Fifteenth Annual Medical Student Research Symposium

Pinn Hall
University of Virginia School of Medicine
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Poster #1
Eosinophil Mediators in Nasal Washes Obtained During Experimental Infections with Rhinovirus-16 in Subjects with and without Asthma
Evan Rajadhyaksha

Rationale: Rhinovirus (RV) infections frequently cause asthma exacerbations in children and young adults. Mechanisms, including the capacity of RV to stimulate Th2 related responses, remain unclear.

Methods: Sixteen subjects (ages 19-33) were inoculated with RV-16 (dose = 300 TCID\(_{50}\)). They included 9 allergic-asthmatics (AA; total IgE levels 596-1989 IU/ml), and 7 non-atopic controls without asthma (total IgE levels 5 to 42 IU/ml). Eosinophil mediators (ECP [Phadia AB] and EDN [MBL International Corporation]) were measured by ELISA in nasal washes (NW’s) obtained before and during the infection. The results were analyzed in relation to symptoms.

Results: Both ECP and EDN peaked by day 3, paralleling cold symptoms over the first 4 days of the infection. Cumulative values derived from morning NWs during the first four days were significantly higher among AA subjects than controls for ECP: GM = 292 ng/ml and 56 ng/ml, respectively, p < 0.05, and higher, but not different statistically for EDN: GM = 487 ng/ml and 276 ng/ml, respectively, p = 0.47. Compared to baseline values (determined before inoculation), mediator values in NW’s increased 12-fold for ECP and 9-fold for EDN by day 3 in the AA. By comparison, ECP and EDN levels increased 4-fold and 5-fold, respectively, among controls.

Conclusions: The increase in eosinophil mediators (ECP and EDN) in nasal washes after RV inoculation was notably greater in the allergic-asthmatics than controls, but the results indicate that RV may also have the capacity to stimulate a Th2-related eosinophil response in the non-allergic, non-asthmatic host.

Poster #2
Uncovering a potential role for GOLPH3L in melanoma susceptibility
Michael A. Kovacs

Cutaneous melanoma is the most aggressive form of skin cancer, accounting for nearly 50,000 deaths worldwide each year. Because the heritability of this cancer is relatively strong (estimated at 55%), characterizing the genetic mechanisms underlying susceptibility could allow us to better understand the pathways involved in early-stage melanomagenesis. In recent years, genome-wide association studies have served as a powerful tool for identifying common germline variants linked to disease risk. One genomic locus found to be associated with melanoma risk (OR = 0.89) is located on chromosome band 1q21.3 and encompasses seven genes over a 400-kilobase range. Consistent with the finding that most risk-associated variants are located in non-coding regions of the genome, the vast majority of the nearly 400 risk variants in strong linkage disequilibrium (LD) with the lead SNP, rs12410869, are intronic or intergenic, suggesting that the risk variants are likely to be gene-regulatory, modulating promoter or enhancer activity. In this study, we examine the functional impact of risk variants linked to rs12410869 on local gene expression patterns. We nominate GOLPH3L, which encodes a Golgi trafficking protein and is a genetic paralog of the oncogene GOLPH3, as a candidate melanoma susceptibility gene. We provide evidence that GOLPH3L transcription is positively correlated with risk allele dosage in melanoma tumors and cell lines. We also offer preliminary data from an experiment that examines the effect of GOLPH3L overexpression on the proliferation status of TERT-immortalized BRAFV600E-expressing melanocytes. Finally, gel shift assays reveal that three GOLPH3L promoter variants in strong LD with rs12410869 interact
with DNA-binding proteins in an allele-specific manner. Taken together with the discovery that these variants are also methylation quantitative trait loci for the GOLPH3L promoter, these data suggest a potential mechanism through which risk variants could mediate susceptibility at the 1q21.3 locus.

**Poster #3**  
**A Medical Mystery: Unexplained Renal Failure in the Burn Unit**

Harrison Lands, B.A.

In the late 1970s, emergence of resistant bacterial strains to the topical antimicrobial silver sulfadiazine occurred at the University of Virginia Medical Center. In a search for an alternative, a topical antimicrobial with known coverage of *Pseudomonas aeruginosa*, Furacin Soluble Dressing (Furacin), was substituted. However, Furacin produced an unexpected toxicity syndrome of hyperosmolality, metabolic gap acidosis, hypercalcemia, and ultimately renal failure. In the article, we review the patient symptoms and medical investigation that occurred to uncover this medical mystery. The polyethylene glycol base of Furacin was being absorbed through the burn wounds and causing the toxicity syndrome and is therefore no longer used at the University of Virginia Medical Center. The Federal Drug Administration has since issued a bulletin cautioning against using Furacin in burn patients with renal dysfunction and added a warning statement to Furacin, yet the product is still used at many institutions.

**Poster #4**  
**Beyond number of brain metastases: Evaluating the impact of brain metastasis location and relative volume on overall survival after stereotactic radiosurgery**

Ashley Emery

**Purpose/Objectives:** Despite understanding that some centers of the brain are critical to life-sustaining function, most prospective evidence informing on therapy for patients with brain metastases uses the number of brain metastases, rather than location, as the main inclusion criteria. We sought to evaluate the impact of tumor location and volume on overall survival (OS) among a large cohort of patients treated with stereotactic radiosurgery (SRS).

**Methods and Materials:** Clinical, radiographic, and dosimetric data were collected on 300 patients treated with SRS for brain metastases at our institution. Patients treated with SRS multiple times had only their first course included. Multivariate analyses were performed to investigate the impact of relative brain metastasis location and volume on OS following SRS.

**Results:** Three hundred patients with 794 tumors were included in the analysis (116 with a single tumor). The most common tumor location was supratentorial (75% of tumors), then infratentorial (19%), and brainstem (5%). Median tumor volume was 0.4 mL (range 0.003-65.0 mL). Clinical factors associated with inferior OS duration included patient age ($p = 0.004$), gastrointestinal tumor origin ($p < 0.001$), and active extracranial disease ($p < 0.001$). Tumor-specific factors associated with inferior survival OS included brainstem tumor location ($p < 0.001$), and large supratentorial tumors ($p = 0.004$). Patients with supratentorial tumors and infratentorial tumors demonstrated similar survival.

**Conclusions:** Informing prognosis in patients with brain metastases is difficult because of the inherent heterogeneity in this patient population. Our results confirm that patients with brainstem metastases and large supratentorial tumors demonstrate inferior survival compared to their
counterparts. These results can be utilized to inform patient prognosis and clinical trial design in the future.

Poster #5
Transition from low to high dose-rate brachytherapy for cervical cancer: Evaluating disease control, survival, and toxicity

Kelly J. Pugh

Purpose: In 2012, our institution transitioned from low dose-rate (LDR) brachytherapy exclusively to high dose-rate (HDR) brachytherapy. This analysis reports the clinical outcomes of cervical cancer patients treated with brachytherapy at our institution over a 10 year period.

Methods: From 2004-2014, 258 women (184 LDR, 74 HDR) were treated with tandem & ovoid brachytherapy as part of the comprehensive management of cervical cancer FIGO stages IA-IVB. Clinical and treatment-related prognostic factors including age, stage, smoking status, relevant doses, and acute and chronic toxicity data were recorded.

Results: For all stages the 2 year local control (LC); and overall survival (OS) rates were comparable between the LDR and HDR groups (87% vs. 81%, \( p = 0.12 \); and 75% vs. 85%, \( p = 0.16 \)), respectively. Factors associated with OS, which remained significant on multivariate analysis, include age, stage, and nodal involvement. On multivariate analysis, severe toxicity (acute or chronic) was higher with HDR than LDR (24% vs. 10%, \( p = 0.04 \)).

Conclusions: This comparative retrospective analysis of a large cohort of women treated with brachytherapy demonstrates no significant difference in OS or LC between the LDR and HDR. Acute and chronic toxicity increased shortly after the implementation of HDR, highlighting the importance of continued refinement of three-dimensional HDR brachytherapy methods, especially with the use of MRI-guidance.

Poster #6
CAD/Ischemic Heart Disease

Franck Azobou Tonleu

Background: Impaired myocardial perfusion reserve (MPR) is prevalent in obesity and diabetes, can occur in the presence or absence of obstructive coronary artery disease (CAD), and portends a high risk of adverse cardiac events. The mechanisms underlying impaired MPR in the absence of CAD are not completely understood and therapies are not well established. We recently showed that mice fed a high fat diet (HFD) are a model of obesity, diabetes, impaired MPR without obstructive CAD, and coronary microvascular disease. Here, we used CMR and other methods to test the hypothesis that Eplerenone (EPL), a mineralocorticoid receptor antagonist, protects the microvasculature and prevents impaired MPR in HFD mice.

