Eighteenth Annual Medical Student Research Symposium

Pinn Hall
University of Virginia School of Medicine
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### Posters to be presented

<table>
<thead>
<tr>
<th>Poster</th>
<th>Presenter/title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Elias Ayoub - The Effects of a Myeloid-Specific Id3 Knockout in a Murine Atherosclerosis Model</td>
</tr>
<tr>
<td>2</td>
<td>Kimberly Boatman - Prevalence and Characterization of Dyspareunia in a General Urology Clinic Population</td>
</tr>
<tr>
<td>3</td>
<td>John Burke - Evaluating the effect of a standardized language protocol for intraoperative c-arm fluoroscopy on perceived communication quality and operating room efficiency</td>
</tr>
<tr>
<td>4</td>
<td>Andrew Burns - The Autism Resources for Transitional Services (ARTS) Study</td>
</tr>
<tr>
<td>5</td>
<td>Christopher Chung - Changes in prospectively collected longitudinal patient generated health data can predict short-term patient reported outcomes following total joint arthroplasty: A pilot study</td>
</tr>
<tr>
<td>6</td>
<td>Justin Coley - Study of Active Neuronal Populations in a Rodent Model of Neuropathic Pain</td>
</tr>
<tr>
<td>7</td>
<td>Alex Demers - Evaluation of the Outside-In Percutaneous MCL Release for Improved Medial Compartment Access During Knee Arthroscopy</td>
</tr>
<tr>
<td>8</td>
<td>Adrienne Doebric - Towards Disability-Conscious Medical Education</td>
</tr>
<tr>
<td>9</td>
<td>Courtney Duckworth and Tiana Walker - The Comparative Utility of Social Determinants of Health Screening Tools</td>
</tr>
<tr>
<td>10</td>
<td>Ryan Duong - Local Estrogen Treatment for Non-Surgical Recontouring of Auricular Cartilage</td>
</tr>
<tr>
<td>11</td>
<td>Tiffany Duong - Characterizing a novel ROCK1 mutation in a family with congenital heart disease</td>
</tr>
<tr>
<td>12</td>
<td>Jakob Durden - Hepatitis C virus-infected solid organ transplantation into non-viremic recipients: implementation of a single-center protocol</td>
</tr>
<tr>
<td>13</td>
<td>Eugenie Hughes - Characterizing Emergency Department Utilization for Mental Health and Substance Abuse in Previously Incarcerated Individuals</td>
</tr>
<tr>
<td>Poster</td>
<td>Presenter/title</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------</td>
</tr>
<tr>
<td>14</td>
<td>Brett Jackson - Virginian Medical Students and a Career in Primary Care: Interest, Attitudes, and Influences</td>
</tr>
<tr>
<td>15</td>
<td>Grace Kim - Factors Influencing No-Show Rates at the UVA Dermatology Clinic</td>
</tr>
<tr>
<td>16</td>
<td>Maneesh Koneru and AJ Winkelman – Automated Quantification of Subcutaneous and Visceral Abdominopelvic Fat Using Machine Learning</td>
</tr>
<tr>
<td>17</td>
<td>Jacob Kosyakovsky - A neuro-economic model describing the evolution of human brain capital across the lifespan explains the basis of functional decline in aging and neurodegenerative disease</td>
</tr>
<tr>
<td>18</td>
<td>Naveen Chandra Kotha - Influence of Age and Gender on Patient Perceptions of Anesthesiologists</td>
</tr>
<tr>
<td>19</td>
<td>Jaina C. Lane - Modeling Medical Education: The Impact of 3D-Printed Models on Medical Student Education in Plastic Surgery</td>
</tr>
<tr>
<td>20</td>
<td>Jackie Lee - Monocyte Response to Chronic Toxoplasma gondii Brain Infection</td>
</tr>
<tr>
<td>21</td>
<td>Jason Li - Loss of Id3 in Endothelial Cells is Associated with Increased Atherogenesis in Mice</td>
</tr>
<tr>
<td>22</td>
<td>Lei Liu - Modulation of stroke-induced spreading depolarizations by inhibition of microglial calcium signaling</td>
</tr>
<tr>
<td>23</td>
<td>Nicholas Lolli - Assessing the feasibility of using a mobile health app to improve HIV medication adherence in rural Tugela Ferry, South Africa</td>
</tr>
<tr>
<td>24</td>
<td>Kara MacIntyre - Nephrology and Palliative Care Collaboration in the Care of Hospitalized Patients with Advanced Kidney Disease: Utilization and Outcomes</td>
</tr>
<tr>
<td>25</td>
<td>Jesse McClure and Leah Shabo - Retrospective chart-review of multilevel anterior cervical discectomy and fusion procedures and outcomes at the UVA health system</td>
</tr>
<tr>
<td>26</td>
<td>Logan McColl and Xizhao Chen - Characterization of Hedgehog Signaling Pathway Activation in Complete Craniofacial Bone Regeneration in a Critical-Sized Rat Mandibular Defect</td>
</tr>
<tr>
<td>27</td>
<td>Haley A. Meade - Effects of Adverse Childhood Experiences in the Central Appalachian Coalfields: An Analysis of Protective Factors Which Combat Negative Health Outcomes</td>
</tr>
<tr>
<td>Poster</td>
<td>Presenter/title</td>
</tr>
<tr>
<td>--------</td>
<td>----------------</td>
</tr>
<tr>
<td>28</td>
<td>Jackson A. Narrett - Prehospital Acute Stroke Therapy with Trans Sodium Crocetinate (PHAST-TSC) Trial</td>
</tr>
<tr>
<td>29</td>
<td>Parantap Patel - Characteristics of Traumatic Brain Injury in a Battlefield Setting: A Retrospective Series</td>
</tr>
<tr>
<td>30</td>
<td>Monica Prudencio - Intraocular hemorrhage as an adverse effect of recombinant t-PA administration</td>
</tr>
<tr>
<td>31</td>
<td>Ben Robinson and Kristian Welch - Medical Legal Partnership and its impact on asthma</td>
</tr>
<tr>
<td>32</td>
<td>Sean Sequeira - A Retrospective Analysis of Outcomes from Foot and Ankle Arthrodesis and Open Reduction and Internal Fixation using Cellular Bone Allograft Augmentation</td>
</tr>
<tr>
<td>33</td>
<td>Nicole Stelling - Governance, Communication, and Financial Transparency in a Clinical Department</td>
</tr>
<tr>
<td>34</td>
<td>Morgan Tyler - Cultural competency Among UVA Primary Care Physicians</td>
</tr>
<tr>
<td>35</td>
<td>Lindsey Whalen - Same game new rules: What is the impact of the 2018 UNOS heart allocation change?</td>
</tr>
<tr>
<td>36</td>
<td>Jeffrey White - Effect of Medicaid Expansion on Patient Population Presenting to the UVA Primary Care Center Family Medicine Clinic</td>
</tr>
<tr>
<td>37</td>
<td>Lijia Zhang - Use of Mepolizumab in Adult Patients with Cystic Fibrosis and an Eosinophilic Phenotype: Case Series</td>
</tr>
<tr>
<td>38</td>
<td>Lijia Zhang - Prevalence of fungal colonization in adult patients with Cystic Fibrosis at University of Virginia: Single center experience</td>
</tr>
</tbody>
</table>
**Poster #1**  
**The Effects of a Myeloid-Specific Id3 Knockout in a Murine Atherosclerosis Model**  
Elias Ayoub

Atherosclerosis is a complex disease that is the leading cause of morbidity and mortality in the United States. Further understanding of the genetic and biochemical mechanisms which underly the development of atherosclerosis will aid in development of more effective therapies for this disease. Within the past decade, researchers have implicated the ubiquitously expressed transcription factor Inhibitor of Differentiation 3 (Id3) as a key regulator of multiple biochemical pathways involved in atherosclerotic plaque development. In a murine model, global knockout of Id3 results in significantly increased atherosclerotic burden. To clarify the role of Id3, we developed a murine model with a myeloid cell-specific Id3 knockout. It was hypothesized that this knockout would result in increased plaque burden and the presence of more unstable, higher-risk lesions. After 12 weeks of a Western diet, we harvested the mouse aortas and analyzed the lipid content and cellular composition of the plaques. Our findings did not support a significant difference in lipid content or necrotic core size between Id3 knockout mice and control mice. Furthermore, no significant difference was found in the amount of smooth muscle cells, macrophages, and endothelial cells composing the plaques. These findings suggest that the athero-protective role attributed to Id3 expression is not linked to its expression in myeloid cells. Further studies should investigate the atherosclerotic effects of Id3 in other implicated cell types, such as lymphocytic cells, smooth muscle cells, and endothelial cells.

**Poster #2**  
**Prevalence and Characterization of Dyspareunia in a General Urology Clinic Population**  
Kimberly Boatman

**Introduction:** Dyspareunia affects an estimated 8-22% of US women. However, a paucity of investigation exists to better understand the specific location and quality of sexual pain. We aimed to assess the specific character of dyspareunia in a general urology population presenting for evaluation of unrelated non-painful complaints.

