2020-2021 Carilion Clinic/ Virginia Tech Carilion Research Day

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Welcome

The Department of Research and Development is responsible for the administrative aspects of all research projects at Carilion Clinic including contracting, finance, regulatory, grant management and the conduct of the trial including research coordination. The Department of Research and Development (R&D) is composed of over 30 employees under the direction of Dr. Francis X. Farrell, Senior Director of Research and Ms. Andrea Bidanset, Director of Clinical Trials. Under their leadership, the department has a goal of increasing the quality and quantity of research studies by increased customer focus, education, streamlined processes and increased collaboration with internal and external partners.

Carilion Clinic in collaboration with Virginia Tech, University of Virginia (Program Hub) and Inova Health Systems was awarded a Clinical and Translational Award (CTSA) from the National Center for Advancing Translational Science of the National Institutes of Health Award UL1TR003015/ KL2TR003016. This five-year program entitled the Integrated Translational Health Research Institute (iTHRIV): Using Data to Improve Health is a $23 million dollar grant to accelerate innovation from the laboratory to patient care across the Commonwealth of Virginia.

In the second year of funding, several initiatives were accomplished by the Carilion Clinic Health Analytics Research Team (HART) including the launch of SPARC Sparc (Storage and Programs Accelerating Research Collaborations), a new secure research environment offering an innovative tool for data storage, access and use. In addition to a highly secure research environment, the tools to analyze research including SAS Viya, R, Python, Microsoft Office Suite are contained within the environment. At present, our academic partners including Virginia Tech, University of Virginia and Radford University have the capability to access SPARC.

A second HART initiative achieved was the installation of a cross-institutional biorepository software system, CAISIS. Lastly, eConsent through Carilion's REDCap software was developed to support ongoing research during a pandemic. Multiple collaborative projects with Virginia Tech, the Fralin Biomedical Research Institute at VTC, and VTC School of Medicine are leveraging the newly approved process and templates. Further, Carilion's Health Analytics Research Team is now pursuing Part 11 compliance for REDCap, anticipated in the new few months.

Yet another component of the iTHRIV CTSA is the opportunity to compete for funding to support pilot translational research and community- based team science. Carilion Clinic submitted proposals in both categories this year and was awarded funding in both. Drs. Peter Apel, Orthopaedics and Miguel Perez, Virginia Tech Transportation Institute will

be exploring driving skills after rotator cuff surgery to find the optimal time that is safe to resume driving. Dr. Felicity Adams-Vanke, Psychiatry and the Child Health Investment Partnership of Roanoke Valley will pursue research pertaining to Maternal Mental Health.

The Research Acceleration Program (RAP 16) received 24 submissions competing for $175,000 in pilot seed funding. Ten investigators were funded with a cumulative award total of $159,850 representing eight clinical sections. This year the request for proposals was directed toward utilization of telemedicine in the execution of a clinical research study. Of the projects selected for funding, several will be collaborations with our partner institutions including Dr. Chitnavis' project with the Salem Veterans Administration and Dr. Bernier's project with a VTCSOM faculty member and medical student. In addition to clinical research two collaborative projects will explore the use of virtual reality for surgical training (Dr. Thompson) with the Department of Computer Science, Virginia Tech and development of a novel biomarker (Drs. Shah and Mittal) for seizure induced neuronal injury with the Fralin Biomedical Research Institute. Lastly, Carilion Clinic funded a joint request for applications initiative with Virginia Tech Carilion Research Institute Center for Transformative Research on Health Behaviors to foster translational research projects between Carilion Clinic and Virginia Tech. Three proposals totaling $60,000 were funded. This is the second year of funding.

Twenty-three (23) sponsored clinical trials with industry partners were executed in FY20 with representation from fifteen clinical sections. This represents a decrease by three trials as compared to FY19. Although decreased, this consistent level of clinical trials is remarkable given that research worldwide was paused for a significant period in 2020. These trials represent a total potential revenue source of $2,171,326 if fully enrolled. This compares to twenty-six with potential revenues of $1,920,977 in FY19 (12 % increase). In addition, 16 feasibility meeting were held with clinical investigators before execution of trial contract and study start. Forty-one (41) grants were awarded to 22 departments/clinical sections with a cumulative total of $2,959,550. Forty-nine (49) grant applications were processed and submitted on behalf of 25 departments/ clinical sections. Fifty-three (53) grant applications were processed and submitted on behalf of 21 departments/ clinical sections. Lastly, two hundred sixty-nine (269) Research and Development applications were submitted for approval to commence research endeavors.