Methods: Untreated (n=11) and EPL-treated (n=8) HFD mice were studied. HFD (60% calories from fat) was initiated at 6 weeks of age and continued for 24-26 weeks. In the treatment group, EPL (100 mg/kg) was added to the HFD chow. CMR (7T Clinscan, Bruker) was performed week 24.2 weeks after the start of HFD. CMR included multi-slice short-axis cine imaging covering the left ventricle (LV) for the assessment of LV volumes, ejection fraction, LV mass and LV end-diastolic wall thickness (LVWT), short-axis cine DENSE in a mid-ventricular slice for the assessment of strain (Ecc), AND first-pass gadolinium-enhanced CMR at rest and after Regadenoson (0.1 \( \mu g/g \) body weight) for the assessment of perfusion and MPR. Glucose tolerance tests (GTTs) were also performed. After euthanasia, perivascular fibrosis was
quantified using Masson Trichrome staining, and mesenteric arteriolar compliance was measured using pressure arteriography.

**Results:** No significant differences were found in body weight, glucose tolerance, LV structure and LV systolic function between groups. However, parameters related to microvascular disease were different. Specifically, while rest and stress perfusion were not different, MPR was significantly higher for EPL-treated mice (Fig.1), with a value similar to previously-studied mice fed a low-fat diet (1). Similarly, there was significantly less perivascular fibrosis and greater arteriolar compliance in EPL-treated mice (Fig.2).

**Conclusion:** CMR, histology and vascular compliance demonstrate that EPL protects the microvasculature and prevents impairment of MPR in HFD mice. Future studies are warranted to explore treatment with mineralcorticoid receptor antagonism and investigate cellular and molecular mechanisms.

**Poster #7**

**Withdrawn**

**Conclusion:** This study demonstrates that previous foregut surgeries make subsequent RYGB more technically difficult, with a high rate of conversion to an open operation and increased perioperative morbidity. However, patients have no long-term complications, maintain a robust %EBMIL, and have a significant reduction in GERD symptoms in the postoperative period. Therefore, while previous foregut surgery makes the operation more technically difficult, in experienced hands it is still feasible to perform safe and effective RYGB.

**Poster #8**

**Expanded Clinic-Based Mental Health Services: Association with HIV Viral Suppression**

Raina Aggarwal

**Background:** The University of Virginia Ryan White HIV Clinic increased clinic-based mental health (MH) services including substance use counseling in 2013. Evaluating this change provides a unique opportunity to assess MH services’ effects on HIV outcomes. The aims of this study are to characterize the changing demographics of the people living with HIV (PLWH) who initiated MH care and to determine the effect of MH services on HIV outcomes, specifically engagement in care and HIV viral suppression.

**Methods:** The cohort included PLWH who received clinic-based MH services 2012-2014. Cohorts A and B initiated MH care before or during 2012 and during 2013-2014 respectively. Demographics were analyzed using t-tests and chi-square tests. For Cohort B, clinical outcomes (pre/post MH care initiation) were compared using paired t-tests and McNemar’s test.

**Results:** Cohort A (n=130) represents 19% of all 2012 clinic clients; Cohort B includes 182 subjects. By 2014, 41% of all clinic clients had established MH care. MH visits increased from 385 in 2012 to 941 in 2013 and 1183 in 2014. Compared with Cohort A, Cohort B had almost three times the number of subjects with CD4 counts below 200 (p=0.024). 96% of Cohort A had been prescribed antiretroviral therapy (ART) at the time of MH care initiation compared with 81.9% for Cohort B (p=0.009). About a third of Cohort B had detectable viral loads compared to less than 20% of Cohort A (p=0.014). Patients in Cohort B received more substance use diagnoses in the year following MH care initiation compared to
Cohort A (p=0.005). For patients in Cohort B who had established HIV medical care at least one year before establishing MH care (n=88), the number of HIV medical visits in the years before and after MH care initiation were not significantly different. For those in Cohort B who had HIV viral loads in the year before and year after MH care initiation (N=170), 43% had detectable viral loads before establishing MH care. The viral suppression rates in the year before and after were 57% and 87% respectively (p<.001).

Conclusions: The data indicate PLWH who gained access to expanded MH services in 2013-2014 had lower CD4 counts. They were more likely to not yet be prescribed ART and to have a detectable viral load. Importantly, initiation of MH services was associated with increased rates of viral suppression. Increased access to co-located mental health and substance use services helped high risk PLWH achieve optimal HIV outcomes.

Poster #9
Utility of Physical Disability Outcome Measures in Pediatric-Onset Multiple Sclerosis

Hitoshi Koshiya

OBJECTIVE: Assess the utility of timed walking tests in pediatric-onset multiple sclerosis (POMS) subjects with comparison to healthy controls.

BACKGROUND: Multiple sclerosis (MS) is an inflammatory, autoimmune disease of the central nervous system that can manifest in childhood. Compared to adult-onset MS (AOMS), pediatric-onset MS (POMS) patients exhibit a more inflammatory disease course with a higher frequency of clinical relapses, a greater burden of infratentorial lesions, and an overall higher brain lesion volume (1-3). Gait impairment is common in MS patients and timed walking tests (e.g., timed 25-foot walk [T25FW]) have been utilized in AOMS as objective measures of physical disability and motor fatigue. Though the T25FW is anecdotally considered unreliable in POMS, its use is widespread in POMS clinical trials (4-8). No study has assessed the utility of adult MS timed walking tests within a POMS population.

METHODS: 15 POMS and 50 healthy control subjects were recruited to complete surveys on physical activity (International Physical Activity Questionnaire [IPAQ]) and various factors affecting activity levels (including Modified Fatigue Impact Scale [MFIS], MS Fatigue Severity Scale [MSFSS]). All subjects also completed the MS Functional Composite (MSFC) and 3 ambulatory tests: T25FW, 2-minute walk (2MW), and 6-minute walk (6MW).

RESULTS: Demographics (including age, sex, body mass index, smoking history) were well-matched between groups. Perceived fatigue was statistically higher in POMS subjects as measured by the MSFSS (p=0.04) and the physical subscale of the MFIS (p=0.01). Subjective measures of physical activity (IPAQ) were strikingly similar (p=0.95) between groups. POMS subjects took significantly longer to walk 25 feet (T25FW) compared to controls (4.3±0.7 versus 3.8±0.6 seconds; p=0.02). Additionally, POMS subjects walked a significantly shorter distance on the 6MW (2049.9±215.0 versus 2223.8±292.8 feet; p=0.04), but distance achieved between groups was not significantly different on the 2MW (716.7±76.1 versus 767.2±98.7 feet; p=0.07).

CONCLUSIONS: Preliminary data demonstrates that POMS subjects subjectively experience more fatigue but do not perceive a lower level of physical activity compared to healthy peers.
Additionally, the T25FW and 6MW are potentially useful measures in the context of a POMS subject.

**Poster #10**  
**Physician awareness of laryngeal stenosis risk factors in the intensive care unit**  
Sergio Ferrante

Laryngeal stenosis (posterior-glottic stenosis or PGS) is a potentially life-threatening complication of endotracheal intubation involving narrowing of the airway at the level of the vocal cords. To analyze how familiar critical care physicians are with risk factors for developing PGS, we surveyed 92 University of Virginia physicians specializing in anesthesiology, general surgery, pulmonology, and cardiology and analyzed their responses to 10 questions relating to intubation and tracheostomy practices. These data reveal that a substantial proportion of physicians prefer an endotracheal tube size exceeding 7.5 for males and 7.0 for females, which has been shown to increase the risk of PGS. In addition, over a quarter of physicians surveyed preferred more than 10 days of intubation before conversion to tracheostomy with 31% of respondents citing proceduralist availability as a reason for delay of tracheostomy. Finally, 35% of physicians surveyed responded that they were “Not knowledgeable” with regard to intubation risk factors for PGS development.