**Methods/Materials:** This is an IRB-approved prospective, survey-based study of female patients presenting to a general urology clinic over a 10-month period (7/2018-5/2019). Participants were recruited and screened by a study coordinator in clinic registration, excluding those presenting specifically for a painful complaint or condition (flank pain, interstitial cystitis). Patients were given a 32-item survey with questions pertaining to sexual activity and dyspareunia, with focus on pain location, quality, frequency, and severity. Detailed anatomic figures were included to aid patients with pain localization. Analysis was performed with R programming language (3.6.1).

**Results:** A total of 181 women completed the survey, with a mean age of 56 years. Overall, fifty-three (29%) women reported dyspareunia. However, among currently sexually active women the prevalence of dyspareunia was 46%. A majority (53%) of patients indicated moderate to severe dissatisfaction with their sexual activity. Despite this finding, a significant proportion (33%) of patients with dyspareunia reported having at least weekly sexual activity. Further, the majority (60%) reported onset of pain prior to age 50. Patients reported a significant variety of pain locations and qualities (Tables 1A and 1B). Whereas women more commonly reported multiple pain locations (median 2 (IQR 1,4)), the majority (70%) endorsed only one
pain quality. A significant proportion (34%) reported high or very high pain severity, with 45% having pain most or all times of sexual activity.

**Conclusions**: A significant percentage of women presenting to a general urology clinic experience dyspareunia. Notably, patient-reported pain characteristics, including location and quality, varied significantly across women assessed. Further study is needed to understand how these characteristics may relate to different and specific etiologies of sexual pain and directed treatment options.

**Poster #3**

**Evaluating the effect of a standardized language protocol for intraoperative c-arm fluoroscopy on perceived communication quality and operating room efficiency**

John Burke

**Background and Rationale**: Intraoperative fluoroscopy is a ubiquitous tool in orthopaedic surgery. However, many orthopaedic surgeons and radiology technologists are not taught standard terms for direction of fluoroscope movements. Lack of consensus leads to miscommunication, inefficiency, increased radiation exposure, and frustration. Simulation studies have demonstrated that a common language for C-arm movements may reduce time to capture the desired images and number of radiographs required.

**Objective**: To investigate the in vivo effect of the implementation of a standardized language for intraoperative C-arm fluoroscopy on the general perception of the quality of communication between the surgeon and radiology technologist.

**Methods**: Our study intervention was the implementation of a common C-arm fluoroscopy terminology education protocol. To evaluate the efficacy of this protocol, a survey was administered to orthopaedic surgeons and radiology technologists after procedures involving the use of C-arm fluoroscopy. Study endpoints were measured utilizing a 5-point Likert scale. This survey was administered before and after the study intervention.

**Results**: Study intervention resulted in a statistically significant improvement in the mean perceived quality of intraoperative communication between the surgeon and the radiology technologist (0.398 [0.072, 0.725], p=0.017). There was also a reported decrease in confusion.
in the OR (-0.572 [-0.880, -0.263], p<0.001), movement correction of the C-arm fluoroscope (-0.592 [-0.936, -0.248], p=0.001), and need for repeat radiographs (-0.782 [-1.158, -0.406], p<0.001) after the implementation of a standardized fluoroscopy language.

**Conclusion**: A standardized fluoroscopy language protocol has the potential to improve intraoperative communication between orthopaedic surgeons and radiology technologists and decrease radiation exposure to the patient and care team.

**Poster #4**
**The Autism Resources for Transitional Services (ARTS) Study**
Andrew Burns

The current prevalence of autism spectrum disorder (ASD) in the United States is estimated at approximately 1 in every 59 children. Rates of ASD have been on the rise due to more inclusive definitions of ASD, increased awareness, and earlier screening methods. With this increase in diagnoses comes a need for resources to support the growth and development of this vulnerable population. These resources are limited especially for adolescents as they prepare to transition from pediatric healthcare to adult healthcare. 500,000 children with special health needs, including those with ASD, make this important transition in healthcare every year. The care required for a child with ASD is extensive and calls for an interdisciplinary and collaborative approach that in many cases must continue into adulthood. This study investigates the currently available local healthcare resources of Charlottesville, Virginia and the surrounding counties aimed at helping adolescents and young adults diagnosed with ASD navigate the healthcare transition. The Autism Resources for Transitional Services (ARTS) Study surveyed English-speaking parents of adolescents (age range of 12-24) with autism spectrum disorder. Participants completed an anonymous survey about their adolescent’s diagnosis, resources used, and barriers to accessing available resources. Surveys were electronically distributed through networks developed by UVA’s Supporting Transformative Autism Research (STAR) initiative of the UVA Curry School of Education and Human Development during the summer and fall of 2019. Results will provide valuable insight into the gap in transitional healthcare resources for this population and guide future program development to address this important stage of life.

**Poster #5**
**Changes in prospectively collected longitudinal patient generated health data can predict short-term patient reported outcomes following total joint arthroplasty: A pilot study**
Christopher Chung

**Background**: Data generated by wearable technology may correlate with more traditional patient reported outcome measures (PROMs). The objective of this prospective pilot study was to determine if perioperative wearable sensor generated data is predictive of short-term PROMs in total joint arthroplasty (TJA).

**Methods**: This was a pilot study of 22 patients scheduled to undergo TJA (13 Total Hip Arthroplasty (THA), 9 Total Knee Arthroplasty (TKA)) at a single institution who were prospectively enrolled and given a wrist-based wearable sensor. “Average daily step count” (aDSC) and “average daily minutes active” (aDMA) were generated by the wearable sensor
preoperatively and up to 6-weeks postoperatively. PROMs were collected preoperatively and at 6 weeks. Change in PROMs was calculated as “∆.” R² values were generated from linear regression between sensor data and PROMs.

**Results:** Complete data were available for 17 patients (10 THA, 7 TKA) at 2-weeks postoperatively and 13 patients (7 THA, 6 TKA) at 6-weeks postoperatively. Change in aDSC from preop to 6-weeks postop strongly associated with change in VR-12 PCS (R² = 0.4532) from preop to 6-weeks. Change in aDMA from preop to 6-weeks postop was strongly associated with ∆HOOS/KOOS (R² = 0.4858). Other measures were not predictive.

**Conclusions:** Changes from pre-operative to 6-week postoperative levels in aDSC and aDMA data collected with a commercial grade wearable sensor are associated with improvement in PROM (∆HOOS/KOOS and ∆VR-12 PCS) collected over the same time period in TJA patients.

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**Poster #6**  
**Study of Active Neuronal Populations in a Rodent Model of Neuropathic Pain**

Justin Coley

**Introduction:** The pathophysiological mechanisms for the development of chronic neuropathic pain are not well defined; therefore, this condition remains difficult to treat. This project aims to test a recently developed technique for visualization of active neuronal populations in murine models to map the central changes that occur with neuropathic pain. This technique, known as targeted recombination in active populations (TRAP) leads to expression of the fluorescent protein tdTomato under dual control of a c-Fos gene promoter and estrogen receptor activation.

**Methods:** Two adult TRAP2 mice underwent unilateral chronic constrictive injury (CCI) of the sciatic nerve, while another two underwent sham surgery. Allodynia developed in only the CCI group, as confirmed by paw withdrawal thresholds using von Frey filament testing. The mice were administered 4-OHT (to “TRAP” active neurons) one week postoperatively and maintained for six days before transcardial perfusion. Tissue clarification and confocal imaging/processing allowed for active neuronal populations in distinct brain regions to then be quantified and compared between groups.

**Results:** Active neuronal populations were ten-fold more prevalent in the posterior central lateral nucleus of the thalamus and four-fold more prevalent in the posterior portion of the anterior periventricular nucleus of the thalamus in the CCI group as compared to controls. Additionally, active neuronal populations were twice as prevalent in the posterior insula in the CCI group.

**Conclusions:** This model demonstrates a clear increase in the neuronal activity of pain-related medial thalamic and cortical structures in the neuropathic pain state. Future work will examine spatial and temporal changes among mice with longer periods of neuropathic pain, which will enhance our understanding of the mechanisms responsible for central sensitization to chronic neuropathic pain and may one day allow for more targeted pharmacological and surgical interventions for patients suffering from this condition.
Poster #7  
Evaluation of the Outside-In Percutaneous MCL Release for Improved Medial Compartment Access During Knee Arthroscopy

Alex Demers

Introduction: Knee arthroscopy is one of the most common procedures performed within orthopaedic surgery. Areas of the knee such as the posterior medial compartment add complexity to arthroscopy by limiting access of instrumentation and preventing visualization of pathology, thus increasing the risk for iatrogenic injury to articular cartilage. The percutaneous, outside-in technique of “pie-crusting” the medial collateral ligament has been shown by systematic review to be a safe and efficacious solution for improving access and visualization of the medial compartment. This prospective study is aimed at quantifying the extent of joint space widening intraoperatively, while also examining post-operative outcomes without bracing following MCL release.