Agenda

Resident/ Fellows

7:00 am Fascial Distortion Model for Extremity Pain in the Emergency Department

	Jessica Pelletier, D.O. Carilion Clinic Emergency Medicine
7:10	Symptom Frequency Preceding Non-Hereditary Young Onset Colorectal Cancer Diagnosis Lindsey A. Bierle, D.O., Carilion Clinic
7:20	10-minute Break
7:30	Biofilm Formation in Acinetobacter Baumannii Clinical Isolates Elizabeth S. Nowak, MD, Carilion Clinic
7:40	Chronic Cocaine Use: Not So Fast Luke J. Ennis, DO, Carilion Clinic
7:50	Making Sense of a Missense Mutation in Thrombomodulin Jessica A. Fleming, DO, Carilion Clinic,
8:00	Tricky Lactate: A Case of Linezolid-Induced Lactic Acidosis Kyle Admire, DO, Carilion Clinic
8:10	Catheter-directed Thrombolysis Transition to Heparin Infusion in Acute Pulmonary Embolism Madalyn Motes, PharmD, Carilion Clinic
8:20	Comparison of LOKELMA and KAYEXALATE for acute hyperkalemia Casey S. Bardsley, PharmD, Carilion Clinic
8:30	Predictors of Mortality and Revision Following Digital Amputation Brian Cripe, MD, Carilion Clinic, Plastic & Reconstructive Surgery
8:40	A Multimodality Approach to HIT-Associated Submassive Pulmonary Embolism Benjamin Fleming, DO, Virginia Tech Carilion Family Medicine
8:50	Warfarin vs DOACs in TAT in Patients with Renal Insufficiency Yang Zhao, PharmD, Carilion Clinic
9:00	Achilles Heel of Familial Hypercholesterolemia Vira Ayzenbart, MD, Carilion Clinic, Internal Medicine
9:10	Identifying and Improving Insurance Gaps in Pediatric Populations Steven J. Griffin, DO, Carilion Clinic, Pediatrics
9:20	Reducing Opioid Prescriptions in Surgical Patients at Carilion Clinic Katie Howe, MD, MPH, Carilion Clinic, General Surgery
9:30	Evaluation of Liposomal Bupivacaine Use in Total Shoulder Arthroplasty Sarah Lipps, PharmD, Carilion Clinic, Pharmacy
9:40	Safety of High Dose Chemical Thromboprophylaxis in Obese Patients

Andrew Scott, PharmD, MBA, RN, Carilion Clinic, Pharmacy

9:50 Improving Screening Of Glucocorticoid Induced Osteoporosis in Rheuamtology
Srujana Pachigolla, MD, Carilion Clinic, Internal Medicine

10:00 Retrospective Study Comparing Office-based Opioid Treatment versus Medication-Assisted Treatment
Shuo Qiu, MD, Carilion Clinic, Psychiatry

Faculty/ Staff

10:30 Does De-Implementation of Low Value Care Impact the Patient-Clinician Relationship?
John Epling, MD Carilion Clinic Family and Community Medicine

10:45 Race, Vitamin D, and COVID-19 using Propensity Score Methods
Ian C. Crandell, PhD, Virginia Tech, Center for Biostatistics and Health Data Science
Presented by Michelle Rockwell, PhD Carilion Clinic Family and Community Medicine

11:00 Counting Respiratory and Heart Rates using new technology
Donna Bond, DNP, RN, CCNS, AE-C, CTTS, FCNS, Carilion Clinic, Nursing,

11:15 Impact of the Influenza Vaccination on the Orthopedic Surgical Patient
Cindy W. Ward, DNP, RN-BC, CMSRN, ACNS-BC, Carilion Clinic, Nursing

11:30 Longitudinal Study-Impact of Schwartz Center Rounds on Moral Distress
Phyllis B. Whitehead, PhD, APRN, ACHPN, PMGT-BC, FNAP, Carilion Clinic, Palliative Medicine/Ethics

Student

11:45 Electronic Clinical Opioid Withdrawal Scale (eCOWS)
Kirin Anand, Student, Virginia Tech, Engineering
Student's Mentor: Robert L. Trestman, MD, PhD, Virginia Tech Carilion School of Medicine, Psychiatry, Behavioral Medicine

11: 55 A Qualitative Analysis of Patient Perspectives on Low Value Healthcare
Kenan C. Michaels, BA, Virginia Tech Carilion School of Medicine
Student's Mentor: Michelle Rockwell, PhD, RD, Carilion Clinic, Family and Community Medicine

12:05 Prehospital Lung Ultrasound (PLUS) Study
A. Harrison Brookeman, BS, Virginia Tech Carilion School of Medicine, School of Medicine,
Student's Mentor: John McNamara, MPA, MS, DC, Virginia Tech Carilion School of Medicine, Basic Science

12:15 Creating Vital Signs Monitors for Low to Middle-Income Countries
Samuel J. Rodgers, Undergraduate student, Virginia Tech, Biological Systems Engineering
Student's Mentor: Andre Muelenaer, MD, MS, Carilion Clinic Physician, Pediatric Pulmonology

12:30 Keynote Lecture:

A Physician's Journey as a Pediatric Pulmonologist Intersecting with Engineering and Team Science
Andre Muelenaer, MD, MS, Carilion Clinic Physician, Pediatric Pulmonology
Professor of Practice, Biomedical Engineering and Mechanics, Virginia Tech

Abstracts for Oral Presentations

Fascial Distortion Model for Extremity Pain in the Emergency Department

Authors: Jessica Pelletier, D.O., Carilion Clinic, Emergency Medicine, jnpelletier@carilionclinic.org; Ian Pelletier, D.O., Carilion Clinic, Internal Medicine; Kai Norbeck, MS-IV, VCOM, N/A; Brian Fuquay, MS-IV, VCOM, N/A; Carol Bernier, D.O., M.M.E.L., Carilion Clinic, Emergency Medicine; Anne Ickes, D.O., Carilion Clinic, Emergency Medicine