**Poster #11**  
**Can Surgeons Still Be Scientists? Productivity Remains High Despite Competitive Funding**  
Adishesh Narahari

**Objectives:** Today’s declining federal budget for scientific research is making it more difficult to become federally funded. We hypothesized that even in this era, surgeon-scientists have remained among the most productive and impactful researchers in lung transplantation.  
**Methods:** Grants awarded by the NIH for the study of lung transplantation between 1985 and 2015 were identified by searching the National Institutes of Health Research Portfolio Online Reporting Tool Expenditures and Results (NIH RePORTER) for: lung preservation, ischemia reperfusion, ex vivo lung perfusion, anti-rejection medication, and airway healing. Every paper resulting from the grants was assigned the impact factor (Journal of Citation Reports 2014) for the journal in which it was published. A grant impact metric was calculated for each grant by dividing the sum of impact factors for all associated manuscripts by the total funding for that grant. Grant impact metrics were compared by department with univariate analysis.  
**Results:** One hundred and eight lung transplantation grants were identified, totaling approximately $300 million, resulting in 2,300 papers published in 421 different journals. Surgery departments received $102.5 million over a total of 27 grants, while Internal Medicine departments received $118.8 million over 42 grants. Surgery has a median grant impact metric of (4.2 per $100,00; Figure 1) which is significantly higher than private companies (p < 0.0001) but no different compared to all other medical specialties (all p > 0.05; Table 1).  
**Conclusions:** Surgery and Internal Medicine departments have received the majority of NIH funding in lung transplantation. However, surgeons have comparatively been awarded fewer grants and less total funding while maintaining a equally high level of productivity and impact.
Poster #12
Long-term Survival After General Surgery: Implications For Accountable Care Organizations
Max Meneveau

Background: Increasingly, patients are faced with farther travel distances to undergo bariatric surgery at high-volume centers.
Objective(s): This study sought to evaluate the impact of travel distance on access to care and outcomes following bariatric surgery.

Methods: Patients who underwent Roux-en-Y Gastric Bypass (RYGB) from 1985-2004 were examined and stratified by patient travel distance. Univariate analyses were performed for preoperative risk factors, 30-day complications, and long-term (10-year) weight loss between “local” defined as <1 hour travel time and “regional” defined as >1 hour travel time. Survival analysis was performed with Kaplan-Meier and Cox proportional hazards models.

Results: 650 patients underwent RYGB, 316 (48.6%) of whom traveled <1 hour to undergo surgery and 334 (51.4%) traveled >1 hour. Median BMI between the groups was equivalent (52.9 kg/m2 local, 53.2 regional kg/m2, p=0.76). Patients who traveled longer distances had higher rates of preoperative comorbidities, including COPD, CHF, DM, and sleep apnea (all p<0.05). Complications within 30 days of surgery and long-term reduction of excess BMI were equivalent between groups. Travel time was an independent predictor of risk-adjusted reduced long-term survival (HR 1.23, p=0.0002).

Conclusions: A majority of patients who underwent bariatric surgery at our center traveled more than one hour. Despite longer travel time for care, 30-day complications and long-term weight loss were equivalent compared to local patients. As expected, patients who live in close proximity were more likely to adhere to yearly follow up in surgery clinic. Travel time was an independent predictor of risk-adjusted reduced long-term survival.

Poster #13
Shunt-Dependent Hydrocephalus after Aneurysmal Subarachnoid Hemorrhage: Predictors and Long-Term Functional Outcomes
Gabriella Paisan

Object: Although chronic hydrocephalus requiring permanent CSF diversion is a common complication of aneurysmal subarachnoid hemorrhage (aSAH), its effect on long-term functional outcomes is incompletely understood. This single center retrospective study aims to (1) determine baseline factors that are predictive of developing post aSAH shunt-dependent hydrocephalus, (2) identify factors associated with shunt-related complications after permanent CSF diversion procedures in aSAH patients, and (3) determine the effect of post-aSAH shunt dependence on functional outcomes.

Methods: A retrospective chart review of all patients presenting to the University of Virginia Health Center from 2000-2015 with a diagnosis of aneurysmal subarachnoid hemorrhage was performed. The baseline factors at presentation and follow up of the patients were documented and described.
Results: The results of the statistical analysis showed that older age, higher WFNS, Hunt & Hess, and Fischer grades; lower GCS, vasospasm, aneurysm in the posterior circulation, clipping, and intraventricular hemorrhage were all predictive of developing shunt-dependent hydrocephalus. Risk factors associated with the development of shunt complications included vasospasm, aneurysm in the posterior circulation, and a higher WFNS score. We also found that patients receiving shunt had significantly worse long-term functional outcomes than patients without shunts.

Conclusion: Patients with shunt-dependent hydrocephalus after aneurysmal subarachnoid hemorrhage tend to have worse long-term functional outcomes. The study also identified several factors that increase the risk for developing shunt-dependent hydrocephalus and developing shunt complications.

Poster #14
Relative Mortality Analysis of Trauma Patients Requiring Emergency Surgery at a Level 1 Trauma Center

Christopher Cramer

BACKGROUND: We compared relative mortality between patients who spent varying times in the Emergency Department (ED) before admission into the Operating Room (OR). The Relative Mortality Metric (RMM) is used to perform a relative mortality analysis, which compares anticipated and actual mortality across the spectrum of injury. We hypothesize that patients with greater ED times will have a higher relative mortality.

METHODS: Using the trauma database of a level 1 trauma center, 4719 patients were identified who were admitted to the OR from the ED and had their total time spent in the ED recorded between 2009-2014. Patients were grouped by Time_{inED} \leq 2 hours (n=1386) or Time_{inED} > 2 hours (n=3333). RMM analysis was performed. The RMM is a number between -1 and 1; higher values reflect superior relative survival.

RESULTS: For the two subpopulations Time_{inED} \leq 2 hours and Time_{inED} > 2 hours, RMMs of 0.3217 and 0.5814 were calculated, respectively. This demonstrates outperformance across both groups compared to expected mortality (RMM>0), however, patients who spent >2 hours in the ED before going to the OR outperformed the group who spent < 2 hours. This rejects our hypothesis that patients who spend more time in the ED have greater relative mortality than those who spend less time before being admitted to the OR. The figure demonstrates significant improved survival for Time_{inED} > 2 hours group for probabilities of survival from 0.2 to 0.5.

CONCLUSIONS: The RMM proves to be a valuable asset in identifying areas to improve performance. Our research suggests among trauma patients receiving emergency surgery, those who spend less than 2 hours in the ED before going to the OR actually have a higher relative mortality than those who spend more than 2 hours in the ED. This suggests that increased ED time does not necessarily lead to increased relative mortality in these groups.

Poster #15
Gauging the Impact of Pediatric Vaccination Records on Parental Engagement and Understanding of Vaccination

Jessica Little

INTRODUCTION: Despite definitive efficacy, childhood vaccinations in the U.S. are often withheld as a result of parental preferences. We believe that these preferences may stem from
fear rooted in a lack of understanding. In this study, we aim to evaluate the impact of physical vaccination records on parental understanding of child vaccination.

METHODS: We surveyed parents of pediatric patients at our institution’s outpatient pediatric clinic from February 2014 - December 2015. Surveys consisted of 19 questions presented in yes-no, rating-scale, closed-ended, and open-ended formats. Surveys were orally administered, and required approximately 10 minutes to complete. Primary outcomes included the proportion of parents citing possession of vaccination records for their children, the characteristics of these records, and the impact of the possession and characteristics of these records on parental awareness of vaccination schedules. Secondary outcome included feedback regarding a vaccination record prototype.

RESULTS: 92 parents were surveyed; 64 parents cite physical possession of vaccination records for their children. Most parents (86%) characterize their records as “easy to use”, and 75% report that their records include only past, rather than past and future vaccinations. On a 1-10 scale with 10 being the highest, parents with vaccination records rated their understanding of their child’s vaccination schedule at 8.18 ± 2.03 (mean ± 1 SD), while parents without vaccination records rated this understanding at 7.11 ± 2.39 (mean ± 1 SD) (p=0.037). Also, parents with vaccination records including past and future vaccines, rather than only past vaccines, were more likely to describe themselves as aware of their child’s vaccination schedule (p=0.001), and better able to name their child’s previous (p=0.021) and next (p=0.006) vaccinations.

DISCUSSION: Parents in possession of vaccination records demonstrated increased awareness of vaccination schedules, and parents with records listing both past and future vaccines were more likely to recall past and future vaccinations. As electronic medical records have emerged, the prevalence of tangible and comprehensive child vaccination records has diminished. Our results demonstrate that physical vaccination records may provide an opportunity to increase parental awareness of vaccination schedules as well as improve education surrounding child vaccination in general.