Methods: IRB approval was granted for execution of a prospective study for patients undergoing knee arthroscopy with preoperative PROMIS and IKDC scores assessed via questionnaires. Intraoperatively, a valgus stress fluoroscopic image was acquired prior to performance of the release. Subsequently, an 18-gauge spinal needle was utilized to percutaneously release the proximal MCL, 1 cm proximal to the joint line. A second valgus stress fluoroscopic image was then obtained. Post-operatively, all patients were managed using this institution’s standard protocol without additional bracing. At six-week follow-up, PROMIS and IKDC scores were reassessed, along with valgus-stress radiographs.

Results: Of the 34 patients enrolled, 14 patients were currently available for analysis with a mean age of 52.4 ± 10.7 years. Mean baseline PROMIS and IKDC scores were 71.5 ± 11.7 and 33.8 ± 13.8, respectively. Intraoperative assessment of medial compartment width prior to release was determined to be 5.85 ± 1.2 mm. Following the release, the mean width of the joint space was shown to be 11.16 ± 2.1 mm, corresponding to a mean increase of 5.31 ± 1.37 mm. At six-week follow up, mean PROMIS and IKDC scores demonstrated a statistically significant increase compared to baseline (PROMIS = 79.3; (CI[79.3-95.1], p=.049); IKDC = 50 (CI[49.5-50.6], p=.008)). Furthermore, valgus-stress radiographs at six-week follow-up quantified the mean medial compartment width as 5.8 ± 0.8 mm.

Conclusion: The outside-in percutaneous release of the MCL has produced consistent widening of the medial compartment without increasing morbidity to patients at this institution. Continued demonstration of the efficacy and safe outcomes associated with the MCL percutaneous release will facilitate its widespread adoption.

Poster #8  
Towards Disability-Conscious Medical Education

Adrienne Doebrich

According to 2016 data from the CDC, one in four U.S. adults report having a disability. Despite this prevalence, numerous studies have shown that health care providers consistently assume the quality of life experienced by people with disabilities to be lower than what is self-reported. Incorrect assumptions about patients’ quality of life and experience with disability negatively influence how patients are treated, valued, and counseled. This perpetuates health care
disparities as well as violates core bioethical principles, namely respect for autonomy. As a result, the AAMC and other professional organizations are increasingly recognizing the need for medical education to include training related to disabilities. This project explores how Disability Studies can be further included in medical education. Including this aspect of medical training is necessary for two reasons: (1) to promote culturally competent healthcare and address current healthcare disparities, and (2) to recognize the role medicine plays in disabling, and conversely its potential role in enabling. However, there is limited comprehensive data on the most effective education methods of including Disability Studies in medical curricula. Strategies implemented by various medical schools, including the UVA SOM Disability Thread and related learning objectives, were reviewed. In evaluating these strategies, an emphasis was placed on Disability Studies literature and perspectives, which have largely been overshadowed by the medical model of disability. The future goal of this project is to continue to work with educators, both clinicians and disability scholars, to further develop UVA SOM’s disability curriculum as well as promote disability-conscious medical education on a larger scale.

Poster #9
The Comparative Utility of Social Determinants of Health Screening Tools

Courtney Duckworth and Tiana Walker

Social determinants of health (SDH) play a key role in patients’ health outcomes, yet tools to assess these needs are underutilized, partially due to lack of consensus. To give clarity to questions that are most effective in assessing SDH, we compared current SDH screening tools to validated gold-standard surveys for six primary SDH domains. By finding the most accurate and sensitive questions for our patient population, we aim to lay the groundwork for other centers to conduct similar studies and identify SDH screening tools appropriate for particular patient populations.

Poster #10
Local Estrogen Treatment for Non-Surgical Recontouring of Auricular Cartilage

Ryan Duong

PURPOSE: Ear malformations afflict 5% of the population. Correction can be accomplished through ear splinting early in infancy. However, beyond this time point, splinting is ineffective, leaving a surgical solution. This effect is thought to be due to retained circulating maternal estrogens, increasing hyaluronic acid in fetal cartilage, improving malleability. We evaluated the potential of direct exogenous estrogen application on splinted ears to provide long-term structural changes to achieve non-surgical recontouring of auricular cartilage.

METHODS: Ears of 9 New Zealand rabbits were folded and splinted, and randomly assigned an experimental group (injected estrogen, topical estrogen, and untreated control) (n=6). Treatment ears received injected estrogen twice weekly or topical estrogen daily for 4 weeks. The splints were removed 2 weeks after treatment, and daily photographs were taken to calculate the retained fold angle. Biopsies were also taken for histologic analysis.

RESULTS: Splinting led to similar ear orientation (24°±5°, 26°±17°, and 29°±13°) for injected, topical, and control groups respectively. 5 days post-splinting, ear shapes stabilized, with injected estrogen exhibiting a significantly maintained angle (108°±29°) compared to topical
estrogen (166°±7°) and control (173°±3°) (p≤0.05). Auricular cartilage thickness and intracartilaginous hyaluronic acid of estrogen treated ears was also preserved compared to control 3 weeks after ceasing treatment.

**CONCLUSION:** Results demonstrate the potential positive effect of local estrogen treatment in non-surgical remodeling of mature auricular cartilage. Future work is needed to more fully investigate the molecular mechanisms of estrogen treatment, optimize dose and frequency of treatment and develop a formulation to achieve functional dermal penetration.

**Poster #11**  
**Characterizing a novel ROCK1 mutation in a family with congenital heart disease**  
Tiffany Duong

Congenital heart disease (CHD) affects 1 in 1,000 births in the US and has a strong genetic correlation. Whole exome sequencing in members of a family with a history of CHD identified a novel activating mutation in Rho-associated coiled-coil kinase protein 1 (ROCK1), a serine/threonine kinase responsible for regulating the actomyosin cytoskeleton and therefore vital cellular processes such as division, motility, and apoptosis. ROCK1 has also been found to play a noncanonical role in the Notch pathway, which regulates cell differentiation during heart development. We sought to characterize the nature of this novel ROCK1 mutation with a cellular model by transfecting MCF7 cells with wild-type and mutant ROCK1. Immunofluorescence and live fluorescence techniques showed increased localization of wild-type and mutant ROCK1 in the cytoplasm of apoptotic MCF7 cells, with increased cell toxicity. ROCK1 inhibitor Y27632 partially rescued the morphology of MCF7 cells expressing wild-type ROCK1 from apoptosis. Proliferation assays showed no significant difference in proliferation between MCF7 cells transfected with wild-type and mutant ROCK1. Further research needs to be done to clarify the mechanisms through which mutations in ROCK1 lead to cell death. These insights can be used in the creation of heart cell and animal models to better characterize the role of this mutant ROCK1 in heart cell development and, ultimately, the development of CHD.

**Poster #12**  
**Hepatitis C virus-infected solid organ transplantation into non-viremic recipients: implementation of a single-center protocol**  
Jakob Durden

**Introduction:** Hepatitis C Virus (HCV) viremic organ transplantation into uninfected recipients (D+/R-) provides an avenue to expand the donor pool and increase transplant volume. The liver transplant program was the first at UVA to adopt an HCV D+/R- protocol in October 2018. The patient who first received a D+/R- had a MELD score that vastly overestimated their functional status, resulting in a decreased likelihood of receiving a non-HCV donor organ. This successful D+/R- liver transplant provided proof of concept, and in February 2019 kidney and combined kidney-pancreas transplant implemented their protocols, followed by heart and lung in March.

**Methods:** All HCV D+/R- transplants through end July 2019 were reviewed using the UVA solid organ transplant quality database.
**Results:** Between October 2018 and end July 2019, 40 HCV D+/R- transplants were completed at UVA, accounting for 20.3% of transplant volume since protocol implementation. The average time spent on the waiting list for recipients of HCV infected organs was 440 days. There was a large variance between groups, with lungs having a much shorter waiting list duration (65d) than liver (168d), whereas kidneys had a waiting list duration that was much greater (694d). 32 organs were HCV nucleic acid testing (NAT) positive and 31 recipients were subsequently infected (table 1). No NAT negative organs transmitted HCV. The mean detection time of HCV viremia was postoperative day 9, and the mean start of direct-acting antiviral (DAA) therapy was post-operative day 42 (table 2). Average viral load at detection varied widely among organs, with the liver transplants averaging a far greater viral load. To date, there has been one patient mortality from entero-atmospheric fistula development secondary to Crohn’s disease.

**Conclusion:** The UVA HCV D+/R- transplant protocol has increased single center transplant volume, allowing for the provision of viable organs to patients who may not otherwise receive a transplant.