Abstract/Case Study: STUDY PURPOSE: To identify whether a low-cost, minimally invasive, one-time manual medicine intervention (fascial distortion model, FDM) is effective for the management of subacute and chronic extremity pain in the emergency department (ED). Demonstration of benefit may have far-reaching implications including reduction of pain medication use in the ED, shortened ED visit times, and future use of this intervention in the outpatient setting for chronic pain management. METHODS: We are conducting a randomized, unblinded clinical trial of FDM for the management of subacute and chronic extremity pain. 296 patients ages 18 and older seeking care in the ER for extremity pain that has been present for more than one week and less than three months will be recruited from four rural emergency departments within the Carilion Clinic hospital network over a 1.5-year time period. Patients are recruited into the study by treating clinicians in the ER and must describe their pain according to a pattern amenable to treatment with FDM. POPULATION: Adult patients presenting to Carilion Franklin Memorial Hospital, Carilion Giles Community Hospital, Carilion New River Valley Hospital, and Carilion Stonewall Jackson Hospital. Prisoners and patients with known serious psychiatric comorbidities are specifically excluded. SPECIFIC AIMS: The primary objective is to determine whether FDM yields significant improvement in function compared with standard care alone. The secondary objective is to determine whether FDM yields significant improvement in pain compared with standard care alone. Our exploratory objective is to determine whether FDM yields clinically significant improvements in pain and function that endure over time. HYPOTHESIS: Patients treated with FDM will demonstrate statistically and clinically significant

improvement in function and pain compared with those treated with standard care alone. SIGNIFICANCE: This is the first clinical trial of FDM in the United States and the first in an ED.

Symptom Frequency Preceding Non-Hereditary Young Onset Colorectal Cancer Diagnosis

Authors: Lindsey A. Bierle, D.O., Carilion Clinic , Internal Medicine Residency, labierle@carilionclinic.org; David Lebel, M.D., Carilion Clinic, Pathologist; Douglas J. Grider, M.D., Carilion Clinic, Pathologist; Marrieth Rubio, M.D., Carilion Clinic, Gastroenterology; Mohamad Mouchli, M.D., Carilion Clinic, Gastroenterology; Shravani Reddy, M.D., Carilion Clinic, Gastroenterology; Miranda Gerrard, M.S., Virginia Tech, Medical School; Adil Mir, M.D., Carilion Clinic, Hospitalist; Christopher Walsh, M.D., Carilion Clinic, Internal Medicine

Abstract/Case Study: The incidence of patients under fifty years of age diagnosed with non-hereditary colorectal cancer is increasing. While some risk factors associated with this cancer have been elucidated, others like gastrointestinal symptoms preceding diagnosis have not been identified. We aimed to assess the frequency of gastrointestinal and non-gastrointestinal related signs and symptoms preceding cancer diagnosis in young patients and assessed its survival impact. In this retrospective observational study, we randomly selected patients < fifty years old with histopathologic diagnosis of non-hereditary colorectal adenocarcinoma at Carilion from 2002-2017. Patients with inflammatory conditions or predisposing genetic syndromes were excluded. Demographics, gastrointestinal symptoms, procedures (index colonoscopy), and mortality were obtained. The cumulative mortality risk among symptomatic patients was estimated using Kaplan Meier curves. One hundred and thirty-nine patients (Mean age, 41.6±6.9 yrs; 53.2% males) with non-hereditary colorectal cancer were identified. Presenting signs and symptoms included rectal bleeding (45.3%), abdominal pain (36.0%), diarrhea (23.0%), constipation (18.7%), weight loss (17.3%), nausea with vomiting (10.8%), rectal pain (2.2%), bloating (2.2%), microcytic anemia (17.3%), and others (12.9%). Cancer was diagnosed after a mean of 4.5+11.4 months with rectal cancer as the most common site (31.4%), followed by sigmoid cancer (25.4%). Twenty-eight patients (20.1%) were asymptomatic at time of diagnosis, 95 (68.5%) had between 1 to 3 signs or symptoms, and 16 (11.5%) had more than 3 signs or symptoms. Roughly 17% of the patients presented with advanced disease; the majority (94.4%) had 1 to 3 signs or symptoms. The median survival was lower in patients with more signs and symptoms (>3) on initial presentation (P=0.046). Non-hereditary colorectal cancer diagnosis was delayed in young patients by four and a half months and rectal bleeding was the most common presenting symptom. The survival of patients with more signs and symptoms was decreased compared to patients with less on presentation.

Biofilm Formation in Acinetobacter Baumannii Clinical Isolates

Authors: Elizabeth S. Nowak, MD, Carilion Clinic, Internal Medicine, Division of Infectious Diseases, esnowak@carilionclinic.org; Ekta N. Bansal, M.D., Carilion Clinic, Internal Medicine, Division of Infectious Diseases; Anthony W. Baffoe-Bonnie, M.D., Carilion Clinic, Internal Medicine, Division of Infectious Diseases; Thomas M. Kerkering, M.D., Carilion Clinic, Internal Medicine, Division of Infectious Diseases; Jayasimha Rao, PhD, Carilion Clinic, Internal Medicine, Division of Infectious Diseases

Multidrug resistant Acinetobacter baumannii (MDR-Ab) is a gram-negative bacterium known for causing severe nosocomial infections, attributed in part to its formation of biofilm. Siderophore is a virulence factor known to support biofilm formation by regulating iron availability. In this study, we screened 44 isolates of MDR-Ab from our gram-negative repository to determine the strains that phenotypically form biofilm and produce siderophore. The results were compared to Pseudomonas aeruginosa PAO1, which produces both biofilm and siderophore.