Poster #16
Predicting post-concussion syndrome: a retrospective analysis of risk factors for prolonged recovery in adolescent and pediatric patients

Emily Kingry

OBJECTIVE: The management of post-concussion syndrome (PCS) in pediatrics and adolescents is not well understood. While emerging literature describes tools for evaluating mild traumatic brain injury (mTBI) in the pediatric population, methods for identification of patients at risk for prolonged PCS have yet to be described. This research examines clinical characteristics of pediatric and adolescent patients with prolonged PCS in an attempt to identify risk factors for prolonged recovery.

METHODS: A retrospective chart review was conducted of 295 patients 0-18 years with ICD codes for concussion, PCS, and TBI seen between January 2010 and May 2014 in a general pediatric neurology clinic serving a state of ~275,000 children. Patients’ symptom recovery courses were defined as either prolonged (>1 month) or short (<1 month). Both populations were analyzed and compared on several parameters using the chi-square test for significance (p<0.05).

RESULTS: 295 individuals were identified with concussion; 207(70.2%) experienced prolonged PCS and 88(29.8%) had short symptom resolution. Population characteristics are described in Table 1.
CONCLUSIONS: This data identifies adolescent age as a possible risk factor for prolonged PCS. No significant difference was identified between the groups with respect to gender, mechanism of injury (sport v. other), concussion history, or pre-morbid neuropsychiatric condition. Pre-morbid neuropsychiatric medication use was significantly different however we hypothesize this is reflective of potentially significant referral bias within this data rather than neuroprotective effects of medication. Further analysis is needed to develop a model for risk-stratification for prolonged PCS in patients at the time of injury.

Poster #17
When to worry about cancer: Factors associated with a concurrent carcinoma in borderline epithelial ovarian tumors

Mackenzie Sullivan

Introduction: Borderline ovarian tumors are technically benign yet can actually metastasize, recur, or progress to a carcinoma (typically low grade). The objective was to assess the outcomes of epithelial ovarian borderline tumors to determine factors potentially implicated in adverse outcomes.

Methods: The pathology and cancer databases were searched at an academic tertiary care center to identify all borderline tumors. Clinical data were abstracted via chart review. Borderline cases with/without a concurrent carcinoma were compared using relevant statistical tests and factors for any recurrence assessed.

Results: A total of 123 borderline patients were identified. The mean age at diagnosis was 51.3 years, mean BMI was 31.5 kg/m2, 82% were white, 83.7% underwent BSO +/- hysterectomy/omentectomy, median time to recurrence was 16.8 months, and over 90% were disease free. An additional ovarian cancer diagnosis occurred in 25% (half low grade, three high grade, and 11 unknown grade). Compared to the borderline only group, the carcinoma/borderline patients did not differ significantly in age, race, BMI, parity, HRT, tobacco use, or personal/family cancer history, but were significantly more likely to be postmenopausal and have an elevated Ca-125. Additionally, the cancer patients had significantly decreased serous histology and increased mucinous or endometrioid histologies.

Conclusion/Implications: Concurrent ovarian cancer is common in women with borderline tumors and is associated with postmenopausal status and elevated Ca-125 levels. While the majority of cancers were still serous, there was a higher percentage of mucinous and endometrioid histologies. These factors should alert clinicians to a potential increased likelihood of concurrent cancer.

Poster #18
Providing a Historical Context for the “Cells to Society” System Curriculum

Janice H. Park and J. Andrew Legan

In a previous History of Medicine survey performed by Aileen Giordano in 2013, all University of Virginia School of Medicine (UVA SOM) faculty members who taught medical students were asked to report whether they incorporated historical perspectives into their curricula, whether they wished to include more historical content, and whether they wanted historical information and resources provided to them. The survey results were overwhelmingly positive. As a result, the “Time Capsules” project was developed within the Edward W. Hook Scholars Program.
Humanities and Ethics to help formalize a History of Medicine thread in the UVA SOM's NxGen curriculum and to produce resources to help faculty to incorporate small “doses” of historical content into their teaching.

The first Time Capsule, a short film, was created this summer by two Hook Scholars participating in MSSRP in order to add historical context for the “Cells to Society” curriculum, which introduces the incoming first-year medical students to diabetes. The video, entitled *Internal Secretion: The Discovery of Insulin*, gives a brief historical overview of the characterization of type I diabetes and tells the story of Dr. Frederick Banting and his landmark discovery of insulin in the early 1920s as a life-prolonging treatment for diabetes. The film was screened for the UVA SOM Class of 2020 on their first day of Cells to Society.

**Poster #19**  
**Gene Expression Profile (GEP) Testing alters clinical management in 19% of consecutively treated patients with Stage IB/IIA melanoma at a single institution**

Alexandra Hickman

**Background:** DecisionDx-Melanoma is a 31-GEP test predictive of metastasis in cutaneous melanoma. Current NCCN guidelines recommend no routine surveillance imaging in Stage IB/IIA. At our institution, patients with a high-risk (Class 2) DecisionDx score are upgraded to high-risk surveillance. We hypothesized that DecisionDx would alter surveillance in at least 16% of stage IB/IIA patients, similar to the upgrade rate from sentinel node biopsy.

**Methods:** A DecisionDx score was obtained for consecutive patients with Stage IB/IIA melanoma treated between 6/2014-6/2016. A retrospective review of a prospectively collected database was performed.

**Results:** 67 patients with Stage IB/IIA melanoma met inclusion criteria. In four cases, a DecisionDx result was not available due to inadequate tissue (N = 2) or gene amplification failure (N = 2). Of the 63 tested cases, 68% were Stage IB (N = 43), and 32% were Stage IIA (N = 20). A high-risk result (Class 2) was seen in 12% of stage IB (5/43) and 42% of stage IIA (8/19) patients. Insurance denied coverage of scans in 1/13 patients with a high-risk DecisionDx. The remaining 12 Stage IB/IIA patients with high-risk scores were “upgraded” to high-intensity surveillance. With a median follow-up of 14 months, 1/13 patients with a high-risk DecisionDx developed distant metastases 21 months after diagnosis of a Stage IIA melanoma.

**Conclusions:** Results from this retrospective single institution study show that DecisionDx-Melanoma results altered patient management in 19% of Stage IB/IIA patients. Early detection in 1/13 patient with high-risk scores in this series supports further investigation into stratifying traditionally low risk patients by GEP.

**Poster #20**  
**Survival Outcomes and Risk Assessment in Pediatric Orthotopic Heart Transplantation Cases: A 21 Year Retrospective Study**

Shawn Shah

**Background:** Cardiac transplantation is the only treatment option for many pediatric patients with end stage heart disease. Evaluating the longitudinal outcomes of these patients is integral
to providing a high standard of care. We reviewed all patients who underwent orthotopic heart transplantation (OHT) at a large referral center in order to describe their diagnostic characteristics and assess risk factors for mortality.

**Methods:** A retrospective cohort study was conducted including all patients who underwent OHT at Johns Hopkins All Children’s Hospital (JHACH) from the first OHT in June 1995 through July 2016 (166 patients underwent 172 OHTs). Demographics and clinical characteristics of patients at the time of transplant and at follow-up were abstracted. Descriptive characteristics were assessed using means/medians/ranges for continuous variables and proportions for categorical variables. Outcomes evaluated were overall survival, operative mortality, and late mortality. Kaplan–Meier analyses were performed to demonstrate longitudinal survival. Univariate and multivariate Cox–proportional hazard models were used to estimate hazard ratios (HR) and corresponding 95% confidence intervals (95% CI) for the association between risk factors and overall survival. A p-value of <0.05 was considered statistically significant.

**Results:** The study included 172 OHTs (18 neonates, 76 infants, 76 children, and 2 adults [≥18 years]; median age at OHT = 248 days [range: 5–8,686 days]; median weight at OHT = 7.5 kg [range: 2.2 to 113 kg]). Primary diagnoses at time of OHT were cardiomyopathy (n=65; 37.8%), hypoplastic left heart syndrome (HLHS) or HLHS–related malformation without prior cardiac surgery (n=32, 18.6%), HLHS or HLHS–related malformation after prior cardiac surgery (n=18, 10.5%), non–HLHS complex congenital heart disease (n=46, 26.7%), and retransplant (n=11, 6.4%). Multivariate analysis showed that patients who received post-operative mechanical support (HR=4.32, 95% CI: 1.45–12.8, p=0.009) and patients with a higher number of prior cardiac operations (HR=1.25, 95% CI: 1.0–1.56, p=0.05) were at an increased risk for mortality. There were suggestions that transplants with increased donor cross clamp durations carried a higher risk (HR=1.26; 95% CI: 0.97–1.64, p=0.08), but this association did not achieve statistical significance.

**Conclusions:** A high proportion of pediatric patients undergoing OHT survive up to 5 years. Posttransplant mechanical circulatory support and a higher number of prior operations are risk factors for decreased survival.

**Poster #21**

**Does liver transplantation lead to improved patient reported outcome measures?**

Alden Adkins

**Introduction and Aims:** The reduced quality of life in patients with chronic liver failure is well documented. However, recent debate disputes that liver transplantation will lead to an improved quality of life (QOL). This study seeks to establish a baseline patient-reported quality of life for patients with chronic liver disease before liver transplantation and create a path to assess if changes in QOL that occur after transplantation.

**Materials and Methods:** Liver transplant candidates in the University of Virginia transplantation clinic underwent screening to enroll in the project. The patients then completed the online Patient-Reported Outcomes Measurement Information System (PROMIS) assessment, a validated questionnaire by the National Institutes of Health, via iPad to assess QOL. Responses were analyzed using T-score algorithms provided by the PROMIS Assessment Center software and scaled from 0 to 100, with 50 representing the median score for the general population in the US.

**Results:** The 79 enrolled patients for whom data has been collected reported significant reductions in quality of life including a decline in cognitive function (mean 47.86 ± 10.69, n=96) and physical functioning (mean 43.17 ± 8.58, n=95) along with significant increases in feelings...
of fatigue (mean 55.47 ± 9.64, n=95), ADL interference by pain (55.26 ± 10.25, n=95), and difficulty sleeping (mean 53.37 ± 10.07, n=95).

**Conclusions:** These data demonstrate a correlation of significant decline in QOL concurrent the presence of chronic liver disease before transplantation. Subgroup analysis by liver disease severity is underway. We expect patients with the most severe liver disease as defined by Model for Endstage Liver Disease score and the number of hepatic decompensating events to be inversely correlated with the QOL domains assessed by PROMIS. Future study will focus on continued enrollment of new transplant candidates as well as follow our cohort of pre-transplantation enrollees as they receive transplants, using the PROMIS assessment to measure any changes in QOL metrics at 3-, 6-, and 12-months post-liver transplantation.

**Poster #22**

**Anatomy and Drainage Features of Spinal Meningeal Lymphatics**

Michael Dong

The presence of lymphatics within the brain meninges provided a connection between the peripheral immune system and the central nervous system. It is unknown whether a similar lymphatic system exists in the spinal meninges. Prox1 transgenic mice and Lyve1 and Vegfr3 antibody staining were used to visualize lymphatic anatomy in meningeal whole mounts of the brain and spine meninges and coronal cross sections of decalcified spines. To assess lymphatic drainage of CSF, Lyve1 was injected into the CSF of the cisterna magna or lumbar spine of Prox1 transgenic mice. To assess the ability of the lymphatics to traffic cells, fluorescent beads or fluorescent CD4+ cells were injected into the CSF of the lumbar spine. Following these injection assays, meningeal whole mounts were imaged with widefield and confocal microscopy. Drainage to peripheral lymph nodes was assessed by the injection of Evans Blue dye into the CSF of the lumbar spine and measured by an IVIS imaging system. Prox1+ Lyve1+ Vegfr3+ lymphatics were found flanking the dorsal nerve roots bilaterally in the cervical, thoracic, and lumbar spine (the sacral spine was not assessed). Similarly characterized lymphatics were seen crossing transversely in the dorsal meninges over C1 and C2. 2hrs post lyve1 injection into the CSF, both the dorsal nerve root lymphatics and the C1/C2 lymphatics were stained with Lyve1. 4hrs and 8hrs post injection of fluorescent beads or CD4+ cells into the CSF, both beads and cells were visualized within C1/C2 lymphatics and dorsal nerve root lymphatics after meningeal whole mount. 2hrs post injection of Evans Blue dye into the CSF of the lumbar spine, fluorescent dye was visualized in the deep cervical, superficial cervical, and lumbar lymph nodes and not seen in the sacral or inguinal lymph nodes. The presence of lymphatics in the spinal meninges surrounding the dorsal nerve roots and over C1 and C2 and their involvement in cell trafficking to peripheral lymph nodes suggests another connection between the central nervous system and the peripheral immune system. The discovery of these spinal meningeal lymphatics provides new avenues to approach the inflammatory processes of spinal cord injury and spinal meningitis.

**Poster #23**

**Wisdom, resilience and burnout in medical students**

Sudheer Vemuru

**Introduction:** Burnout in physicians is a sense overwhelming distress and unfeeling characterized by a low sense of personal accomplishment, a high level of emotional exhaustion,
and a high level of depersonalization. Burnout poses a major cause for concern both in terms of physician job performance and overall physician health. Burnout may be interrelated with the concepts of wisdom and resilience through a mechanism that is currently unclear.

**Methods:** During the 2014-2015 academic year, all 630 medical students at the University of Virginia School of Medicine were given the opportunity to complete an anonymous online survey. The survey included the 3D-Wisdom Scale, Maslach Burnout Inventory (MBI), and the Connor-Davidson Resilience Scale. Responses were analyzed to identify the relationship between burnout and wisdom and resilience in medical students.

**Results:** Emotional exhaustion (EE) scores ($F=17.9$, $p<.001$) and Depersonalization (DP) scores ($F=14.8$, $p<.001$) from the MBI were lower in students with high wisdom scores. The prevalence of high combined burnout ($\chi^2 = 14.2$, $p<.001$) was also lower among students with high wisdom. Resilience scores were positively correlated with personal accomplishment scores ($r=.534$, $p<.001$) and negatively correlated with EE scores ($r=-.379$, $p<.001$) and DP scores ($r=-.194$, $p=.002$).

**Conclusions:** Increased wisdom and resilience are both associated with reduced burnout measures in medical students. Adding interventions to increase wisdom and resilience in undergraduate medical education may be useful in combating the negative consequences of burnout later on.

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**Poster #24**
**Implementation and Analysis of Safe Sleep Practices in the UVA Children’s Hospital**

Eleanor Sharp

**BACKGROUND:** The American Academy of Pediatrics (AAP) recommends specific safe sleep practices for infants with the aim of reducing sudden unexpected infant deaths. Modeling of these recommendations in the hospital is important for educating parents. Our institution, a large quaternary care center, standardized guidelines for safe sleep throughout the entire Children's Hospital in accordance with the AAP’s guidelines.

**METHODOLOGY:** An audit tool was developed to assess adherence and identify areas needing improvement. Using the Plan, Do, Study, Act cycle model of quality improvement (QI) in each of the clinical settings: mother/baby, NICU, and acute pediatrics, each unit launched QI campaigns for the five measures of safe sleep: 1) head of bed flat, 2) supine sleeping, 3) safely swaddled, 4) crib free of objects, 5) without bed sharing. All infants under the age of one were included. Infants with medical contraindications to safe sleep practice were excluded.

**RESULTS:** All three units demonstrated marked improvement towards modeling safe sleep practices. Overall, for the children’s hospital we had 17% compliance with all recommendations and after two PDSA cycles we have increased to about 59%.

**CONCLUSIONS:** PDSA cycle methodology can improve safe sleep adherence in the pediatric setting. Due to the complex nature of the hospital setting there is still significant work to be done. PDSA cycles will continue until we reach our goals of at least 80% compliance.

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**Poster #25**
**Viability of Mouse Pancreatic Islet Cells in 3D Bioprinted Silk-Fibroin Hydrogel Scaffolds**

Houston Wiedle

As the number of patients on the national transplant list continues to rise, an increase for the need of organs has been placed on our health care system. With this, an alternative to normal
organ procurement has been identified as a major research topic. Multiple alternatives have been suggested and researched. One such topic is the idea of 3D bio-printing viable organs for transplantation into patients. To help work toward this goal, our team has researched the possibility of using 3D bio-printing technology by printing hydrogel scaffolds, specifically focusing on hydrogels containing pancreatic islet cells. Along with this, our team has focused on specific bioink medias containing varying levels of glycerol and silk-fibroin protein isolated from silkworm cocoons. After experimenting with multiple concentrations, our team found that a 70:30 and 60:40 by weight silk:glycerol concentration provided excellent cell growth and viability in populations of both BJ fibroblasts and mouse pancreatic islet cells. With the results obtained from our research study, we believe hydrogels based on silk-fibroin are a novel bioink that should be researched further to understand the mechanics of the material as well as to determine other cell type’s viability in the media.

Poster #26
Barriers to MyChart Patient Portal Use in the Orange Pediatrics Clinic Population

Rachel Mayo

This project aimed to provide an understanding of the barriers to use of the MyChart electronic patient portal in the Orange Pediatrics population. The patient portal is a secure website that allows patients to review basic healthcare history, lab and radiology results, request medication refills, and message the office with non-urgent questions. Although the portal offers many potential benefits to access and workflow, several studies and reviews show that uptake and use of patient portals typically remain low over time. In this study, we investigated potential barriers to Orange Pediatrics clinic families’ use of MyChart including internet access and overall interest in using a patient portal. These barriers were assessed through distribution of a questionnaire in the waiting room and in-person interaction with families while offering MyChart account establishment. Findings showed that overall access to the Internet was available to the Orange Pediatrics population, particularly via mobile phone. Additionally, a majority (80%) of families elected to create a MyChart account when offered the chance in person. Follow up to this study will be necessary to understand usage of the portal upon account creation. Importantly, although there is significant interest in creating accounts, the process is cumbersome and requires additional support to be successful in the long term.

Poster #27
Liposome Adjuvants to Enhance the Immunogenicity of an Amebiasis vaccine

Mohammed Suraju

*Entamoeba histolytica* remains one of the primary etiologies of diarrheal related mortality and morbidity in developing countries. As such, there is a dire need for a vaccine against this pathogen. Here, we have expanded our previous studies which established that a liposome adjuvant containing TLR4/7/8 ligands- GLA/3M052, enhances the efficacy of our candidate vaccine (LecA) against *E. histolytica* in a murine model. Specifically, we modified physicochemical characteristics of the liposome adjuvant such as the polyethylene glycol (PEG) length, concentration, and the size of the nanoparticle; to evaluate effects on the immunogenicity of our vaccine. Immunogenicity was scored by measuring titers of stool IgA and Th1 responses (IFN-γ and plasma IgG2a), both of which have been correlated with protection from *E. histolytica* infections in humans. Surprisingly, neither varying PEG concentration, PEG
length, particle size nor the addition of QS21, a saponin adjuvant, significantly boosted IgA titers as compared to the original liposome adjuvanted LecA formulation. Nonetheless, all of the modifications except varying PEG concentration enhanced IgG2a titers as compared to the original adjuvanted formulation. Finally, only increasing PEG length appeared to enhance IFN-γ titers. Taken together, increasing the PEG length of GLA/3M052 may represent the most effective way of enhancing the immunogenicity of LecA using the GLA/3M032 adjuvant.

Poster #28
Analyzing the Vertical Displacement of Seat Belts

Hannah Carr and Brittany Smith

Seat belts are designed to sit low and tight over the Anterior Superior Iliac Spine (ASIS). As the U.S. population increases in Body Mass Index (BMI), the position of the lap belts over the ASIS is at risk for displacement, potentially lowering the efficacy and safety of the seat belt. Our objective was to determine if lap belts are displaced superiorly with the increasing BMI of the occupant. In this study, we analyzed data from the Crash Injury Research and Engineering Network (CIREN), a product of the National Highway Traffic Safety Administration (NHTSA). Using Stata software, we queried the CIREN database for vehicle occupants who were at least 16 years old, restrained by 3-point seat belt, and involved in front-end collisions that had a change in velocity of at least 35 miles per hour. We then used Slicer software to analyze their CT scans for evidence of, and measure anterior and superior displacement of Seat Belt Signs (SBS) from the ASIS. We found no significant correlation between BMI and superior displacement of the SBS (R = -0.105 and -0.117 for right and left, respectively). SBS displacement of normal BMI versus obese BMI occupants resulted in P-values of 0.431 and 0.404 for the right and left ASIS respectively. We did find a correlation between increasing BMI and anterior SBS displacement (R = 0.501 and 0.226; P = 0.0003 and 0.006 for right and left respectively). Although this study found no correlation between the BMI of vehicle occupants and superior SBS displacement, a correlation between BMI and anterior SBS displacement was seen which may have implications of its own for further research into the efficacy of lap belts for obese occupants.

Poster #29
Shared Medical Appointment for non-English speaking patients with diabetes mellitus

Sayuri Inoue

Group visits demonstrated non-replicable benefits in chronic disease management, such as improved clinical outcome, quality of care and sustainable benefits in overall patient and provider satisfaction. The Primary Care Center (PCC) at Cambridge Health Alliance (CHA) offered shared medical appointments (SMA) for patients with type II diabetes in English and will offer similar groups to non-English speaking patients (starting in the fall 2016). In preparing for SMAs for non-English speakers, PCC has been particularly careful to understand the specific needs and challenges faced by non-English speaking patients. PCC can draw upon the findings from various studies on Hispanic patients’ perspectives on the disease and barriers, while adding new insights related to its target population (Portuguese speaking patients). This research outlines the needs of non-English speaking patients with DM and translate how the format of the group visit could address these needs.
Research on this topic suggested that SMAs should start with conversations with patients to hear their stories. This will help patients and providers understand each patient’s views on DM and obstacles. In addition, patient’s progress overcoming their barriers to better quality of care should be periodically assessed. Frameworks to better understand non-English speaking patients’ perspectives and barriers (both medical and non-medical) have been identified. Phase 2 of this research plans to assess more specifically the PCC’s patients’ needs, expectations, and satisfaction through surveys and interviews.

**Poster #30**
**Investigation of Iron metabolism in *Pneumocystis*, an Opportunistic Fungal Pathogen**

Laura Walsh

*Pneumocystis jirovecii* (Pc) is an opportunistic fungal pathogen that causes life-threatening pneumonia in immunocompromised patients, especially those with HIV infection. Iron is critical to survival of microorganisms including fungi, since it is involved in a wide range of necessary metabolic functions. Fungi have developed various mechanisms to evade host strategies of iron limitation, including siderophore production, reductive iron assimilation, and heme uptake. Analysis of Pc genomes recently sequenced by our lab revealed the absence of most genes utilized by other fungi to acquire iron, although the genomes did contain six genes encoding proteins with CFEM (common fungal extracellular membrane) domains that in select fungi are involved in heme/iron uptake. The current study was undertaken to better understand iron metabolism in *Pneumocystis* and the potential contributory role of CFEM proteins. We used two approaches to examine this. In the first, we used a heme affinity column to identify native Pc proteins that bind to heme, since this would be a necessary step if heme is used as an iron source and is taken up by the organism. We suspended a crude rat Pc lysate in either hemin-agarose beads or as a control, glutathione-agarose beads. After washing, bound proteins were eluted using free hemin and analyzed by mass spectroscopy. Mass spectrometry analysis showed the presence of one CFEM-containing protein, indicating that Pc does indeed contain a CFEM protein capable of binding to heme. In the second approach, we cloned and successfully expressed two Pc genes containing CFEM domains in bacterial cells. The purpose of this approach is to use recombinant proteins to further explore binding to heme and to characterize some of the parameters of the binding. In future studies we will utilize purified recombinant CFEM proteins to immunize mice. Immunization would allow us to examine host antibody and cellular immune responses to a potential Pc antigen. The antibodies could further be used to localize the CFEM proteins in Pc organisms by immunohistochemical studies, to identify what stage of the Pneumocystis life-cycle expresses them, and to verify that they are surface proteins. Better understanding of iron metabolism may allow development of drugs that target these pathways to treat *Pneumocystis* pneumonia.

**Poster #31**
**Human-Centered Design of Women’s Reproductive Health Education in Guatemala: Promoting Education and Understanding about Cervical Cancer**

Emily Schutzenhofer

Although cervical cancer is the most common cancer as well as the leading cause of cancer-related premature deaths and disabilities (DALYs) among women in Guatemala, only an estimated 40% of Guatemalan women have ever been screened for this preventable cancer.
With the long-term goal of increasing women’s utilization of cervical cancer screening, this project of the UVA-Guatemala Initiative (UVA-GI) utilized human-centered design (HCD) methodology to co-design an educational curriculum concerning cervical cancer (CC), screening, and preventive health with indigenous Guatemalan women. This study involved in-depth interviews of 48 indigenous Mayan (Kaqchikel) women— who were selected based on prior involvement with UVA-GI programs— in three rural villages surrounding San Lucas Tolimán, Guatemala. Interviews were facilitated and interpreted with community liaisons/staff. The interviews assessed knowledge and opinions concerning women’s reproductive health and healthcare access, CC and screening, health education, and preventive health. The study qualitatively analyzed collections of statements concerning each of these topics via the following HCD ideation procedure: download of learnings, identification of themes, creation of insight statements, translation of these statements into opportunities for design, and designation of design principles. Several key themes emerged to guide the design, including participants’: unfamiliarity with secondary prevention strategies; unawareness of disease presenting without symptoms; misconceptions concerning the cause of CC and the purpose/outcomes of CC screening; favor toward group education, games, metaphors, and images; and potential educational discouragement due to embarrassment and immaturity of peers. The design project applied these themes and consequent design principles to create a rapid prototype of a CC-focused educational curriculum, including several culturally-respectful in-class activities designed to emphasize fundamental learning objectives. Prototype journey-mappings, metaphors, and games were tested with five Kaqchikel women to elicit feedback that was then integrated into a re-iterated curriculum. The curriculum will be piloted in early 2017. The course will then be implemented in the communities surrounding San Lucas Tolimán by UVA-GI staff, with continual evaluation through course exams, information retention exams, and surveys. HCD application processes will be shared with other UVA-GI projects and global health innovators.

**Poster #32**

**Quality of care provided to individuals with life-limiting illnesses in long-term care facilities**

Ahmar Hashmi

The impetus for this research was to address the quality of care provided to individuals with life-limiting illnesses in long-term care facilities. Specifically, the aim of this study was to evaluate how members of the LGBQT community are treated in palliative settings and to assess how this care can be improved by interviewing health care providers with relevant experience in the field. An interview guide was developed to determine the current quality of care, practices which incorporate spirituality, care specifically targeting the vulnerable LGBTQ community, shortcomings, and the possible improvements that could be made in the delivery of care. Data was collected through interviews of the faculty members associated with the University of Virginia School of Nursing. The responses from the questionnaire were analyzed and used to suggest improvements in these facilities and to address the health care disparities that target the LGBTQ population. The data collected from interviews was discussed and used to make several suggestions that could optimize care for patients in the end stages of life. Further research in this field needs to be done and specifically input from patients has to be incorporated in making definitive guidelines for end of life care.

**Poster #33**
Isoniazid and Levofloxacin pharmacokinetics and outcomes in a Russian cohort with Human Immunodeficiency Virus and Tuberculosis

Herman Pfaeffle

Introduction: In Irkutsk, Siberia, multidrug-resistant (MDR), pre extensively drug-resistant (pre-XDR) and extensively drug-resistant (XDR) tuberculosis (TB) are common and drive mortality in patients infected with human immunodeficiency virus (HIV). Isoniazid (INH) and levofloxacin (LFX) are commonly given in all forms of drug-resistant TB in Irkutsk, and high-dose INH is increasingly incorporated in short-course MDR regimens worldwide. Little is known about the pharmacokinetics of anti-TB medications in HIV infected patients in Russia.

Methods: Among consecutively enrolled HIV infected patients initiating anti-TB treatment at a referral hospital in Irkutsk, after 2 weeks of treatment, 2 and 6 hour plasma samples were collected for determination of estimated peak concentration (C_{max}). Drug concentrations were determined utilizing a variety of analytic methods (U Florida), the data for INH and LFX reported here. Minimum inhibitory concentration (MIC) and determination of phenotypic drug resistance was completed onsite using the MYCOTB Sensititre plate. Potential drug activity was defined as a C_{max} greater than individual isolate MIC. Patients were followed prospectively and treatment failure was defined as default or death while treatment success was defined as cure or treatment completion.

Results: 69 patients were enrolled and able to complete procedures, among whom there was significant variation in drug susceptibility patterns. Of the total isolates from each patient, 36 (52%) were DS-TB, 11 (15.9%) were MDR, 16 (23.1%) Pre-XDR, and 6 (8.7%) were XDR. Thirty-eight patients were treated with INH, all at high doses, median dose of 575 mg (IQR 500-600 mg). The median INH MIC was 2.0 (0.81-4.0). Among those with MDR, pre-XDR or XDR and both INH C_{max} and MIC data, INH had activity in 8 (80%). Of those with INH activity, treatment success occurred in 6/8 (75%) compared to the 2/2 (100%) without activity who both experienced treatment failure, p=0.05. The median INH Cmax/MIC, with exclusion of default, was 1.26 (0.00-2.52) and 1.77 (1.44-1.80), p= 0.21 among those with treatment failure and success respectively. 30 patients were treated with LFX dosed at the lower end of conventional ranges, median dose of 500 mg (IQR 500-750). The low end of standard dosing of LFX produced a median C_{max} 3.18 (0.04-5.63), n=22, compared to doses of 750 mg and above, 6.60 (3.94-7.31), n=8; p = 0.04. Among those with MDR, pre-XDR or XDR and both LFX C_{max} and MIC data, 4 had LFX activity but only 2/4 (50%) had treatment success while the one patient without LFX activity had treatment failure, p=0.36. The median LFX Cmax/MIC, with exclusion of default, was 7.70 (0.05-15.34) and 11.97 (11.36-12.6) among those with treatment failure and success respectively.

Conclusions: In this HIV-infected cohort with complex drug resistance, potential drug activity for INH was common despite elevated MICs indicative of phenotypic resistance. LFX, while generally dosed at the lower end of the standard dosing, achieved significantly higher plasma levels when higher doses were utilized. Further study will be required to determine the tolerability and efficacy of higher dose regimens in the treatment of similar patients with such heterogeneous drug resistance.

Poster #34

Connor C. Wang
**Context:** In academic medicine, the concurrent goals of optimized patient care and resident education hold equal priority. Superimposed on these missions are the realities of physical and temporal separation of trainees and supervising faculty during much of the training period. Although conventional telemedicine is an established medium for remote supervision, the lack of mobility and infrastructural cost and maintenance limit application to resident clinical education. Mobile health (mHealth) media and wearable devices, such as Google Glass, offer hands-free applicability for remote evaluation and supervision in the clinical learning environment (CLER).

**Methods:** The study is a prospective, single-blinded comparison trial of neurology resident clinical exam skills using Google Glass versus standard face-to-face evaluation of stroke patients during 2 phases of the project, the ambulatory and the inpatient phase, respectively. Our primary goal is to determine attending agreement for neurology examinations as measured by intra- and inter-rated/method reliability of the NIH Stroke Scale and the NEX Clinical Skills Assessment Scores. Our secondary goals are to inspect the technical feasibility of Google Glass evaluations as measured by audio and video quality assessments from blinded attending raters and to survey the neurology resident, attending, and patient satisfaction with Google Glass as compared to face-to-face evaluations and supervisions.

**Results:** Preliminary results from both phases 1 and 2 have shown wide favorability for Google Glass among residents and patients. It holds promise as a mobile, hands-free alternative to conventional telemedicine platforms for remote resident supervision and evaluation. However, several technical limitations in the current version constrain readiness and effectiveness for the CLER at this time.

**Conclusions:** Google Glass, with its numerous functionalities and capacity to facilitate mobile, hands-free real-time audiovisual telemedicine, offers potential as a novel educational tool to augment neurology resident supervision in the CLER. The potential of wearable telemedicine endpoints for neurology is bolstered by the importance of the observational physical examination and option for hands-free use during real-time consultations. As mHealth evolves with technical improvements and enhancements, Google Glass and other wearable devices may serve to enhance competence, decision-making, and preparedness without compromising satisfaction and autonomy for residents in the CLER.

**Poster #35**

**Effects of Healing Touch on Outcomes in Persons Experiencing Orthopaedic Surgery**

Vaishnavi Lanka

Elective total hip and knee arthroscopic joint replacements are becoming an increasingly prevalent procedure in the United States. One of the most important post-operative symptoms to consider in this patient population is pain. Conventional methods of managing pain, including opioids and narcotics, are often associated with many undesirable side-effects including nausea, pruritus, sedation, dizziness, bladder dysfunction, reduced gastrointestinal motility and sleep disturbances. The purpose of this study is to evaluate complementary mind body approaches to pain management, including Healing Touch (HT) that may help with pain management. 100 patients age ≥18 years scheduled for elective total hip or total knee arthroscopic joint replacement were enrolled from the five hospitals in the Inova Health System. These patients received HT therapy after their surgery and their outcomes including ambulation, pain ratings and opioid use were measured. These patients were compared to matched controls extracted from the electronic medical record. Additionally, a sample of patients were interviewed to study patient perspectives towards complementary therapy. Preliminary results on patient
perspective show patients on both ends of the spectrum; some patients have experience with such practices before and believe they make an impact whereas others were more skeptical and did not see a difference. A majority of the patients reported they thought the treatment was logical and they were confident it would work. Patients reported increased relaxation and stress reduction as one of the benefits of therapy. These results indicate that HT therapy can be used in conjunction with traditional pain management to improve patient comfort in the post-surgical unit.

**Poster #36**
**Analyzing PTC tumors for RET/PTC1 mutations**

Madeline Carmain

Thyroid cancer incidences have tripled over the past three decades; the majority of this increase can be attributed to papillary thyroid carcinoma, which comprises 80% of thyroid cancers. Genetic rearrangements involving the proto-oncogene RET act as drivers in the development of PTC; it is estimated that 20-70% of PTC has an RET/PTC rearrangement. Sporadic PTC, the most common PTC, is associated with RET/PTC1. In this project, thirteen patient PTC samples were tested for an RET/PTC1 rearrangement; seven patient PTC tumors contained an RET/PTC1 rearrangement.

**Poster #37**
**Investigating Trends of Serum Alanine Aminotransferase and its Relationship with Metabolic Syndrome and Obesity in U.S. Adolescents, 1999-2014**

Cyrelle Fermin

**Introduction:** Non-Alcoholic Fatty Liver Disease (NAFLD), characterized by hepatocyte dysfunction, fat accumulation, and fibrosis, is the most common cause of chronic liver disease in children. Levels of serum alanine aminotransferase (ALT) are used clinically to assess for liver dysfunction. This analysis studied the relationship between ALT levels and the Metabolic Syndrome Severity (MetS) Z-Score as well as BMI.

**Materials & Methods:** We studied 5411 non-Hispanic-white, non-Hispanic-black, and Hispanic adolescents ages 12-19 with complete MetS Z and ALT data from the National Health and Nutrition Examination Survey 1999-2014. Elevated ALT levels were defined by 2 different cut-offs: one for both sexes (30 U/L) and another that was sex-specific (22 U/L, girls; 25 U/L boys).

**Results:** Neither the trend of mean ALT nor the prevalence of elevated ALT differed over time. Over time, BMI Z-scores increased, and MetS severity Z-score decreased. ALT levels were significantly related with BMI Z-score and MetS Z-score (p<0.0001). There were significant odds of having ALT levels over 30 U/L if elevated MetS Z-score (OR 3.52, 2.86 – 4.32) or elevated BMI Z-score were present (OR 2.79, 2.32-3.36).

**Conclusion:** Prevalence of elevated ALT has not changed over time, potentially due to divergent trends regarding the BMI Z-score and the MetS Z-Score. Continued vigilance in monitoring BMI and ALT levels are advised for the US adolescent population. MetS Z-score
could act as another tool to monitor risk of elevated ALT and subsequent development of NAFLD.

**Poster #38**

**A Novel Phylogenetic Approach to Infer the Frequency of Gene Conversion Events**

Ajay Chatrath

Gene conversion is the unidirectional transfer of genetic information from a donor sequence to a highly homologous acceptor sequence that occurs after gene duplication. Many human diseases are known to be caused by gene conversion events. It remains to be elucidated about how frequently gene conversion occurs between duplicate genes in a genome. Because sequences of duplicate genes are homogenized by gene conversion, distinguishing between recent gene duplication and gene conversion events is difficult, resulting in an overestimation of the gene duplication rate. To tackle this issue, we developed a novel approach to accurately infer the frequency of gene conversion events. Because whole genome duplication (WGD) duplicated all genes simultaneously in *S. cerevisiae*, we can infer whether and when gene conversion occurred by examining the phylogenetic relations of WGD gene pairs (ohnologs). After examining the phylogenetic trees and genetic distance matrices of 547 ohnologs in budding yeast, we found that up to 32% of these ohnologs underwent gene conversion since WGD. The gene expression levels of the ohnologs that underwent gene conversion were more closely correlated than those of the ohnologs that did not. In fact, the genetic distance between the promoter sequences of ohnologs that underwent gene conversion is less than those that did not. Genes that underwent gene conversion are also under greater amounts of purifying selection than those that did not. Homogenization of the DNA sequence and gene expression patterns of these ohnologs suggests that gene conversion may have played a significant role in evolutionary history following gene duplication events by homogenizing both regulatory sequences and coding regions in these genes.

**Poster #39**

**Local IgE Production in Allergic and Non-Allergic Rhinitis**

Ahmed Hamed

**Background.** Local production of IgE has been described as a pathogenic mechanism contributing to symptoms of both allergic (AR) and non-allergic rhinitis (NAR). However, whether or not this occurs has been controversial, partly due to methodological differences between prior studies.

**Objective.** We assayed the presence of specific IgE relevant to exposure history in interstitial nasal secretions in subjects with rhinitis symptoms with and without positive skin tests to the Virginia aeroallergen panel.

**Methods.** Interstitial nasal secretions were collected via absorptive filter paper applied to subjects’ inferior turbinates for 5 minutes. Allergen-specific IgE was assayed via ImmunoCAP®. To eliminate confounding influences of transudation or transcytosis, data were normalized to total IgE concentrations in the interstitial fluid and the ratio was compared between the nasal and serum sample for each subject.

**Results.** Subjects with skin test positive (AR; n=10) and negative (NAR; n=6) rhinitis were equally likely to complain of rhinorrhea, paroxysmal sneezing, nasal congestion, and posterior pharyngeal drainage. However, subjects with AR were more likely to report itchy nose, palate,
eyes, or ears and epiphora. Only very low concentrations of total IgE were detected in the nasal secretions of NAR subjects and none demonstrated nasal specific IgE. Specific IgE was only detectable in nasal secretions of 3 AR subjects but in only 2 was the nasal specific:total IgE ratio elevated in comparison to the serum ratio, demonstrating local production.

**Conclusions.** We could not identify any skin test negative subjects demonstrating local IgE production to aeroallergens. Furthermore, these subjects demonstrated distinct clinical findings as compared with allergic subjects. Local IgE production can occur in AR, although this is uncommon and was only demonstrated in 2/10 subjects.

**Poster #40**  
**An Overview of the Necessary Thymic Contributions to Tolerance in Transplantation**

John B. Hickman

The thymus is important for the development of the immune system. However, aging leads to predictable involution of the thymus and immunodeficiency. These immunodeficiencies may be rectified with thymic rejuvenation. Atrophy of the thymus is governed by a complex interplay of molecular, cytokine and hormonal factors. In this article, we review the interaction of these factors across age and how they may be targeted for thymic rejuvenation. We further discuss the growing pre-clinical evidence defining the necessary and sufficient contributions of the thymus to successful tolerance induction in transplantation.

**Poster #41**  
**Geographical Distribution of High Utilizer Patients**

Sarah Dillon

The Centers for Medicare and Medicaid Services evaluate hospital readmission rates and penalize hospitals with higher rates of thirty day readmission for patients with certain conditions. To improve care and reduce readmissions, the UVA Accountable Care Organization and Quality and Performance Improvement Department are exploring the characteristics and needs of patients with high hospital utilization. The purpose of this study is to assess the geographical distribution and socioeconomic patterns of patients identified as high utilizers of UVA Hospital from July 1st 2014 to June 30th, 2015. The ultimate aim is to explore the role of geographic information systems (GIS) software in providing information for care coordination efforts. ArcGIS Software was used to map the home addresses of 1043 patients identified as high utilizers by the Quality and Performance Improvement Department. Maps created with ArcGIS were used to assess (1) the spatial distribution of high utilizer patients, (2) spatial access to UVA Hospital and community resources, and (3) the socioeconomic characteristics of patients’ communities.

**Poster #42**  
**Engaging Residents of Low Income Neighborhoods in Charlottesville with the Intention to Teach Nutrition**

Patrick Marvil
In 2009, the adult obesity rate in Charlottesville was 26.9%. In 2011, 36.7% of 5th graders enrolled in Albemarle and Charlottesville public schools were overweight, with 18.4% of these children being obese. Given these high rates of obese and overweight adults and children and the associated health problems these conditions cause, the goal of this project was to develop and teach nutritional classes to selected low income neighborhoods in Charlottesville. The project was conducted in conjunction with the Urban Agricultural Collective of Charlottesville (UACC), a non-profit organization that promotes working together to grow and share healthy food to cultivate healthy communities. The first objective of the project was to gauge the residents' awareness and level of knowledge of nutritional impacts on health. The second objective was to develop and teach nutritional classes to the residents of the neighborhoods.

There was significant progress made during the summer of 2015 in building rapport with and gaining the trust of the residents of the communities. By the end of the summer, the residents were open and receptive to further discussion and education about nutrition and health. The primary lesson learned is that it takes time to gain the trust of members of the community and to form a partnership with the community in order to understand the needs and begin implementing programs.