**Poster #13**  
**Characterizing Emergency Department Utilization for Mental Health and Substance Abuse in Previously Incarcerated Individuals**  
Eugenie Hughes

Incarcerated individuals experience a higher health burden than the general population, with higher rates of mental health disorders and infectious disease. Mental illness has been shown to increase the risk of crime and repeat offending. However, prisons and jails are often not equipped to provide the treatment needed to address this population’s unique health concerns. Upon discharge, the strain of navigating employment, housing, transportation, etc. coupled with inadequate mental health treatment while incarcerated, results in increased likelihood of utilizing emergency department (ED) services. Understanding the ED utilization of previously incarcerated individuals may inform interventions to reduce mortality and recidivism, especially as those interventions relate to mental health and substance abuse. This study characterizes the mental health and substance abuse related ED utilization of previously incarcerated persons. Study subjects are those incarcerated at the Albemarle-Charlottesville Regional Jail from 2015-2017 who were discharged to the local area. ED utilization data is pulled from UVA Hospital Emergency Department within a year of each study subject’s release. The study also looks at the effect of intervention services on the ED utilization of a cohort of this population. Interventions services are provided at Region 10 in Charlottesville, VA and are in the form of individual therapy, group therapy, and medical treatment by a social worker, psychologist, or psychiatrist based on a determined diagnosis. Data collection is ongoing.

**Poster #14**  
**Virginian Medical Students and a Career in Primary Care: Interest, Attitudes, and Influences**  
Brett Jackson

**Background:** The AAMC predicts that there will be a shortage of between 21,100 and 55,200 primary care physicians by 2032, or roughly 45% of the entire physician shortage (between
46,900 and 121,900). Additionally, in 2019, the percentage of U.S. seniors filling primary care residency positions was the lowest on record. Past research suggests that students’ attitudes towards a career in primary care can change during medical school based on medical school culture, exposure to primary care, and even discouragement or disparagement from faculty.

**Purpose:** The purpose of this study is to evaluate Virginian medical students’ interest in and attitudes towards a career in primary care and to identify factors that may be influencing them.

**Methods:** An anonymous survey will be distributed to Virginian medical students by email. If they decide to participate, they will follow a link to the questionnaire administered through Qualtrics. One follow-up email will be sent to remind students to complete the survey if they have not done so. The questionnaire was adapted, with permission, from a study conducted at the University of Oxford that aimed to answer similar questions to my study. Upon collection of the completed surveys, the results will be further de-identified by deleting participants’ IP address and location data before being analyzed using Qualtrics analytics and with the assistance of the UVA Public Health Sciences department.

**Future Steps:** If we are able to identify patterns in students’ attitudes and influences, future projects could focus on cultivating and protecting medical students’ interest in primary care. Recruitment efforts at medical schools are ongoing.

**Post #15**

**Factors Influencing No-Show Rates at the UVA Dermatology Clinic**

Grace Kim

Multiple studies have been conducted to investigate the factors contributing to appointment no-shows, with the majority under the setting of family practice or psychiatric service settings. These no-show appointments can bear a cost to the healthcare system both on the providers on lost productivity and patients with poor disease control. The objective of this study was to then identify factors influencing no-show rates that could potentially be future targets of intervention to improve appointment attendance.

A retrospective chart review was conducted on appointments scheduled at the outpatient dermatology clinic at the University of Virginia for the calendar year of 2018. All appointments were included in the study except for prior confirmed cancellations. Factors investigated were race, gender, employment, financial class, appointment time, age, provider type, visit type, how far in advance the appointment was made, and the distance of patients to the clinic. A chi square test was used to determine whether individual factors showed a significant difference in no-show rates.

The total number of appointments in the study was 26475 with 2954 (11.2%; 95% CI, 11.3% to 18.8%) no-show appointments. Appointment time (p=0.0005) and all other factors investigated (race, gender, employment, financial class, age, provider type, visit type, lead time, and distance) (p<0.0001) were shown to be significant in affecting no-show rates. The most to least influential factors were determined to be employment, financial class, age, race, provider type, visit type, lead time, gender, distance, and appointment time.

Next steps may be to identify reasons why patients don’t show up for appointments without cancelling. Identification of both patient characteristics with higher no show-rates and obstacles
to appointments can be used for targeted interventions to increase both appointment attendance and receive prior confirmation of cancellations.

**Poster #16**

**Automated Quantification of Subcutaneous and Visceral Abdominopelvic Fat Using Machine Learning**

Maneesh Koneru and AJ Winkelman

Obesity is a global epidemic most commonly defined by BMI, a proxy measurement for body fat. However, BMI relies on total weight and therefore, fails to differentiate between subcutaneous and visceral fat and includes irrelevant weights like muscle mass. Radiological techniques such as CT (computer tomography) and MR (magnetic resonance) allow clear visualization of fat against surrounding tissue in a single slice, allowing greater accuracy in assessment of fat content. However, to quantify the total fat content in an individual’s abdomen by manually summing these slices would be labor intensive and impractical. Instead, by using machine learning we were able to calculate total fat content in subjects in a rapid and automated method. This method can be used to produce a more accurate biomarker of physical health than BMI by correlating subcutaneous and visceral fat volumes directly to deleterious obesity related outcomes, while excluding factors which confound BMI like bone and muscle. Final statistics have not been completed, but preliminary results suggest fat content obtained through this method to be a more effective marker for obesity and its associated complications than BMI.

**Poster #17**

*A neuro-economic model describing the evolution of human brain capital across the lifespan explains the basis of functional decline in aging and neurodegenerative disease*

Jacob Kosyakovsky

While the healthcare burden of dementia continues to grow, our understanding of the basic processes underlying brain aging and neurodegenerative disease remains incomplete. Using principles from resource economics, I created a dynamic model explaining how the brain develops and evolves with aging. Treating the brain as an asset, this model tracks the formation of human brain capital, the set of infrastructure and processes that underlie brain function. In the model, brain capital is subject to depreciation over time. Furthermore, a consequence of the deployment of human brain capital is the production of damaging pathology (pollution), part of which is short-term, clearable pathology (such as reactive oxygen species) that can be cleared in the process of pollution control, and part of which is long-term, persistent pathology (such as protein aggregates) that accumulates. I model the evolution of the levels of brain capital over the lifetime as the dynamic interplay between its development and these factors. In this system, brain capital grows in early life, plateaus in adulthood, and declines in late life. Crucially, I find that functional decline with aging is a fundamentally endogenous process—without assuming any external shocks or factors, decline following plateau is caused by the irreversible accumulation of long-term pathology. This framework suggests that neurodegenerative diseases are individual manifestations of this aging process that involve severe decline caused by the accumulation of insoluble protein aggregates (a potent form of long-term pathology), and I show that this framework is highly consistent with current data. I further simulate the roles of external stressors and factors in causing cognitive decline (as in vascular dementia) and in contributing to the pathogenesis of neurodegenerative disease. Additionally, I demonstrate that
this model can be used as a platform to assess the explanatory power of several current theories of Alzheimer’s disease, and I suggest an amyloid-tau interaction model to explain the complex spatiotemporal relationships between senile plaques, neurofibrillary tangles, and neurodegeneration in this disease. Finally, I demonstrate that these results have significant implications for future therapies seeking to target brain aging, neurodegenerative disease, and Alzheimer’s. All in all, this model provides a robust framework that explains how and why the brain develops, ages, and declines across our lifetimes.

Poster #18
Influence of Age and Gender on Patient Perceptions of Anesthesiologists

Naveen Chandra Kotha

Anesthesiologists must establish rapport with patients in short periods of time, often in stressful situations such as just prior to surgery. Patient and their family members’ perceptions of their anesthesiologist’s competence is therefore an important area of study. The purpose of this study was to investigate the impact of anesthesiologists’ age and gender on patient perceptions. It was hypothesized that patients would perceive older-appearing, more senior anesthesiologists as more confident, more intelligent, more likely to be chosen to care for one’s family members, and more likely to be considered a leader than younger-appearing, more junior anesthesiologists. A total of 300 patients were enrolled in this study through the UVA Preoperative Evaluation and Testing Center (PETC). Patients were shown a set of four two-minute videos in random order. Each video showed an anesthesiologist explaining general anesthesia and its associated risks. Each video portrayed one of four actor anesthesiologists: a senior male anesthesiologist, a junior male anesthesiologist, a senior female anesthesiologist, and a junior female anesthesiologist. After viewing the four videos, patient participants were asked to complete an anonymous questionnaire asking them to rank each anesthesiologist in order of how likely they were to choose the anesthesiologist to care for their family member, perceived confidence, and perceived intelligence. Participants were also asked to choose one of the four anesthesiologists who seemed most like a leader. The questionnaire also asked participants for their demographic information, including gender, age, and race. The collected data is currently undergoing statistical analysis with the goal of examining the relationships among anesthesiologist age and gender, patient preferences towards the anesthesiologists, and patient demographics.

Poster #19
Modeling Medical Education: The Impact of 3D-Printed Models on Medical Student Education in Plastic Surgery

Jaina C. Lane

PURPOSE: Trainee exposure to craniofacial disease can be limited due to rare disease presentation, revealing a need for tools that assist in visualizing complex 3D pathologic anatomy. 3D-printed models show potential as a useful aid, allowing for physical manipulation and hands-on experience. This study investigates their educational value in teaching craniofacial pathology and surgical repair.