Isolates were cultured in minimal M9 media and diluted to a standard concentration. Tygon tubes were then inoculated with 50 microliters of each culture in triplicates. This process was repeated in a 96-well plate with 100 microliters of each culture. The Tygon tubes and plate were incubated statically for 48 hours at 30C and then stained with crystal violet. The contents were dissolved in 33% glacial acetic acid and analyzed by spectrophotometry to measure biofilm formation. Siderophore secretion was measured in supernatants with Chrome Azurol S (CAS) reagent and production was observed on CAS agar plates.

High levels of biofilm formation were observed in 8 strains of MDR-Ab in the 96-well plate (3, 4, 9, 22, 61, 1010, 1012, 1022) and 6 strains in Tygon tubes (3, 4, 16, 66, 1002, 1010). There was less siderophore production in MDR-Ab isolates compared to PAO1 in both Tygon tubes and the 96-well plate. Only 4 strains lacked phenotypic siderophore production on CAS agar and were inversely negative for the secretion in medium.

Many strains of MDR-Ab readily form biofilm. Overall siderophore production is lower in MDR-Ab than in PAO1, but this does not appear to affect its ability to form biofilm. Unlike in PAO1, biofilm formation in MDR-Ab may occur independently of siderophore production. This finding may impact selection of future antimicrobial targets against MDR-Ab biofilm production.

Chronic Cocaine Use: Not So Fast

Authors: Luke J. Ennis, DO, VTC SOM, Internal Medicine, ljennis@carilionclinic.org; Matthew Schumaecker, MD, Carilion Clinic, Cardiology; Chad DeMott, MD, VTC, Internal Medicine

Abstract/Case Study: Case: Cocaine is known to cause sympathomimetic effects in patients. Chronic use, however, can cause issues such as sinus bradycardia, longer QTc interval, and early repolarization. This leads to an increased risk for adverse cardiac events. A 54-year-old woman with chronic cocaine use presented to the emergency department with bradycardia. She denied tick exposure or rash. She had a history of heart rate in the 50s during past hospital visits. In the emergency department, heart rate was 40BPM. Mentation was appropriate. ECG showed sinus bradycardia with no evidence of heart block. She had no prior cardiac history. Labs were normal. UDS was positive for cocaine. Her echocardiogram was normal. She was admitted to the cardiology service for further work-up. The initial working differential included vagal etiology versus substance use, as hypothyroidism and medication causes had been ruled out. Telemetry showed continued sinus bradycardia. On ambulation, the patient's heart rate remained in the 40s. Stress testing for evaluation of chronotropic competence was planned; however, the patient left against medical advice. On review of her record, she had a history of chronic cocaine use

disorder and long-standing sinus bradycardia on past ECGs. While cocaine intoxication can cause sympathomimetic signs, chronic cocaine use can be associated with bradycardia. There have been reports that established increased risk of early repolarization and severe bradycardia when the 12-lead ECGs of cocaine-dependent patients were compared to non-cocaine-using control patients. The most likely mechanism for this effect is desensitization of the beta-adrenergic receptors from excessive stimulus exposure. This case highlights the potential significance of chronic cocaine use, as its adverse effects on the conduction system can lead to fatal cardiac arrhythmias.

Making Sense of a Missense Mutation in Thrombomodulin

Authors: Jessica A. Fleming , DO, Carilion Clinic, Internal Medicine, jlarconti@carilionclinic.org; Matthew Skelton, MD, Carilion Clinic, Hematology Oncology; Benjamin C. Fleming, DO, Carilion Clinic, Family Medicine

Abstract/Case Study: Thrombotic microangiopathy (TMA) is a pattern of thrombosis that occurs in the smallest blood vessels of the body, especially the kidney. TMA etiologies include complement dysregulation, low ADAMSTS13, cytokine storm, and malignant hypertension (MHT). Many pivotal genetic predispositions to TMA have yet to be elucidated. Thrombomodulin mutations, as a precipitant of TMA, are of significant research interest. Thrombomodulin is expressed in endothelial cells and has critical roles in anticoagulation and inflammation. Its highly functional domains regulate protein C activation, the complement cascade, fibrinolysis, and cytokine activity. Here we present a patient with chronic kidney disease stage 4 (CKD IV), MHT, and TMA whose genetic analysis revealed a missense mutation in thrombomodulin and a class II mutation in G6PD. A 25-year-old female at 20 weeks gestation with severe chronic hypertension and CKD IV presented with acute kidney injury and hypertensive emergency to 240/130 mmHg. Diagnostic workup revealed thrombocytopenia, hemolysis, 12% ADAMSTS13, and normal complement. Kidney biopsy revealed longstanding TMA. Hereditary thrombotic thrombocytopenic purpura was suspected, given her low ADAMSTS 13 without an inhibitor. Despite pregnancy termination, MHT, hemolysis, and thrombocytopenia continued. She was eventually stabilized on eculizumab, fresh frozen plasma, and dialysis. Genetic analyses revealed normal ADAMSTS13 and complement genetics. Interestingly, a missense mutation in the thrombomodulin gene was discovered, along with a class II mutation in G6PD. In our patient, mutations in thrombomodulin and G6PD coincided with TMA and MHT. Similar mutations in thrombomodulin are reported in pregnancy-associated atypical hemolytic uremic syndrome (aHUS) and idiopathic nodular glomerulosclerosis with TMA and MHT. Single nucleotide polymorphisms in thrombomodulin cause 5% of aHUS cases as well. While the immensity of thrombomodulin's function has yet to be discovered, each thrombomodulin mutation unveiled provides a glimpse into its roles in cytoprotection and hemostasis.

Tricky Lactate: A Case of Linezolid-Induced Lactic Acidosis

Authors: Kyle Admire, DO, Carilion Clinic, Internal Medicine, kjadmire@carilionclinic.org; Kyle Pfaff, DO, Carilion Clinic, Internal Medicine; Chad DeMott, MD, Carilion Clinic, Internal Medicine

Abstract/Case Study: Background: Linezolid is a bacteriostatic antibiotic that is increasingly utilized for the therapy of multi-drug resistant bacteria. Side effects are often mild and include GI upset and headache, especially with shorter courses. However, as the duration of therapy is lengthened, more serious adverse effects such as lactic acidosis can develop. The literature regarding this side effect is mostly comprised of case reports and two case review series that attempted to identify risk factors. Case Presentation: A 56-year-old male was transferred to our facility after developing cardiogenic shock due to atrial fibrillation with rapid ventricular response following multiple unsuccessful attempts at cardioversion. His hospital course was complicated by acute renal failure, multiple intubations requiring tracheostomy as well as MRSA pneumonia, Pseudomonas pneumonia, Candida Lusitania fungemia, and Vancomycin-Resistant Enterococcus (VRE) Faecium bacteremia. Shortly after starting Linezolid for his VRE bacteremia, his anion gap increased and a lactic acidosis was discovered. Further investigation did not reveal a definitive etiology for his elevated lactate. Lactic acid levels normalized shortly following completion of Linezolid therapy. Discussion: Linezolid binds to the bacterial 23S rRNA of the 50S ribosomal subunit which stops the translation of bacterial proteins. Current evidence suggests that Linezolid can inhibit mitochondrial protein synthesis by interacting with the 16S rRNA gene which is homologous to the binding site of bacterial 23S rRNA. This ultimately leads to decreased mitochondrial enzyme activity, limiting aerobic energy and accelerating lactate generation independently of tissue damage or hypoxia. Data suggests that Linezolid-induced lactic acidosis is more likely to occur with prolonged antibiotic courses. However, our case illustrates that this potentially fatal side effect can occur with shorter durations. Thus, lactic acid monitoring should be considered in patients receiving Linezolid, especially with prolonged treatment regimens. Treatment of Linezolid-induced lactic acidosis includes discontinuation of therapy and supportive care.

Catheter-directed Thrombolysis Transition to Heparin Infusion in Acute Pulmonary Embolism

Authors: Madalyn Motes, PharmD, Carilion Roanoke Memorial Hospital, Pharmacy, mamotes@carilionclinic.org; Corey Goodwin, PharmD, Carilion Roanoke Memorial Hospital, Pharmacy; Hannah Hall, PharmD, Carilion Roanoke Memorial Hospital, Pharmacy; Ashley Milkovits, PharmD, Carilion Roanoke Memorial Hospital, Pharmacy

Abstract/Case Study: Management of acute pulmonary embolism (PE) includes therapeutic anticoagulation, and in eligible patients, thrombolytic therapy. Catheter-directed thrombolysis (CDT), or alteplase via a peripherally inserted catheter, has been utilized to lower total thrombolytic dose and reduce bleeding events. Our institution has implemented a CDT order set that delivers alteplase 1 mg/hr via 'standard' or 'EKOS' catheters with systemic intravenous heparin (UFH) 500 units/hr. No specific recommendations are included for restarting anticoagulation following procedure. Therefore, the objectives of this study were to evaluate the transition from CDT to therapeutic UFH infusion and CDT order set utilization. This was a single center, retrospective review'of adult patients admitted to Carilion Roanoke Memorial Hospital who received CDT therapy followed by therapeutic UFH for acute PE from'September 10, 2016 to September 28, 2020. Patients were excluded if'less than'18 years old, pregnant or'if'procedure prematurely discontinued due to bleeding. Data was analyzed using descriptive statistics. A total of 73 patients were included for analysis. Submassive and massive PE were reported in 62 (85%) and 10 (14%) patients, respectively. A standard catheter for administration was most

commonly utilized (47 patients; 64%). An appropriate post-procedure UFH rate (18 units/kg/hr or pre-procedure UFH rate) was noted in 78% of patients. Assessment of first follow-up aPTT using CRMH UFH Collaborative Protocol was as follows: therapeutic (42%), subtherapeutic (32%), and supratherapeutic (25%). Median time from CDT completion to initiation of weight-based UFH infusion was 1.5 hours (range: 0-13.9). Median time from CDT completion to therapeutic aPTT was 11.7 hours (range: 4.5-39.0). Inappropriate catheter documentation was noted in 17 patients (23%). The majority of patients who received CDT for acute PE were transitioned appropriately to UFH infusion. Nevertheless, there is still potential to update CDT order set to allow for more accurate alteplase documentation and update the UFH Collaborative Protocol to guide appropriate transition.

Comparison of LOKELMA and KAYEXALATE for acute hyperkalemia

Authors: Casey S. Bardsley, PharmD, Carilion Roanoke Memorial Hospital PGY2 Critical Care Pharmacy Resident, Pharmacy, csbardsley@carilionclinic.org; Jessica Schad, PharmD, BCPS, Carilion Roanoke Memorial Hospital Emergency Medicine Specialist, Pharmacy; Corey Goodwin, PharmD, BCCCP, Carilion Roanoke Memorial Hospital Medical Intensive Care Unit Specialist, Pharmacy; Elizabeth Riegle, PharmD, BCCCP, St Mary's Medical Center, Pharmacy

Abstract/Case Study: Historically, sodium polystyrene sulfonate (SPS) was the only resin binder therapy available. Recently, Sodium zirconium cyclosilicate (SZC) was approved and has proven effective at achieving normokalemia. Due to literature-based efficacy, improved safety profile, and quicker onset of action, SPS was replaced with SZC on formulary in May of 2020. This study evaluated the efficacy and safety of SPS and SZC on reduction of serum potassium. This retrospective, single-center cohort evaluation included adult patients admitted with serum potassium value(s) ' 5.5 mmol/L and received oral SPS or SZC. Exclusion criteria included renal replacement therapy between SPS or SZC dose and potassium level re-check, a hemolyzed sample, or level checked via a point of care machine. The primary endpoint was the difference in the reduction of serum potassium within 12 hours post-administration between groups. Secondary endpoints include incidence of repeat resin binder dose and incidence of adverse events associated with SPS and SZC. Continuous data are represented as means, analyzed with two-sample t-test, and categorical data are represented as frequencies, analyzed with Fisher's exact test. A total of 77 patients were included, 49 receiving SPS and 28 SZC. There was no difference in baseline characteristics between groups. The mean baseline potassium value was similar in both groups (6.1 mmol/L SPS vs 6.0 mmol/L SZC). The difference in reduction of serum potassium post-administration was similar between groups (-0.8 SPS vs -0.7 SZC, p=0.84). Approximately one third of patients received repeated doses in both groups (33% SPS and 39% SZC). There was an overall low incidence of adverse events. Edema was common in both groups. There was no difference in effectiveness and safety between SPS and SZC in reducing serum potassium. Sodium zirconium cyclosilicate will continue to be the formulary resin binder at this institution.

Predictors of Mortality and Revision Following Digital Amputation

Authors: Brian Cripe, MD, Carilion Clinic, Plastic & Reconstructive Surgery, bacripe@carilionclinic.org; Noah Orfield, PhD, Carilion Clinic, Orthopedic Surgery; Peter Apel, MD PhD, Carilion Clinic, Orthopedic Surgery; Alicia Lozano, MS, Virginia Tech, Department of Statistics; Alexandra Hanlon, PhD, Virginia Tech, Department of Statistics; Anthony Capito, MD, Carilion Clinic, Plastic & Reconstructive Surgery

Abstract/Case Study: Purpose: Digital amputation is a commonly performed procedure. There is a lack of comprehensive data regarding prognosis for mortality and revision following digital amputation. Methods: All digital amputations over a 10-year period (2008-2018) at a single center were reviewed. There were 484 amputations in 360 patients, with 358 performed for trauma (reference population) and 126 for infection or necrosis (population of interest). Mortality and revision were determined from National Vital Statistics System and medical records. Medical comorbidities were recorded. Results: Among trauma patients (N=256), survival rates at 2, 5 and 10 years were 97.2%, 94.4% and 77.7%. Among infection/necrosis patients (N=104), survival rates at 2, 5 and 10 years were 79.4%, 57.3% and 17.5%. The 2-year revision rate was 15% for trauma and 34% for infection/necrosis. Among all amputations, there was an increased risk of revision in the presence versus absence of diabetes (Hazard Ratio [HR]=2.14), peripheral vascular disease (PVD) (HR=2.58), dialysis (HR=2.37), as well as necrosis/infection versus trauma amputation (HR=2.17). These effects were additive, with the highest risk for revision seen in patients with diabetes, PVD, dialysis, and amputation for infection/necrosis when compared to those with no recorded comorbidities (HR=8.47), a 2-year revision rate of 47.7%. Smoking status and did not significantly predict revision or mortality. Conclusions: Mortality and revision risk is high for patients that require an amputation for infection/necrosis and are significantly increased with medical comorbidities. Hand surgeons should consider the prognostic implications of this data when counselling patients and making surgical decisions. Level of Evidence: Level II Prognostic/Risk Study

A Multimodality Approach to HIT-Associated Submassive Pulmonary Embolism

Authors: Benjamin Fleming, DO, Virginia Tech Carilion Family Medicine, Family Medicine, bfleming@carilionclinic.org;

Abstract/Case Study: The treatment for Intermediate-High Risk Submassive Pulmonary Emboli (PE) is a multi-modality approach that should be aimed at reducing right ventricular dysfunction (RVD). ’ We report a 70 year old man with a history of chronic left bundle branch block (LBBB) presenting with a submassive intermediate high risk PE secondary to Heparin-induced Thrombocytopenia (HIT). Two weeks prior, he had a surgical aortic valve replacement and was exposed to heparin products. On presentation, his initial echocardiogram revealed an enlarged right ventricle under volume and pressure overload with a TAPSE of 12mm. NT pro BNP was elevated. Systemic and catheter-based thrombolysis was contraindicated due to a drop in platelets of 118k to 47k after initially receiving heparin for anticoagulation. Platelet factor 4 Ab and a positive serotonin release assay confirmed HIT. Heparin was discontinued and he was

placed on bivalirudin. Catheterization of the pulmonary arteries for thrombectomy or thrombolysis posed further risk in the setting of the patient's LBBB, which could progress to complete heart block. Inhaled nitric oxide (iNO) was used as an initial therapy to reduce RVD while allowing placement of a pacemaker. With the placement of a temporary pacemaker, pulmonary thrombectomy was able to be performed with mean pulmonary artery pressure returning to 25mmHg from 34mmHg. At 4 months, follow up ECHO revealed normal right ventricle systolic function with TAPSE of 20.8mm.' RVD in hemodynamically stable patients with PE can be a predictor of poor outcome. Thrombolysis or thrombectomy work to reduce pulmonary artery clot burden effectively reducing RVD. By acutely decreasing pulmonary vascular resistance with iNO, right ventricle strain can be reduced and an intervention for clot-reduction can be formulated. Treatment of submassive intermediate high risk pulmonary emboli requires a multi-disciplinary approach and must be strategically tailored to the presentation of the patient.

Warfarin vs DOACs in TAT in Patients with Renal Insufficiency

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Abstract/Case Study: This was a retrospective, single-center cohort study comparing the safety of triple antithrombotic therapy (TAT) using direct oral anticoagulants (DOACs) versus warfarin in patients with renal insufficiency. Adult patients were included if they had chronic kidney disease stage IV or V and were on concurrent dual antiplatelet therapy (DAPT) and oral anticoagulation. The primary endpoint was the incidence of major bleeding at 12 months, defined as Bleeding Academic Research Consortium Definition (BARC) 3 or 5 type bleeds. Key secondary endpoints included incidence of major bleeding at 1 and 6 months, minor bleeding (BARC type 1 or 2) at 12 months, any bleeding, and mortality at 12 months. Chi-square or Fisher's Exact tests were used to analyze nominal data. Wilcoxon Rank Sum test was used to analyze ordinal and non-parametric continuous variables. A total of 49 patients were included (warfarin=25, DOAC=24). Most of the patients were on clopidogrel (96%), followed by ticagrelor (4%). There were 22 patients on apixaban and 2 patients on rivaroxaban in the DOAC group. There was a non-significant increase in major bleeding in the warfarin group compared to the DOAC group at 12 months (36% versus 20.8%, p=0.24). There was not a significant difference in major bleeding at both 1 month (12% versus 8.3%, p=0.81) and 6 months (24% versus 12.5%, p=0.33) between the two groups. There was no difference in minor bleeding at 12 months (12% versus 20%, p=0.40) and mortality (32% versus 29%, p=0.82). In conclusion, there was no significant difference in the incidence of major or minor bleeds between the warfarin and DOAC arms in patients with renal insufficiency who are also on DAPT at 12 months. The high incidence of major bleeding in this population warrants further study and clinical caution with TAT initiation in patients with renal insufficiency.

Achilles Heel of Familial Hypercholesterolemia

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Abstract/Case Study: Familial hypercholesterolemia (FH) is an inherited disorder that results in a high level of low-density lipoprotein (LDL). Without early treatment, the cumulative risk of a coronary event by age 50 in men is up to 44% and in women, it is up to 20%. A 52-year-old woman with no history of prior cardiac events presented with 2 days of dyspnea and exertional, squeezing, substernal chest pain. Social history was notable for 12 pack-year-history with ongoing tobacco use. Her mother passed away from a myocardial infarction in her seventies. Physical exam was notable for Achilles' tendon xanthoma. ECG showed no signs of ischemia. Troponin peaked at 0.64 ng/mL. Her total cholesterol was 319 mg/dL, LDL was 248 mg/dL, HDL was 41 mg/dL, and triglycerides were 150 mg/dL. Laboratory workup showed pre-diabetes but normal thyroid and kidney function. She was treated with aspirin, atorvastatin, heparin, and two drug-eluting stents to right and left coronary arteries (for 95% and 85% occlusion, respectively). The prevalence of FH is as high as 1 in 200 to 1 in 500 for the heterozygous state. However, this condition is grossly underdiagnosed. Tendon xanthomas and corneal arcus with elevated LDL are specific for FH and are part of the Dutch Lipid Clinic Network and the Simmon-Broome criteria. Before 2015 many patients were unable to reach LDL goals of <70 mg/dL despite statin therapy. The FOURIER and ODYSSEY OUTCOME trials showed that PCSK9 inhibitors lower LDL further in patients taking statins and reduce the risk of cardiovascular death, MI, and stroke. With a significant reduction in the cost of PCSK9 inhibitors in 2018, more patients have access to effective treatment. FH is common and is associated with a high risk of coronary events. It is easily identified through family history, physical exam, and cholesterol screening and its side effects are preventable.

Identifying and Improving Insurance Gaps in Pediatric Populations

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Abstract/Case Study: Abstract: Identifying and Improving Insurance Gaps in Pediatric Populations Pediatric patients at Carilion Jefferson Plaza Pediatrics were presenting for care without insurance after discharge from nursery or after insurance lapsed after 1st birthday. AIM statement: By July 31, 2020, of pediatric patients aged 0-18 years old who are uninsured, at least 50% will become insured in the Carilion Pediatric Jefferson Plaza Population. Methods: Data was collected from EPIC of insured and uninsured visits from January 2019 to July 2020. A mobile DSS office was set up in Jefferson plaza that handled referral and walk in visits to establish insurance in one visit. Only visits to Jefferson Plaza pediatrics was collected and patients seen by Jefferson Plaza Primary care providers. Study period percentages and Z scores were calculated to compare the percentages of period 1 and 2 to the control group. Results: 19,418 visits were

documented over the study period with 959 of these being uninsured. Total number of visits decreased during the COVID pandemic in period 2. Percentages of uninsured visits were 5.08% for control, 4.57% in period 1, and 5.26% in period 2. Z score for period 1 was 0.7812 with a p value of 0.2177. Period 2 had a Z score of '0.45 with a p value of 0.326. Conclusions: The intervention did not decrease the number of uninsured patient visits. This was confounded by the COVID-19 pandemic impacting clinic visits. The demographics of patient visits changed with virtual visits and globally decreased throughput in clinic during pandemic.

Reducing Opioid Prescriptions in Surgical Patients at Carilion Clinic

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Abstract/Case Study: Background The national opioid epidemic is a gateway to heroin use. In 2017 Virginia had the highest relative increase in heroin-related overdose deaths in the US. In response to CDC recommendations, healthcare institutions are implementing guidelines to promote multimodal pain control regimens and restrict opioids on discharge after surgery. As of 2020, Carilion Clinic had no organized opioid reduction program. Methods An interprofessional team examined the opioid prescriptions for General and Trauma Surgery patients between the ages of 18 and 89 years old at Carilion Clinic 2015-2020, then implemented new Epic order sets in October 2020 to standardize pain medication prescribing habits. We defined 'ideal' opioid prescription amount based on inpatient usage. We have begun a retrospective review of prospective data to determine if there is a significant difference between pre- and post-intervention morphine milligram equivalents (MME) prescribed at discharge. Results New admission order sets have largely replaced pre-intervention order sets. Pre-op oral Tylenol increased from 6% to 40%, however then decreased to 30% of patients. Across General Surgery, opioid prescription amounts are down from an average 16 oxycodone 5mg tablets to 8 tablets. 38% of patients received the ideal amount. In Trauma Surgery, the average opioid prescription amount decreased from 26 tablets to 16 tablets. 26% of patients received the ideal amount; 52% were underprescribed. Average oxycodone tablets have decreased most after exploratory laparotomy (down 65%) compared to open colectomy (47%), laparoscopic procedures (27-36%), and lumpectomy (31%). Conclusion This QA/QI project is still in progress. As additional data are collected, more complex statistical analysis will be used. We have seen opioid prescription amounts vary broadly by month. For long-term success we must improve compliance among all prescribers. This pilot study will guide future research and best practices from the scientific literature into the Carilion Clinic work flow.

Evaluation of Liposomal Bupivacaine Use in Total Shoulder Arthroplasty

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Abstract/Case Study: Background: Poorly managed post-operative pain is a substantial clinical and economic concern leading to both physical and psychological consequences that impair recovery. Total shoulder arthroplasty (TSA) is considered one of the most painful surgeries that requires a multimodal regimen to adequately manage pain. Continuous interscalene blocks (CISB) and short acting local anesthetic infiltration have previously been considered the standard of care to manage post-operative pain. Liposomal bupivacaine (EXPAREL) has gained popularity due to ease of administration and potential to provide extended post-operative pain relief. The goal of this analysis was to compare liposomal bupivacaine versus standard of care in terms of total opioid consumption and post-operative pain control. Methods: This was a single center, retrospective analysis conducted at Carilion Roanoke Memorial Hospital in Roanoke, Virginia. The Institutional Review Board determined this was Exempt Human Subjects Research. Patients 18 years or older receiving TSA or reverse TSA and received either standard of care or liposomal bupivacaine were included. The primary outcome was total opioid consumption, in morphine milliequivalents (MME), 24 hours post-operation. Secondary outcomes included median pain score at rest for the first 24 hours and percentage of opioid free patients at 24 hours. Results: The liposomal bupivacaine group had a statistically significant reduction in MME requirements 24 hours post-operation compared to standard of care (37.2 vs 56.4; p=0.0056). A significant difference was observed in median pain scores and opioid free patients at rest 24 hours post-operation in the liposomal bupivacaine group, respectively [3(0-5) vs 4(2.5-5.5); p=0.016; 8(17.8%) vs 2(3.9%); p=0.0419]. Conclusion: This analysis demonstrated that liposomal bupivacaine use in TSA is associated with reduced total opioid consumption and pain scores 24 hours post-operation when compared to standard of care. Due to the retrospective nature and potential confounders the results of this study should be interpreted cautiously.

Safety of High Dose Chemical Thromboprophylaxis in Obese Patients

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Abstract/Case Study: The primary objective of this study was to compare the proportion of hospitalized obese adult patients with a major bleed receiving either weight-based enoxaparin or high dose unfractionated heparin (UFH) for venous thromboembolism (VTE) prophylaxis. