs. Control: 20) from 4 institutions were obtained, with a total publication count of 2,411 manuscripts. Sixty-nine individuals (T32: 49 vs. Control: 20) were analyzed after applying the exclusion criteria. The T32 group consisted of 18 current trainees and 31 practicing CT surgeons and the Control group consisted of 20 practicing CT surgeons. The T32 group had significantly more publications per surgeon per year compared with the Control group over 15 years post medical school graduation (Figure, $p<0.0001$). The T32 and Control groups both have a bimodal distribution of publications, with peaks at or near the completion of residency (years 5-8) and again after approximately 10 years in practice (years 14 and 15). Additionally, T32 programs have produced significantly more academic surgeons as compared with Control programs (77% [24/31] vs. 45% [9/20], $p=0.034$).

Conclusions: T32 training grants supporting CT surgery research are vital to the development of prolific academic CT surgeons. These results warrant continued funding by NHLBI to support the development and training of residents interested in CT surgery and attending surgeons should continue to apply for these grants.

Figure Legend: Publications per surgeon per year following medical school graduation for surgeons supported by cardiothoracic T32 training grants during residency (T32) compared with surgeons who trained at programs without cardiothoracic T32 support (Control).



Poster #21
Predictors of Active Surveillance at a Multidisciplinary Small Renal Mass Conference

Sean W. Noona, Matthew B. Clements, Jennifer M. Lobo, Daniel Bitner,
Noah S. Schenkman, Tracey L. Krupski

Introduction: Active surveillance (AS) is an option for small renal masses (SRMs), typically up to 4 cm. The physician threshold for recommending treatment of such masses may be higher depending on renal function, age, and comorbidities. Patient goals and values determine the treatment ultimately chosen after shared decision making. We reviewed all available cases discussed at our monthly multidisciplinary SRM conference to identify independent predictors of recommending active surveillance to a patient.

Methods: Conference records were reviewed to identify patients discussed at the SRM conference and the conference treatment recommendation since its inception in April 2015 through May 2017. We queried the prospectively maintained database for demographic variables, imaging characteristics, renal function, comorbidities, and biopsy results. Patients discussed more than once were considered distinct SRM cases. Two non-standard cases, three cases with non-cystic masses >7 cm, and 25 cases where further imaging/biopsy data was recommended were excluded. We modeled the odds of the conference recommending active surveillance and the odds of the patient receiving active surveillance using a generalized estimating equation with an exchangeable correlation structure to account for patients discussed at more than one conference.

Results: A total of 125 cases met criteria. On univariate analysis, age and diagnostic biopsy (both $p < 0.05$) were greater in patients chosen for AS. Our regression model showed that age, Chalrson Index, and >1 mass were significant predictors of SRM Conference recommendation of AS and that diagnostic biopsy was a significant predictor of active treatment. (Table 1). The second regression model showed that age was a significant predictor of receiving AS and that diagnostic biopsy and increasing mass diameter were predictive of active treatment (Table 2). In a separate regression of age categorized by quartiles and adjusted for GFR and sex, those >75 years had much greater odds of being recommended AS (OR 6.6, p=0.003).

Conclusions: Having a diagnostic biopsy made both physician and patients less likely to pursue AS, which highlights the importance of biopsy. Age and comorbidity status were important for both patient and physician decisions on active surveillance, but renal function was not significant. Mass diameter may be more of a factor in patient decisions than physician recommendations.

Table 1: Predictors of SRM Conference Recommendation of Active Surveillance

SRM Conference Recommendation of Active Surveillance		
Variable	**Odds Ratio (95% CI)**	**p-value**
Age	**1.05 (1.01, 1.09)**	**0.008**
Male	**0.53 (0.22, 1.28)**	**0.162**
Charlson Index	**1.32 (1.02, 1.72)**	**0.037**
GFR	**1.01 (0.99, 1.02)**	**0.524**
Diagnostic Biopsy	**0.30 (0.12, 0.69)**	**0.006**
Mass Diameter (cm)	**0.79 (0.60, 1.02)**	**0.082**
>1 Mass	**4.77 (1.28, 20.02)**	**0.024**

Table 2: Predictors of Receiving Active Surveillance

Receiving Active Surveillance		
Variable	**Odds Ratio (95% CI)**	**p-value**
Age	**1.06 (1.02, 1.10)**	**0.007**
Male	**0.45 (0.17, 1.17)**	**0.105**
Charlson Index	**1.19 (0.88, 1.62)**	**0.265**
GFR	**1.01 (0.99, 1.03)**	**0.381**
Diagnostic Biopsy	**0.28 (0.10, 0.73)**	**0.011**
Mass Diameter (cm)	**0.68 (0.49, 0.92)**	**0.017**
>1 Mass	**1.95 (0.33, 10.17)**	**0.433**

Poster #22
Infographics: A Novel Tool in Medical Education

Joseph Mort, Joanna Odenthal, Neeral L Shah, MD

Background and Aims: Infographics are used to convey information simply and understandably through images and flow charts. Though used commonly for patient education, infographics have yet to be used as a tool for education in the field of medicine. In this project, we aimed to study the use of infographics in clinical training and the modality in which they are used.

Methods: We developed twenty-nine, high-yield infographics for the most commonly seen diagnoses on the GI service. The intended audience was third year medical students. Information was compiled from USMLE Step 2 study material and GI textbooks. The infographics were posted on a website (https://pages.shanti.virginia.edu/infographics) and a feedback survey was available for users.

Results: Initial feedback has shown promise for these infographics as study tools in the academic setting and for use in patient care. Using the survey and a focus group of second year medical students, we studied the role of infographics in medical education. Responses to the survey came from a diverse group of learners consisting of medical students from all four years, residents, and nursing students. Over 93% of survey participants reported the infographics being moderately to very useful. The top three reasons learners identified as reasons they would use infographics in their clinical training were the following: knowledge reinforcement prior to patient care (55%), exam preparation outside of patient care (26%), and knowledge reinforcement after patient care (10%). The majority of learners preferred to download pdfs of these infographics onto their device (63%), otherwise equal numbers preferred printing copies (18.5%) or accessing them as a slide show on the internet (18.5%). Our focus group expanded on the idea of favoring printed copies, as to avoid using devices that could be deemed unprofessional and affect their grade on clinical rotations. Further, having the entire page visible was a more favored spatial memory aide than panning on each infographic on the small screen of a phone.

Conclusions: Through the results of this study, we feel that infographics are a useful study tool for learners in clinical medicine. Knowledge reinforcement before and after patient care and exam preparation seemed to be the most optimal setting for their use. Finally, allowing users to have other options beyond downloading pdfs of the infographics onto their device may be essential for students to use them consistently alongside patient care. Future efforts to expand infographics to other clinical fields may be helpful and allow further investigation of their use in a broader audience.

Poster #23
Interruption of Oxytocin Administration and Risk of Cesarean Delivery: A Retrospective Cohort Study

Adam Petraglia

Introduction: To assess whether interruption of continuous oxytocin (OT) administration during labor reduces the odds of a vaginal delivery (VD).

Methods: We conducted a retrospective chart review of all singleton deliveries in 2015 at our institution. Women that received oxytocin (OT) for induction (IOL) or augmentation (AOL) of labor were included. Data on oxytocin administration, maternal sociodemographic and clinical characteristics, and delivery outcomes were abstracted from electronic medical records. Univariate chi-squared tests and logistic regression were used for analysis. The cumulative risk was plotted over number of oxytocin cessations. Linear regression was used to assess whether there was a linear association between increasing number of oxytocin cessations and cesarean delivery.

Results: We identified 287 women, of which 85.7% (246/287) received OT for IOL and 14.3% (41/287) received OT for AOL. Overall, 19.5% (56/287) underwent CD. Most women had ≥ 1 OT interruption (56.2%: 144/256), with a mean number of 0.98 (SD±1.25). Among women who had ≥ 1 OT interruption, most were stopped due to an abnormal fetal heart rate tracing (64.2%: 95/148), followed by excessive uterine activity (tachysystole) (13.5%: 20/148). Having ≥ 1 OT interruption was associated with CD in univariate analysis ($p<0.001$). Number of OT dose changes, maternal body mass index at delivery, and being nulliparous were also associated with CD in univariate analysis ($p<0.05$). When adjusting for potential confounders, OT interruption remained associated with CD in multivariable analysis (OR=4.97; 95% CI: 1.73-14.24). The cumulative risk for CD increased linearly with the number of oxytocin interruptions. In univariate linear regression, the number of OT interruptions increased linearly ($p<0.001$) with risk of CD (B=0.12, 95% CI: 0.10-0.16). The AUROC was 0.64 (95%CI: 0.54-0.74). The most sensitive predictor of CD was ≥ 1 interruption (Sensitivity= 87.00%, Specificity=51.00%).

Conclusion: Interruption of continuous oxytocin administration during induction or augmentation of labor is associated with an increased odds CD. Although the number of OT interruptions has a linear association with the odds of CD, having at least one OT vs no interruptions appears to best predict whether CD will occur.

Poster #24
A Systematic Review: Russia and the Former Soviet Union, the HIV/AIDS Epidemic as Understood by trends in Scientific Literature from the Region

Herman Pfaeffle

Since 1981 the HIV/AIDS epidemic has plagued the world infiltrating even the most developed countries and infrastructures. The disease has left almost 36.7 million infected and stands as the single-most lethal infectious agent, causing an estimated 1.5 million deaths per year.[1,2] The disease most heavily burdens Sub-Saharan Africa – and as a result its effects on countries of the Far East are often less sensationalized. The Russian Federation alone accounts for upwards of 1.5 million HIV infections, and along with the remainder of Eastern Europe and Central Asia stands as the only region in the world where the rate and number of HIV infections are rising.[3] To understand this disparity an expansive and in-depth analysis, documenting research records and identifying the priorities of that research is necessary. In doing so, any gaps or misalignments in research efforts can be identified to explain trends in HIV epidemiology for the region. The data may also prove useful to policy makers and scientist alike guiding the future direction of HIV/AIDS research and management. This review was also

prepared for the U.S. Embassy in Moscow, Russia through the U.S. State Department Lab Diplomacy Program at the University of Virginia. Using scientific databases: PubMed, Web of Science, Embase, Google Scholar, and top Russian equivalents; research abstracts and articles from 1991 to present day were analyzed for relevance then documented. Articles were systematically tagged using the criteria of 33 'hot topic' fields in the area of HIV/AIDS research (ranging from injection drug use to virology), most importantly including the geographic location of the research – both where the research took place and where the patients/ data to conduct research came from. Results from these databases were synthesized to create an interactive web application visualizing research in regards to HIV/AIDS from Russia and countries of the former Soviet Union by displaying them over a geographic area. Within the application, users can search HIV 'hot topic' criteria through a map legend which allows for interactive visualization of research emerging from the Far East corresponding to the user-selected criteria. Other functions include a timeline feature showing progression of research from Eastern Europe from 1991 to present, full abstracts and hyperlinks to full texts (if available on public domains), and additional maps showcasing other research attributes – including a map of the location of researchers involved in Russian HIV-efforts from around the globe. This review should serve as an easily accessible source for physicians, researchers, and students interested in any aspect of HIV/AIDS in Eastern Europe.

Poster #25
Impact of venous collaterals on clinical outcomes in Paget-Schroetter syndrome

DR Phadke B.S., DP Sheeran M.D., LR Wilkins M.D., JA Kern M.D, JF Angle M.D.

Division of Vascular and Interventional Radiology, University of Virginia School of Medicine

Background: Effort thrombosis, Paget-Schroetter syndrome (PSS), is an axillo-subclavian venous thrombosis often following repetitive and vigorous use of the upper extremities. The development of collateral venous circulation is known to occur around the region of first rib impingement, but the effect these collaterals have on thrombolysis and surgical outcomes is unknown. The object of this study was to characterize the effect of venous collaterals on the success of thrombolysis and the rate of re-interventions after surgery in patients with PSS.

Methods: Single center retrospective study of all patients presenting with the clinical diagnosis of PSS receiving catheter directed thrombolytic therapy (CDT) from 2007 through 2017. Patients receiving prior surgical intervention were excluded. Three readers analyzed venograms at presentation, post-lysis, and at each re-intervention for severity of venous stenosis, thrombus burden, and collateralization. Subjects were divided into groupings of high and low grade collateral flow based on venographic appearance.

Results: CDT was performed in 35 extremities (34 patients) with a success rate of 100%. Pre-procedure venogram showed 27 extremities with low-grade collaterals and 8 with high-grade collaterals. The re-intervention rate within 12 months for extremities with high-grade collaterals was 88% (7 of 8), significantly higher than those with low-grade collaterals, 41%(11 of 27, p=0.021). There was a significant decrease in the severity of collateralization post thrombolysis (p=.048) and within 30 days post-operatively (p=.038)

Conclusions: The severity of venous collateralization on presenting venogram in patients with PSS does not appear to affect success rates of initial CDT, but may be predictive of long-term patency of the affected extremities. CDT seems to be effective in reducing collateral burden; however, patients with severe collateralization on presentation are more likely to need re-intervention.

Poster #26
Effects of Injury History and Healthcare Exposure on Collegiate Student-Athletes' Attitudes Toward Healthcare

John J. Popovich, MS2, Kristen M. Wells, MPH, Ph.D, John M. MacKnight, MD
University of Virginia School of Medicine

Elite, competitive athletes have a unique relationship with the healthcare system. Though the strain of competition increases their healthcare needs and their involvement in an organized program increases the frequency and ease of access, there is also anecdotally a culture of skepticism and distrust toward the healthcare system. However, little data are available about athletes' perceptions of healthcare and how those perceptions change with exposure. We developed a survey designed to assess effects of healthcare exposure—as measured by years in competitive sports and injury history—on student-athletes' trust in, and willingness to use, the healthcare system and their care providers. First, we collect general information about their athletic and injury history; second, we administer the Trust in Medical Professions scale, which is a validated tool for gauging a patient's trust in the healthcare system as a generalized entity; third, we ask about their willingness to go to their care providers for help with myriad concerns more peripheral to the athletic realm (e.g. mental and sexual health) and about perceived barriers to seeking help (e.g. being seen as "weak"). Study subjects are University of Virginia Division I student-athletes who represent a cross-section of sports, ages, and experience levels. Data collection is ongoing.

Poster #27
Implementation Analysis of Proyecto SABER: An Electronic Medical Record in the Emergency Department of Totonicapán, Guatemala

Corinne Roberts

Proyecto SABER is an electronic medical record system developed specifically for the resource-limited environment of the Emergency Department of Hospital Nacional de Totonicapán in Guatemala. Despite the successful implementation of SABER into the Emergency Department, there remained several challenges to its complete usage. The Ministry of Health in Guatemala requires all patient charts to be documented on paper, thus the implementation of SABER into the Emergency Department required medical students to complete patient charts both in paper and electronically, creating the unideal situation of double work. In order to analyze the implantation of SABER and optimize the system for future use, we spent four weeks in Hospital Nacional de Totonicapán in Guatemala observing work flow, analyzing paper charts vs. electronic charts, conducting surveys of the medical staff, and communicating with the developers of SABER. We also worked as scribes and completed patient charts in SABER to

increase the amount of data that could be extracted for future use. We identified the sections of SABER that were not being completed by the Guatemalan medical students and implemented an updated version of SABER with these sections minimized in order to simplify the system. We found that the work flow for admitted patients was different from the work flow for non-admitted patients, so, working with the developers of SABER, we proposed a simpler electronic chart for non-admitted patients and a more extensive electronic chart for admitted patients. The long-term goal of this ongoing project is to prove to the Guatemalan Ministry of Health that a change from paper charts to electronic charts would lead to an improvement in the quality of health care. Our goal while in Guatemala was to strengthen this proposal by increasing the amount of data in SABER and suggesting future improvements to the system.

Poster #28
Female Military Physician Work-Life Balance

Joscelyn Seaton

Purpose: Female military physicians encounter challenges as they seek to fulfill their duties to family, patients, and the United States of America. The research team conducted interviews focused on work-life balance in order to gain insight as to how female military physicians have adapted their lifestyles in order to be successful full-time doctors while attending to extra-military obligations – family, friends, and hobbies.

Methods: Female military physicians were interviewed using a semistructured-question format with questions centered around five main themes: Work Hours and Patterns, Career Planning and Development, Spouse Relationship and Roles, Deployments/Relocation to New Duty Station, and Work-Life Balance. The phone interviews were recorded, transcribed, and analyzed through qualitative thematic analysis looking for commonalities and differences between the female physicians and their work-life balance.

Results: Eleven female military physicians were interviewed. The research team found several common themes among the physicians. First, the majority began having children in their 30s, noting that they did not feel established enough to have a child until after their residency and first military tour. Second, their spouses had more flexible jobs, allowing them to travel with their military wives more easily and to take care of children at home. The female physicians often described intense pre-marital discussions with their current spouses to see if they were prepared for the military lifestyle. Third, moves and separations associated with residencies, new duty stations, and deployments often evoked stress in them and their partners, as they sought new childcare, spousal employment, and community friendships. Fourth, the physicians noted the incredible amount of leadership opportunities in the military as opposed to the civilian sector. They had regular discussions with their spouses about how many hours they worked.

Conclusions: Female military physicians contribute significantly to military medicine. Often their military and medical work obligations require them to have an unconventional family structure, as their spouse and children must be ready to move every 2-3 years for a new duty station. The military should continue to expand its childcare arrangements, its support networks for military spouses, its mentors for female physicians, and its policies to accommodate more female military physicians who have families.

Poster #29
A Study of Probiotic and Fermented Food Consumption

Haley Smith

Introduction: There is currently a large field of study dedicated to the use of probiotics and fermented foods for the purposes of holistic, preventive and therapeutic medicine. It remains unclear to what extent and by which mediums this information reaches health care consumers, as well as how this information is integrated into their health and dietary decisions.

Purpose: The purpose of this study is to determine the general prevalence of – and certain motivations behind – probiotic and fermented food consumption among patients at family medicine clinics. Additional goals of the study are to assess familiarity with the term probiotics and to determine main sources of information about probiotics among these patients.

Methods: Participants (n=74) were recruited from adult patients in the respective waiting rooms of two UVA family medicine clinics: the UVA Primary Care Center and Stoney Creek Family Medicine. The survey collection period is August 22nd, 2017 - October 6th 2017.

Results: Demographic characteristics of participants to date: 68.9% of participants were women; 31.1%, men. Caucasians made up the highest proportion of those surveyed (55.4%), followed by African Americans (24.3%), and Asians/Pacific Islanders (9.5%). The majority of participants had obtained at least some college level education or more.

Discussion and Conclusions: Participant recruitment and survey distribution is still ongoing; the data collection period is August 22, 2017 to October 6, 2017. Full data analysis will be completed prior to November 1st, 2017.

Poster #30
Diagnostic Biopsy Rate of Small Renal Masses

Mark Sultan MS2, Jennifer M. Lobo PhD, Tracey L. Krupski MD MPH

Introduction: Small renal masses within 7 cm may be treated with percutaneous radiofrequency ablation, partial nephrectomy, radical nephrectomy, or active surveillance. For clinicians, counseling patients is difficult when suspicious of a lesion's malignant spread. One potential way for physicians to reduce uncertainty is to biopsy. We sought to delineate rates of diagnostic biopsies and their histological spread within the University of Virginia Health System.

Methods: In an IRB approved project, data was collected between April 2015 to June 2017. A total of 175 patients were discussed in a multidisciplinary SRM Conference at the University of Virginia. Individualized patient data was collected in an effort to trace outcomes from diagnosis onward, including biopsy pathology and frequency of diagnostic rates.

Results: Of the 175 total patients, 118 core biopsies were performed. Of those, 110 (93.2%)

were diagnostic and 8 (6.8%) were not. The most common small renal mass diagnosis was a clear cell renal cell carcinoma (RCC) making up 52 (44.1%) of core biopsies. Though benign lesions such as an oncocytoma are possible, 31 (26.3%) biopsies indicated a different RCC subtype, primarily papillary.

Variable		Core (N=118)
Diagnostic (%)	Yes	110 (93.2)
	No	8 (6.8)
Histological Category (%)	Atypical Cells	8 (6.8)
	Benign/Fibrosis	13 (11.0)
	Clear Cell RCC	52 (44.1)
	Oncocytoma	11(9.3)
	Other RCC Subtype	31 (26.3)
	Other Neoplasm	3 (2.5)

Conclusion: Core biopsy utilization works well to aid in physician-patient shared decision making. With a diagnostic rate over 90%, core biopsy application may be critical to small renal mass management.

Poster #31
Use of MRI in risk stratification, diagnosis, and monitoring of Pediatric Non-alcoholic Fatty Liver Disease

Zachary Swenson and Lydia Kuo-Bonde

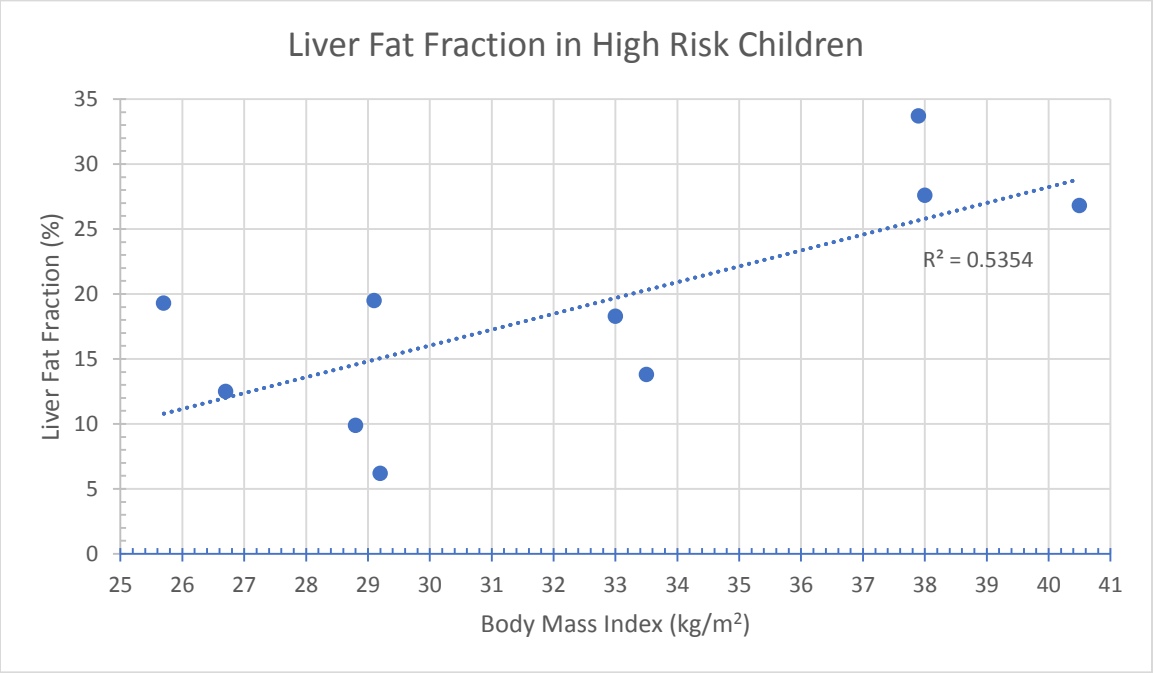
Introduction: Non-alcoholic fatty liver disease (NAFLD) is now the most common form of pediatric chronic liver disease. This disease can have profound effects on overall health and is associated with diabetes, heart disease, and an increased risk of hepatocellular carcinoma. The exact pathogenesis of NAFLD remains poorly understood, though it is known to progress to various chronic liver diseases, the most prevalent being hepatic fibrosis. The current gold standard for quantifying fat in the liver is via a core biopsy, which is expensive and carries an inherent risk of morbidity and mortality which makes it unsuitable for screening and monitoring purposes. We propose that MRI can be an effective, fast, and non-invasive method of screening and monitoring pediatric NAFLD. This would allow for earlier diagnosis and monitoring of pediatric NAFLD which would aid in treatment and management of this disease.

Methods: Children between the ages of 7 and 17 years old with a BMI > 85th percentile were recruited and consented for a fast MRI. Each of these patients underwent a limited MRI of the abdomen which included a Multi-echo 2-point Dixon imaging protocol covering the liver using a 3T Skyra MR-scanner (Siemens, Germany). The liver proton density fat fraction (PDFF) is calculated based upon the multi-echo method estimation where the fat fraction is based upon multiple pairs of opposed phase and in-phase echoes.

Results: Preliminary data in 10 patients shows that in a high risk pediatric population (BMI > 85th percentile) signs of NAFLD are present. The fat fraction in these patients ranged from 6.2% to 33.7% (Table 1). A fat fraction of >5% is generally considered to be pathologic with higher numbers indicating more severe disease.

Conclusions: In a high risk pediatric population (BMI >85th percentile), MRI can be used as a fast and non-invasive way of screening for pediatric NAFLD. This can be used to provide earlier diagnosis and monitoring of pediatric NAFLD helping to treat and manage this disease.

Table 1



Poster #32
Novel Diagnostic Methods in the Diagnosis of Blood Pressure Sensitivity to Salt

Nicole Thieken

Blood pressure sensitivity to salt is present in approximately 25% of adults which can predispose these individuals to an increased incidence of strokes, heart attacks, and renal failure. While salt sensitivity can be a risk factor for elevated blood pressure (hypertension), it is also a stand-alone risk for increased mortality independent of hypertension. As understanding of hypertension grows, there is a strong need for better testing and management approaches that incorporate new findings and diagnostic tests, including those for salt sensitivity. These diagnostic and management plans must be readily and easily accessible for physicians and patients.

Our hypothesis is that novel diagnostic tests coupled with dietary interventions can yield data that would provide patients with a personal cardiovascular index that could guide their choice of appropriate healthy lifestyles. We will use our novel diagnostic tests in an NIH funded prospective, randomized high and low sodium dietary protocol in 400 participants over the next 4 years. The protocol will follow a genetic analysis of subjects that are placed on a one week diet of low salt and a one week diet of high salt to examine the relationship between genetic variants and salt sensitivity. Previous research has suggested there is a genetic component to salt sensitivity in which possession of certain genetic variants may predispose an individual to

reduced sodium excretion. The genes *SLC4A5* and *GRK4* are two candidates whose products act in sodium excretion systems in the kidney. Novel diagnostic methods that use a combination of gene variant analysis, cell based assays of living renal cells excreted in the urine, exosomal micro RNA patterns, and blood pressure responses to controlled salt diets will be interpreted using a cloud based app. Thus, we hypothesize that our proposed tool that will allow any physician to provide a personalized and accurate cardiovascular health assessments and appropriate therapeutic regimen if necessary.

Poster #33
An Adaptive Mathematical Model of Atrial Cardiac Myocytes

Shawn Tsutsui, ScB, U.Va. SMD 2020
Vivek Iyer, MD MSE, Columbia University Medical Center

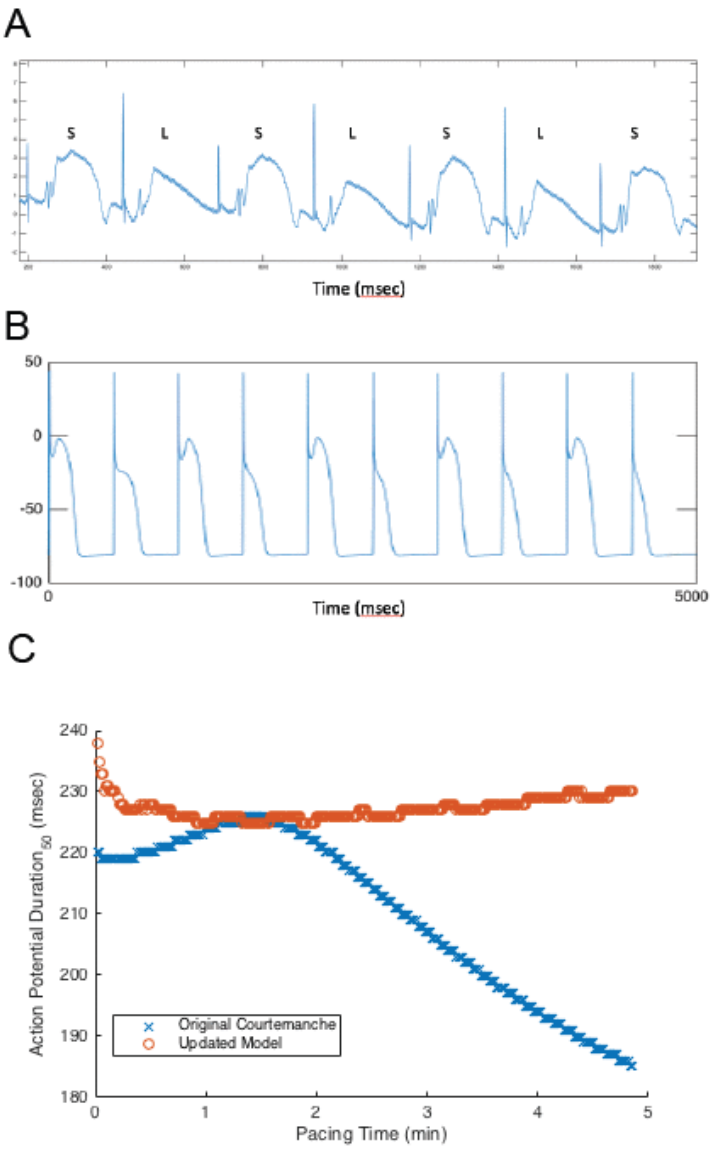
INTRODUCTION: Cell-based computational models have contributed to our understanding of human atrial fibrillation (AF), but remain limited by computational intractability for 3D simulations and/or inadequate reproduction of critical human atrial cardiomyocyte behaviors. Here, we describe an improved cell-model that preserves computational tractability while adding biophysical details critical for the study of AF.

METHODS: We modified the Courtemanche model (1998) to include local control of subsarcolemmal sodium, saturation mechanisms for the sodium-calcium exchanger, and an improved calcium handling system that incorporates subspace calcium and a common pool model of the ryanodine receptor, resulting in improved excitation-contraction coupling behavior, and compared the results to clinical responses.

RESULTS: These modifications show rapid sodium equilibration and adequate computational speed while replicating important dynamic behaviors observed in monophasic action potentials (see figure): cardiac alternans (implicated in the initiation of AF) and appropriate refractoriness in response to single and dual extrastimuli. The model exhibits action potential duration stability over long-term pacing ad is adapts rapidly to dynamic changes in cycle length, unlike previously published atrial models.

CONCLUSIONS: This model of the human atrial cell maintains computational efficiency while including important biophysical details implicated in arrhythmia formation. With the aforementioned updates, the model exhibits an accurate reflection of sodium-mediated calcium control and cardiac alternans. Paired with intracardiac monophasic action potential and extrastimulus refractory period data that we are currently collecting, we can readily see this model applied to tissue-level simulations. With appropriate constraining to patient data, this model can be used to quickly generate custom models to match individual patient physiology.

FIGURE



A. Monophasic action potential recordings exhibiting alternans of short (S) and long (L) beats.
B. Model-generated action potential tracings showing alternans behavior.
C. Action potential duration response to 1 Hz pacing comparing the original and new models.

Poster #34
Family Reading Behavior in a Pediatric Clinic

Laura Walsh

Literacy skills are essential to success as an adult; a high level of literacy improves academic, occupational, and social success. Those with poor literacy skills are at an increased risk for poverty, decreased productivity, increased teenage pregnancy, and increased welfare dependence. Literacy skills, which are so important for success later in life, begin to develop in

infancy, long before children reach school age. The early development of language and literacy skills is greatly affected by home environment, parent behaviors, and socioeconomic status. Parents from higher socioeconomic backgrounds speak to their children more often and in more complex ways, helping their children to acquire a more complex set of vocabulary. In contrast, children who live in poverty are more likely to be raised in a “poor-quality home linguistic environment”. Reading aloud by parents is important in building the foundation for success in reading. Reach out and Read (ROR) is a nonprofit program that aims to incorporate books into pediatric primary care and encourage parents and children to read aloud together. Reading aloud to children from ages 4 months to 5 years improves children’s’ vocabulary and sets them up for success in school. Parents who received ROR education are more likely to look at books with their children. The goal of the ROR program is not simply to provide children with a book at the end of a visit. Rather, a carefully orchestrated patient interview strategically incorporates books into each visit, allowing the physician to educate parents and assess child developmental milestones. It is critical to provide training to residents and physicians so that patients can reap the benefits from the ROR program. The aim of the current study is to examine whether resident training improves parent understanding of the importance of reaching to children. Parents of pediatric patients will be surveyed at regular clinic visits after pediatric residents have received ROR training. Parents will be asked questions aimed at analyzing how often they read to their children. This study will use a survey to obtain an understanding of parents’ behaviors towards reading to their children. Parents of young pediatric patients will complete a brief written survey. The survey will assess how often parents read to their children, what their favorite activities are to do with their children, and whether they have received guidance from their pediatrician on early literacy promotion. Surveys from the parents of children over two weeks old will be compared to those from the parents of children old. Parents of children less than two weeks old do not receive ROR information in the clinic, and will serve as a control group. Data is currently being collected in the clinic and will continue to be collected until February 2018.

Poster #35
Subnuclear compartmentalization modulates early events in double-strand break repair in *S. pombe*

Robert Wharton

A double-strand break (DSB) in the genome represents a significant lesion that must be repaired, and cells maintain diverse pathways of DSB repair. There is increasing evidence that positioning of DSBs within the nucleus may modulate their repair. In order to characterize two early steps that commit a DSB to repair by homology-directed repair (HDR), resection and repair protein loading, we created an *in vivo* fluorescence microscopy assay tethered to the nuclear periphery to monitor repair events in real time. DSBs are targeted to an HO endonuclease cut site downstream of a LacO/LacI-GFP array, which is tethered to the nuclear envelope by the GFP binding protein fused to an inner nuclear membrane protein. The progress of resection is visualized as LacI-GFP is evicted from single-stranded DNA and repair proteins tagged with mCherry load processively. We found that DSBs tethered to the periphery resected faster, indicating that the peripheral environment could promote resection mediated by faster long-range exonucleases or that changes in nucleosome turnover affect repair rate at the periphery. We also observed that Rad52 and Ssb2 foci have reduced intensity at the periphery, but return to normal intensity when DSBs are untethered and allowed to return to the nuclear interior. This finding suggests that Rad52 and Ssb2 are prevented from loading in a reversible

fashion at the periphery. Together these results demonstrate that the nuclear periphery is a distinct compartment that influences the course of DSB repair.

Poster #36
D_5 Receptor Stimulation and Src Product Phosphorylation

Janet Zhang

The renal dopaminergic system's involvement in sodium balance has been a topic of ongoing interest since 1979, due to its ability to regulate 75% of sodium excretion under conditions of high sodium load in the renal proximal tubules. The D_1R and D_5R dopamine receptors are the most relevant to this process, and have been shown to play a role in down regulation of the AT_1R, which in turn has been shown to have an anti-natriuretic response. In particular, Src has been speculated to play an important role as an intermediate in the D_5R pathway. We tested the hypothesis that stimulating the D_5R pathway with losartan (angiotensin II antagonist) and fenoldopam (dopamine partial agonist, 1μM) would increase the phosphorylation of Src products, caveolin 1 (Cav1) and protein phosphatase two A (PP2A). In order to confirm that Src is not involved in the D_1R pathway, two renal proximal tubule cell lines were used—one with a mutation that uncoupled the D_1R receptor from its cAMP second messenger, and one with a normal variant of the D_1R (and D_5R) pathways. We hypothesized that if Src were in the D_5R pathway, one would not expect to see a difference between the coupled and uncoupled cell lines. Each cell line received 4 conditions: incubation with losartan, fenoldopam, both, or none. Cells were then stained with primary rabbit-derived antibodies against Y14 Cav1 and Y307-PP2A, and then with secondary anti-rabbit antibodies. A plate reader was used to quantitatively determine the fluorescence intensity of p-Cav1 and p-PP2A, and fluorescence imaging was used to confirm successful phosphorylation. Each condition for each cell line was compared to the baseline (no drug incubation) to assess for a difference in Src product phosphorylation. Although general trends showed that incubation with either drug alone did result in an increase in phosphorylation of Cav1 and PP2A, the standard deviation of the data for the coupled cell line was too high to conclude anything significant for the D_1R-coupled cell line. Surprisingly, adding both fenoldopam and losartan together resulted in fluorescence intensities similar to not adding any drugs. Examination under light microscope revealed that many of the cells given the double drug incubation had died. Future studies should confirm the trend seen here, and further explore the interplay between losartan and fenoldopam, if any, on survivability of renal proximal tubule cells. Furthermore, the localization of Cav-1 also was noted to be unique, possibly localized to the proximal tubule brush border. Future studies should confirm this localization, as it would be a novel finding.