METHODS: Forty-four medical students randomly assigned to a control group or model group were given a PowerPoint presentation-based module on craniosynostosis and surgical repair.
The model group was also provided with 3D-printed models of sagittal, metopic and bicornoral synostosis, created using patient-specific preoperative computed tomography data. A survey using the Likert scale evaluated participants' learning experience. Pre- and post-module scores on a 10-question multiple choice quiz were recorded.

RESULTS: The survey showed that students in the model group reported better understanding of the anatomy (4.86 ± 0.15 versus 4.26 ± 0.22; p = 0.0001) and visualization of the defect (4.76 ± 0.23 versus 4.26 ± 0.25; p = .0064), gaining an improved understanding of surgical approach (4.38 ± 0.37 versus 3.83 ± 0.29; p = .0066), which was more effectively taught (4.24 ± 0.33 versus 3.30 ± 0.38; p = 0.0007) with the 3D-printed models. The mean pre- and post-module quiz scores between groups were similar.

CONCLUSION: 3D-printed models demonstrated an improved learning experience for medical students as shown by survey. These findings suggest a potential use for 3D-printed models in medical education of craniofacial pathology and surgery.

Poster #20
Monocyte Response to Chronic Toxoplasma gondii Brain Infection

Jackie Lee

Toxoplasma gondii is an obligate intracellular parasite that infects all mammals, including mice and humans. T. gondii is extensively prevalent worldwide, infecting an estimated one-third of the world’s population. In otherwise healthy adults, the immune system is able to readily control the infection, keeping the parasite in a dormant state and resulting in a subclinical or asymptomatic presentation. However, in immunocompromised systems, such as in HIV-AIDS patients or those undergoing chemotherapy, T. gondii parasites are reactivated and undergo uncontrolled replication. T. gondii establishes chronic infection in the CNS, resulting in toxoplasmosis, a life-threatening disease characterized by abscesses and necrosis within in the brain parenchyma. Chronic toxoplasmosis in mice acts as a useful disease model to study the brain-specific immune response to localized lesions in the brain. Previous studies have shown that infiltrating myeloid cells are crucial to the control of T. gondii infection in mice. Specifically, a subset of monocytes is recruited to infected brain lesions and mediate antimicrobial activities, playing a crucial role in controlling parasite burden. It is essential to gain a more refined understanding of the recruitment and functional capacity of monocytes in the setting of infection.

In this study, we explored a system to visualize monocyte recruitment and differentiation into tissue-resident macrophages through adoptive monocyte transfer to T. gondii-infected recipients. We evaluated changes in localization and characteristics of transferred monocytes at four time points, spanning eight days. We assessed cell-surface markers on the transferred monocytes that characterize their maturation and functional capacity by flow cytometry and visualized the transferred cells using immunohistochemistry (IHC) staining to compare changes in localization and ramification over time. From this experiment, we observed that transferred monocytes indeed enter the brain, with an increasing number of cells entering across even the earliest time points. Over time, an increasing number of monocytes gained cell markers indicative of maturation into macrophages; a subset of these cells expressed inducible nitric oxide synthase, a major innate effector of anti-parasitic activity that effectively blocks T. gondii. Through IHC, we observed a majority of transferred monocytes in the meninges and brain vasculature at 24 hours, with more cells found deeper within the parenchyma after 48 hours. We
were also able to observe morphological changes of the transferred cells over time, from that of circulatory monocytes into cells with branching processes consistent with macrophages.

Given that peripherally-derived macrophages play a crucial role in controlling *T. gondii* infection in mice, it is important then to discover factors that dictate their recruitment to infected brain lesions. These results offer adoptive monocyte transfer as a promising method through which we can further explore what is necessary for monocyte recruitment and function in the control of *T. gondii* brain infection.

**Poster #21**  
**Loss of Id3 in Endothelial Cells is Associated with Increased Atherogenesis in Mice**  
Jason Li

Atherosclerotic vascular disease is the leading cause of death worldwide. Over the past decade, sequencing of the human genome has enabled exploration of genes implicated in the pathogenesis of atherosclerosis. In this context, Id3, a member of the helix loop helix family of proteins with negative transcription regulator functions, has been suggested to have an atheroprotective role. In humans, a SNP in Id3 leading to loss of function is associated with subclinical disease. In ApoE<sup>−/−</sup> mice, global loss of Id3 results in increased atherosclerotic burden as well as increased VCAM-1 expression and macrophage accumulation in atherosclerotic plaques. As endothelial dysfunction is a critical step in the early pathogenesis of atherosclerosis, in this project, we attempted to determine whether Id3 exerted its atheroprotective role via its effects on endothelial cells. Mice with loss of Id3 specifically in endothelial cells showed increased amounts of atherosclerotic plaque volume in the aortic root, but lesion area as a percent of total root area was not significantly changed. Furthermore, the plaques did not show increased VCAM-1 expression, macrophage accumulation, or smooth muscle hyperplasia. However, the plaques did show increased lipid content, suggesting worsened plaque stability.

**Poster #22**  
**Modulation of stroke-induced spreading depolarizations by inhibition of microglial calcium signaling**  
Lei Liu

Stroke is a leading cause of death and severe disability worldwide. Yet, there are only a few therapeutic interventions available in the current clinical practice. Soon after ischemic injury, spreading depolarizations (SD), characterized by spreading loss of ion homeostasis, begin to develop within the brain. SDs form propagating waves of synchronized depolarization of neurons and astrocytes, followed by a prolonged period of inactivity, and metabolic recovery. SDs are thought to exacerbate the tissue infarction after a stroke event through prolonged ionic gradient breakdown and metabolic disturbances. It has been shown that microglia play a critical role in the initiation and propagation of SDs in the brain. Calcium signaling through calcium release-activated calcium (CRAC) channels is crucial in microglia activation. However, little is known about how modulation of Ca<sup>2+</sup> signaling in microglia could affect SD in the setting of stroke. We hypothesized that blockade of CRAC channels in microglia would inhibit Ca<sup>2+</sup> signaling and reduce SD initiation and propagation. We generated an Iba1-GCaMP5 transgenic mouse line, in which the Ca<sup>2+</sup> indicator GCaMP5 is specifically expressed in microglia. By using a two-photon microscopy system we imaged microglial activities in the somatosensory cortical
area in vivo. We found infrequent spontaneous Ca\textsuperscript{2+} activities in naïve mice. We then performed middle cerebral artery occlusion (MCAo) to induce a stroke and monitored microglial responses in vivo. In contrast to naïve mice, synchronized spreading Ca\textsuperscript{2+} waves were captured at a variable frequency. To further study the role of CRAC channels in Ca\textsuperscript{2+} waves, we applied 1M KCl solution to the nearby cortical area to chemically induce SD in the brain. We compared a group of mice treated with lipopolysaccharide (LPS) which mimics sterile inflammation occurring in the stroked brain, with controls. We found that microglial Ca\textsuperscript{2+} activity was significantly stronger in the LPS treated group. In addition, our preliminary data show that administration of CM-EX-137, a CRAC channel blocker, effectively abolishes the Ca\textsuperscript{2+} signals in microglia and SD upon application of KCl. In conclusion, the blockade of CRAC channels appears to inhibit microglial Ca\textsuperscript{2+} signaling and SD initiation and propagation in vivo. Further investigation of CRAC channel inhibition in microglia as a pharmacological target for stroke is warranted.

**Poster #23**

**Assessing the feasibility of using a mobile health app to improve HIV medication adherence in rural Tugela Ferry, South Africa**

Nicholas Lolli

Tugela Ferry is a small rural town located in the KwaZulu-Natal Province of South Africa. Its hospital, Church of Scotland Hospital, treats a large number of people living with HIV, including those who struggle to adhere to medications. At UVA’s Ryan White HIV Clinic, use of PositiveLinks, a mobile health application designed to foster social support and community, has shown to increase patient engagement in healthcare and improve health outcomes. The app’s features include an anonymous community discussion board, daily check-ins that track medication usage, stress, and mood, healthcare resources, and patient-provider messaging function. Over a 12-month period, patients using PositiveLinks showed an increased retention in care and an improved viral load. The aim of this study is to assess the usability of PositiveLinks in the context of Tugela Ferry, South Africa before expanding to a larger study that analyzes engagement in care and health outcomes after using the app. The app was translated to isiZulu for use in Tugela Ferry. Participation is open to up to 50 adult patients of Church of Scotland Hospital who are initiating antiretroviral therapy, including both newly diagnosed patients and ‘defaulters’ who are re-initiating therapy. Each participant completes demographic, medication adherence, and usage surveys at enrollment and 2 weeks, 1 month, and 3 months post-enrollment. Participant activity is also monitored through the administrative portal of the PositiveLinks app. As of October 2019, there are 15 participants, all of which are female, and only a few participants currently show consistent use of the app. There have been many barriers to implementing use of the app. Men in Tugela Ferry come to their antiretroviral therapy appointments far less than women, possibly due to a higher feeling of stigmatization. Furthermore, they tend to have jobs that require them to move around the country throughout the year, making it harder to follow-up with them. Another identified barrier to using the app is a lack of mobile data. Most people in Tugela Ferry have intermittent internet access and purchase data when they can afford it, not having enough to power use of the app. We plan to continue study enrollment and post-enrollment follow-ups until we can better clarify other barriers to app use and then re-assess whether the app can truly be useful to people living with HIV in Tugela Ferry.
Poster #24
Nephrology and Palliative Care Collaboration in the Care of Hospitalized Patients with Advanced Kidney Disease: Utilization and Outcomes

Kara MacIntyre

Introduction: Advanced kidney disease (AKD) (eGFR <15 ml/min) is a complex illness associated with high morbidity and mortality. Palliative care (PC) emphasizes the management of symptoms along with discussions with patients and their families regarding prognosis in order to help clarify their goals in managing their illness. Despite the evidence of improved outcomes for patients with AKD receiving PC, the use of PC for patients has been limited. Among the reasons cited for the limited involvement of PC for these patients are limited access to PC services and a lack of resources available to the renal care providers to provide appropriate PC services to their patients. We aimed to study patients with terminal AKD who have been followed by nephrologists in the outpatient setting and were admitted to a tertiary care hospital where resources are available for PC consultation (PCC) to further understand the pattern of PCC (or the lack of it) of these patients and to shed light on the outcome of such consultations.

Methods: We retrospectively studied 126 patients AKD who were previously seen by a nephrologist and who were hospitalized at University of Virginia (UVA) between 1/1/18-3/31/19 and died during that period. Demographic, comorbidity, PCC, goals of care (GOC), advance directive (AD), do not resuscitate (DNR) status, and hospice data were obtained.

Results: PCC was obtained in 72 patients (57.1%). No statistical differences were noted in demographics (age, gender, race) between those with PCC versus no PCC. Similarly, aside from more PCC for patients with congestive heart failure, there were no statistical differences noted in comorbidities (coronary artery disease, hypertension, diabetes mellitus, use of dialysis) between both groups. Patients with PCC had significantly higher rates of GOC discussions, AD planning, DNR documentations, and hospice referrals.

Conclusion: Despite the improved care of patients noted when PC is consulted in a subset of terminally ill patients with AKD, PCC are still underutilized. Consulting PC as soon as possible for patients with AKD is recommended for high-quality patient-centered care that improves the end of life experience for patients.

Poster #25
Retrospective chart-review of multilevel anterior cervical discectomy and fusion procedures and outcomes at the UVA health system.

Jesse McClure and Leah Shabo

Background: The Anterior Cervical Discectomy and Fusion (ACDF) procedure is a safe and effective method of treating several types of nerve impingements in the cervical region. While originally performed as single level procedures, there has been an emergence of multilevel procedures. To date, there is a paucity of information surrounding ACDF procedures’ success rates when 3 or more cervical levels are fused.
Objectives: To determine outcomes and complications after multilevel ACDF at our institution. The Primary outcome was the overall rate of fusion for 3- and 4-level ACDF. A secondary outcome was the time to fusion for both 3- and 4-level ACDF.

Methods: We reviewed each case of 3- and 4-level ACDFs performed at our institution from 2010 until July 2017 with at least two years of clinical follow-up. Utilizing their electronic medical record, we determined fusion rates, time to fusion, and reoperation rates among other key outcome, perioperative, and demographic measurements.

Results: The average age of the entire cohort was 58.4 years (range 35-83), of which, 48.7% were male. The average BMI at time of surgery was 29.8 kg/m² (range 16.8-81.0). 15.1% were current tobacco users, 36.1% were former users, and 48.7% denied any use of tobacco. Of the 119 patients identified, 65.4% and 60.0% of patients undergoing 3- and 4-level ACDF achieved complete fusion determined radiographically by two years, respectively. Following these patients to their last clinical follow-up showed a 71.8% and 67.5% fusion rate, respectively. The median time to fusion was 11 months and 13 months, respectively (range 3-44 and 3-68). The percentage of patients requiring revision was low (5.8%), and without regard to rate of fusion/non-union. Those requiring a revision had a mean time to failure of 36.8 months (range 15-69).

Conclusions: Review of our institution’s cases involving 3- and 4-level ACDF procedures demonstrated an equivalent rate of fusion and time to fusion between 3- and 4-level ACDFs. These rates are similar to previously published data from smaller cohorts of similar patients at other institutions.

Poster #26
Characterization of Hedgehog Signaling Pathway Activation in Complete Craniofacial Bone Regeneration in a Critical-Sized Rat Mandibular Defect

Logan McColl and Xizhao Chen

Background: Osseous craniofacial defects remain a reconstructive challenge despite existing modalities – bone grafting, rigid fixation, free tissue transfer – due to significant morbidity, incomplete bone regeneration, and free tissue transfer noncandidacy.

Objective: To quantify osseous regeneration associated with smoothened agonist (SAG), bone morphogenetic protein-6 (BMP-6), vascular endothelial growth factor (VEGF), and/or natural IgM autoantibodies (IgM-NAA) in Matrigel® suspension and characterize the underlying cellular processes and immunocyte profiles within the bone healing environment via a novel Fluorescence Activated Cell Sorting (FACS) process.

Methods: Bilateral non-segmental critical-sized defects (CSDs) were created at the angle of the mandible in thirty-four 8-week female Lewis rats. The CSDs were either left untreated or filled with Matrigel® as: Matrigel®-only, SAG, BMP-6-VEGF-SAG [BVS], or IgM-NAA. Twenty-four rats were sacrificed after 2- or 4-weeks and defect bony calluses were analyzed via FACS. Ten rats were sacrificed at 8-weeks and mandibular bone regeneration was evaluated with radiographic imaging. Analysis of variance testing was used to compare treatment FACS and imaging data.

Results: Within the 8-week cohort, treatment with BVS resulted in complete bony defect closure, the first such result within this animal model. Other treatment groups showed minimal defect closure upon radiographic analysis. FACS was remarkable for decreased immunologic...
cell recruitment with IgM-NAA treatment at 2-weeks. Between 2- and 4-week SAG-treatments, FACS showed mesenchymal cell recruitment was significantly elevated (p= 0.008).

Conclusion: Treatment of mandibular CSDs with BVS Matrigel® suspension resulted in complete defect closure in this animal model, further validating the role of hedgehog pathway activation in enhanced craniofacial osteogenesis. Further research is warranted to delineate the effect of hedgehog pathway activation on immunologic cell recruitment.

Poster #27
Effects of Adverse Childhood Experiences in the Central Appalachian Coalfields: An Analysis of Protective Factors Which Combat Negative Health Outcomes

Haley A. Meade

In 1998, Felitti et. al. published a revolutionary study investigating a relationship among adverse childhood experiences and health-risk behaviors and diseases in adulthood. In recent years, researchers have worked to both identify ways of decreasing exposure to childhood trauma and to identify the factors that are protective against the effects of such trauma. This region, specifically eastern Kentucky and southwest Virginia, face unique struggles with relation to health care and social determinants of health, as described by the Creating a Culture of Health in Appalachia: Disparities and Bright Spots initiative (Marshall et. al. 2017). Specifically, the Appalachian region experiences an increased prevalence and risk for many of the health-risk behaviors and diseases cited in the Felitti et. al study (1998). To fill the need for an analytic study in the central Appalachian coalfields, this study investigated the relationship between adverse childhood experiences and resiliency measures in this region. A total of 585 surveys were handed out to patients at Mountain Comprehensive Health Corporation, a Federally Qualified Health Corporation, in Whitesburg, Kentucky. 132 surveys were completed with 129 surveys incorporated into statistical analysis. A statistically significant positive relationship between self-oriented decision-making, moral meaning making, social support, and emotional regulation and the probability of thriving was observed. A statistically significant reduction in the probability of thriving was observed for increasing number of adverse life events and increase in financial strain. The effect of forgiveness on thriving as indicated by health-related quality of life was not statistically significant. This study from the central Appalachian coalfields confirms earlier research about the lifelong burden of adverse childhood events on health-related quality of life. The reported results mirror those found in Banyard, et. al., published in 2016, further illuminating the impact resiliency has in protecting individuals from the negative health outcomes associated with adverse childhood experiences. This study demonstrates how important community support, self-oriented meaning making, moral meaning making, social support, and emotional regulation are in the promotion of resiliency and how this resiliency can impact an individual’s quality of life. Further, we see just how important adverse childhood experiences and financial strain are on an individual’s health, further solidifying the points made by Felitti, et. al. in 1998. In the future, we hope to use these results to implement an intervention aimed at increasing knowledge of adverse childhood experiences and also highlighting measures to increase the resiliency of communities in the central Appalachian coalfields.
Poster #28
Prehospital Acute Stroke Therapy with Trans Sodium Crocetinate (PHAST-TSC) Trial

Jackson A. Narrett

Neuroprotection is a treatment strategy with the potential to benefit patients with both ischemic and hemorrhagic stroke. Many promising neuroprotectants have been identified in animal models of stroke but none have demonstrated clear efficacy in clinical trial. Trans sodium crocetinate (TSC) is a potential neuroprotectant with a unique mechanism of action. TSC forces water molecules into a more ordered configuration to enhance the diffusivity of oxygen in blood plasma and improve oxygen delivery to ischemic tissues. The Prehospital Acute Stroke Therapy with Trans Sodium Crocetinate (PHAST-TSC) trial is a phase II, multicenter, double-blind, placebo-controlled, parallel group trial that will test the safety and efficacy of TSC when administered in the hyperacute period of stroke. This trial will enroll 160 participants with acute stroke, within two hours of symptom onset, as identified by the modified Los Angeles Prehospital Stroke Screen performed by emergency medical service (EMS) providers. Physician investigators make final enrollment decisions via telephone or videoconference. Informed consent will be obtained in the field when possible, however, it is anticipated that the majority of patients will be enrolled under exception from informed consent (EFIC). The study intervention is a single intravenous injection of TSC at a dose of 0.25 mg/kg or a volume matched placebo administered in the field by EMS providers. Randomization is stratified by ambulance, and each ambulance carries only the next single study drug kit in its permuted random block sequence. The primary efficacy end point of this trial is global disability level as measured by the utility weighted modified Rankin Scale (UW-mRS). Secondary efficacy endpoints include functional independence (mRS 0-2), Barthel Index (BI) of Activities of Daily Living, National Institute of Health Stroke Scale (NIHSS), and global disability level on the mRS assessment at 90 days in participants with ischemic stroke. Safety measures include serious adverse events and all-cause mortality. Few prehospital drug trials for stroke have been completed. Successful implementation of the methods of the PHAST-TSC trial at centers in rural Virginia and urban Los Angeles will further demonstrate the generalizability of this design. Results of the PHAST-TSC trial will inform the design of future trials that may further evaluate the efficacy of TSC as a neuroprotectant or test other potential stroke therapeutics in the prehospital setting. This study is sponsored by Diffusion Pharmaceuticals, Inc. (Charlottesville, VA).

Poster #29
Characteristics of Traumatic Brain Injury in a Battlefield Setting: A Retrospective Series

Parantap Patel

Traumatic brain injury (TBI) is a leading cause of morbidity and mortality among young adults and is particularly significant among members of the armed services. Due to the unique nature of blast and high-velocity injuries and the challenges associated with resource-limited settings, surgical interventions play a key role in acute management of battlefield TBI. Presented are the case logs of a United States Navy neurosurgeon, detailing the acute management and outcomes of 156 patients sustaining TBI between November 2010 and May 2011 during the War in Afghanistan. The vast majority of patients were male and 65% were local nationals. American nationals and allied forces comprised only 13% of the patient cohort. By mechanism of injury, blunt trauma (40%) and explosive injury (37%) were the most common contributors to TBI. Approximately 41% sustained comorbid injuries in addition to TBI. Decompressive
craniectomies (24%) and clot evacuations (15%) were the procedures most commonly performed. Nearly one-quarter of patients were transferred to receive further care, yet only 3 patients were referred for rehabilitative services. Only 3 patients died following acute interventions. Improvements in battlefield medicine have resulted in all-time high survivability rates following TBI. However, the burden of chronic disease posed by TBI remains poorly understood in current rehabilitation science. These chronic sequelae are difficult to investigate, especially in the military setting. Improvements in documentation of military patients may augment our knowledge of TBI and further identify potential variables or treatments that may affect prognosis. The increased survivability from TBI also highlights the need for additional research expenditure in the field of neurorehabilitation.

Poster #30
Intraocular hemorrhage as an adverse effect of recombinant t-PA administration

Monica Prudencio

Stroke is a common vascular event, affecting 800,000 Americans annually and ranking as the fourth cause of death in the US. The introduction of recombinant tissue plasminogen activator (rt-PA) as first-line therapy for ischemic stroke was monumental in the treatment of this significant pathology. However, its utility and safety have always been of concern, as the thrombolytic properties of the agent pose risks of hemorrhage both within the brain and throughout the body. As a result of these significant risks, the use of rt-PA is limited in time and scope, with specific guidelines for its used based on onset of symptoms, specific pathology, and analysis of numerous risk factors. One potential sight of hemorrhage is within the eye. Intraocular hemorrhage can have devastating consequences for one’s quality of life, leading to increased intraocular pressure, glaucoma or vision loss. Yet it is not frequently listed as a potential side-effect of rt-PA administration, and clinical guidelines do not list antiplatelet drugs or anticoagulants as direct causes of such hemorrhages. We are conducting a systematic review and meta-analysis of the literature to determine if intraocular complications are reported after use of rt-PA in patients and at what rate these complications occur. We are curious as to whether this complication is (a) intentionally studied in clinical trials as a potential side effect; and/or (b) listed as an outcome when side effect profiles are developed. While our formal results are still pending, our preliminary perusal of the literature, as well as anecdotal evidence, suggest that many publications discussing the use and safety profile of rt-PA fail to mention this potentially serious complication as a safety event, raising the question of whether it is in fact observed in patients. The incidence of intraocular hemorrhage as an adverse effect of rt-PA administration is relevant to any physician considering use of these drugs to treat ischemic events.

Poster #31
Medical Legal Partnership and its impact on asthma

Ben Robinson and Kristian Welch

Introduction: The purpose of this pilot research study is to examine the impact of a Medical Legal Partnership intervention to identify and address the social and legal needs of patients with poorly controlled asthma. The Common Cause Medical Legal Partnership at UVA takes an interdisciplinary approach to addressing social and legal needs through the collaboration of physicians, lawyers, public health scientists and social workers. We know that social
determinants of health can have a profound impact on a spectrum of diseases, including asthma. Accordingly, we predicted that addressing social and legal needs of patients with poorly controlled asthma through an MLP would improve the health status of those patients.

**Methods:** During the summer, we screened and enrolled patients with poorly controlled asthma and social and/or legal needs for the study. We collected data on enrolled patients before, during, and after MLP intervention to evaluate if using this model had a positive impact on asthma control. Data collected included surveys on asthma control, perceived stress, and chart review of hospital and ED visits.

**Results:** Enrolled patients had an average of 3 unmet social and/or legal needs, and an average baseline Asthma Control Test (ACT) score of 12.5 (controlled asthma is >20). Preliminary results show that patients’ asthma control improves after MLP intervention to an average ACT score of 14. With our current follow-up data, more than half of enrolled patients who received assistance with their social or legal issues had asthma control scores that increased at least one class of control afterwards (improvement of 3+), which indicates significant clinical improvement.

**Conclusion:** Current data show moderate improvement in asthma control of patients receiving MLP intervention. We are continuing to follow-up with patients and gather more data about the outcomes from MLP intervention. We hope our work will continue to add to the limited body of knowledge about the role of Medical Legal Partnerships in improving health outcomes for vulnerable populations.

**Poster #32**

**A Retrospective Analysis of Outcomes from Foot and Ankle Arthrodesis and Open Reduction and Internal Fixation using Cellular Bone Allograft Augmentation**

Sean Sequeira

**Background:** With an increasing life expectancy and growing incidence of comorbidities, foot and ankle surgeries are on the rise and concomitant fusion rates continue to improve especially since the advent of augment use. Vivigen is an allogeneic mesenchymal bone matrix product that possesses osteoconductive, osteoinductive, and osteogenic properties to enhance bony fusion without the drawbacks of autograft bone. To date, this is the largest case series in the literature of patients undergoing foot and ankle procedures with an allogenic cellular bone matrix product containing MSC’s.

**Methods:** This retrospective chart review included 135 mid and hind foot and ankle arthrodesis and ORIF at a single academic center from 2017-2018 that utilized Vivigen bone graft for augmentation in an institutional-review board approved study. Each operation was evaluated using postoperative follow-up and imaging for evidence of fusion. Patient demographic data and medical comorbidities were recorded.

**Results:** The overall fusion rate for the arthrodesis cohort was 85.8%. Smokers were observed to have significantly lower rates of fusion compared to non-smokers (p=0.01). Bony healing rate for the ORIF cohort was 86.4%. Peripheral vascular disease patients (PVD) had significantly lower rates of bony healing compared to patients without PVD (p=0.009).
Conclusion: Our study’s findings of satisfactory fusion rates and minimal complications across a wide variety of surgeries, methods of instrumentation, and patient comorbidities is a valuable addition to the literature as it is the largest case series to date of patients undergoing foot and ankle procedures with an allogenic cellular bone matrix product containing MSC’s. Our findings help to introduce Vivigen as a safe and efficacious alternative to other forms of augmentation for fusion and ORIF procedures about the foot and ankle.

Poster #33
Governance, Communication, and Financial Transparency in a Clinical Department

Nicole Stelling

Introduction: Many factors impact levels of faculty satisfaction within a clinical department at a school of medicine including departmental governance, communication, and financial transparency, which were areas that this specific clinical department indicated as less satisfactory on a recent StandPoint Faculty Engagement Survey. This study aimed to identify specific strategies to increase satisfaction in the above referenced areas, as this has been lacking in previous research.

Methods: All faculty in this clinical department were invited to participate in focus groups where questions were asked to address governance, communication, financial transparency, and burnout. The focus groups were recorded, transcribed, and coded based on the themes that arose and the conceptual framework of the self-determination theory.

Results: Faculty expressed wanting an accessible, responsive leader who advocates for them, increased participation in decision-making processes, greater support for research, increased use of technology during meetings, a clear vision statement for the department, more clarity surrounding their compensation plan, funds flow, and the general health of the department, the establishment of a finance committee within the department, and increased support personnel.

Conclusion: The results of the focus groups indicated that while there are many areas of disagreement within the faculty of this clinical department, particularly with regard to financial transparency, there are also clear areas where changes could be made to increase faculty satisfaction.

Poster #34
Cultural competency Among UVA Primary Care Physicians

Morgan Tyler

Purpose: The purpose of this research is to conduct an anonymous baseline survey measuring cultural competency among UVA primary care physicians to evaluate whether it may be a factor in health care utilization by minority populations, particularly Black men and women.

Despite an overall increase in physician visits after the passing of the Affordable Care Act, there remains significant medical care need within minority populations. Even after adjustments for various factors, the unmet need for Black men and women increased by 2.1 and 2.5 percent respectively. Other studies have found that even after correction for access, socioeconomic factors, and other demographic factors, the utilization rate for minorities remains lower than for
whites. This shows that despite attempts at increased access to care, there are other barriers to meeting the needs of this population.

For Black men and women in particular, there are multiple factors that contribute to the lack of utilization of the healthcare system, some of which include: ethnic and social history, racial concordance/discordance, use of home remedies, religion, mistrust, and health illiteracy. Cultural competency involves the recognition of these factors and finding ways to mitigate them in each patient to improve outcomes. We will administer an anonymous, validated survey to Internal Medicine, Pediatrics, and Obstetrics and Gynecology physicians within the UVA Health System via email, over an 8-week period between October and December of 2019. We have adopted the Cultural Competency Assessment Instrument, a validated survey tool that includes two sections. The first section includes demographic information regarding race/ethnicity, language(s) spoken, and previous cultural competency training. Part two of the survey instrument includes questions about what minority groups are seen at the respondents' practices, levels of success in outreach and retaining these populations, and a series of self-assessment questions. These questions are answered on a scale of 1-6, with 1 being strongly disagree and 6 being strongly agree. Data will be analyzed and serve as a baseline measurement of cultural competence among primary care physicians within the UVA Health System.

**Poster #35**

**Same game new rules: What is the impact of the 2018 UNOS heart allocation change?**

Lindsey Whalen

**Purpose:** The 2018 UNOS heart allocation policy shifted priority from patients supported with durable devices to those with temporary mechanical support. We sought to quantify the implications of this change including impact on wait times, hospital bed utilization and use of mechanical circulatory support devices.

**Methods:** This study was a retrospective review of 32 consecutive patients who underwent heart transplantation at a single center between October 2017 and May 2019. Patient charts were reviewed for information regarding preoperative characteristics, operative data, and perioperative characteristics. Univariate analysis compared demographics and outcomes before and after the October 2018 policy change.

**Results:** There were 16 patients each in the pre and post policy-change groups. Patients did not differ significantly in their demographic profiles. Significant differences were noted, however, in the time on transplant list with median days of 166 before vs. 18.5 after policy change (p = .017), and in the presence of preoperative temporary support (12.5% vs. 68.75%, p = .011). Prior to the allocation change most heart transplant patients were admitted from home on the day of transplant (9/16 vs. 6/16), while afterwards the average preoperative length of stay was 14.7 days with the majority of these days as ICU status (11.06). Operative times were shorter (593 vs. 685 median minute, p = .0026) in the post allocation change group. There was no difference in operating room blood transfusions, postoperative outcomes, or postoperative length of stay between the groups.

**Conclusion:** This study suggests that following the 2018 policy change, patients who received heart transplants experienced shorter waitlist times, longer preoperative hospital stays, and had
an increased use of temporary mechanical assist devices. This shift to a resource intensive inpatient management strategy has implications that will require further evaluation.

**Poster #36**

**Effect of Medicaid Expansion on Patient Population Presenting to the UVA Primary Care Center Family Medicine Clinic**

Jeffrey White

On January 1, 2019, Virginia expanded Medicaid eligibility to over 400,000 adults not previously eligible. The influx of patients into the healthcare system has the potential to strain resources and highlight limitations. Electronic health record (EHR) data can provide the ability to detect overall changes in patient populations in near-real time. We collected EHR data on 128 patients who presented to the UVA Primary Care Center Family Medicine Clinic for an initial visit in the first six months of 2018 and 2019 who listed Medicaid as their primary insurer. Demographic data for the patients was collected, as well as information on several markers of illness severity. After expansion, the clinic saw a greater number of patients (71 in 2019 vs. 57 in 2018), from a wider geographical area (11 ZIP codes represented vs. 6), and with a more diverse background. On average, the new patients were older (36 ± 11 years vs. 32 ± 7 years, p = 0.02), had higher systolic blood pressure (123 ± 19 mmHg vs 117 ± 15 mmHg, p = 0.05), and had more medication changes (0.8 ± 2 vs. 0.3 ± 1, p = 0.04) than in 2018. Among the new 2019 patients, those who had no recorded insurance prior to their initial visit had markers of poorer health than those who had been enrolled in Medicaid before 2019 and those who had had other insurance before switching to Medicaid, including more new prescribed medications (1.2), new diagnoses (4.2), and procedures ordered (0.9). These data indicate that the patients newly enrolled in Medicaid have different medical requirements and present unique challenges compared to the established population. This could guide the hospital system as it adapts to changes in its patient population occasioned by Medicaid expansion.

**Poster #37**

**Use of Mepolizumab in Adult Patients with Cystic Fibrosis and an Eosinophilic Phenotype: Case Series**

Lijia Zhang

**Background:** Cystic fibrosis (CF) is characterized by inflammation, progressive lung disease, and respiratory failure. Although the relationship is not well understood, patients with CF are thought to have a higher prevalence of asthma than the general population. Asthma and CF have many similar symptoms and both have reversible obstruct lung function, making it difficult to differentiate the two. A specific asthma phenotype (type 2 inflammatory signature), is often identified in CF patients, suggesting a potential use of asthma immunological therapies.

**Methods:** In this case series, we present three patients with CF, along with high total serum IgE concentrations and significant eosinophilic inflammation, who were treated with mepolizumab, an immunological used in asthma. We assessed the effect of mepolizumab on each patients’ lung function (FEV1), blood markers of type 2 inflammation, and frequency of CF exacerbations through Epic Chart review and Microsoft Excel analysis.

**Results and Conclusion:** Mepolizumab has a positive effect on type 2 inflammatory markers in patients with CF and was safe and well tolerated in patients with CF and type 2 inflammation.
Although there were no significant changes in exacerbation rates, one patient had a substantial increase in lung function after starting mepolizumab and all three patients were able to reduce their oral corticosteroid use.

**Poster #38**
**Prevalence of fungal colonization in adult patients with Cystic Fibrosis at University of Virginia: Single center experience**

Lijia Zhang

**Introduction:** Cystic Fibrosis (CF) is an autosomal recessive disorder caused by function deficiency of the transmembrane regulator (CFTR) protein. Its disease process is characterized by inflammation, progressive lung disease, and respiratory failure. Previous studies have shown that fungal colonization in CF airways is associated with pulmonary exacerbations and lung function decline. Aspergillus Fumigatus, the predominant fungal pathogen in CF patients, is a particular concern, as it may lead to IgE-mediated aspergillus-exacerbated asthma/CF and allergic bronchopulmonary aspergillosis (ABPA), a complex condition that leads to worsening of airway inflammation and progressive damage. Moreover, antibiotic therapy (a common regimen for CF patients) is associated with increased prevalence of aspergillus in CF patients. Therefore, we aim to examine the prevalence of fungal colonization in CF patients at UVA.

**Methods:** 92 CF adults seen at UVA during 2013-2018 underwent fungal culture to determine the prevalence of fungi in their respiratory tracts. 15 patients were excluded due to incomplete data. In addition, demographics, spirometry (used to define CF severity), and fungitell and aspergillus galactomannan results were collected; we used positive fungitell or galactomannan results along with the corresponding fungal culture to define tracheobronchitis.

**Results:** Aspergillus Fumigatus (34%) and Yeast (32%) were the most common fungi seen in the sputa of 92 individuals with CF (our microbiology laboratory results do not speciate yeast species and reported yeast refers primarily to candida.) These prevalence’s were seen regardless of the severity of the patient’s CF (mild, moderate, severe). Of the individuals with tracheobronchitis, 81% tested positive for aspergillus fumigatus.

**Conclusion:** This study highlighted Yeast and Aspergillus Fumigatus as the main fungal pathogen associated with CF patients at UVA.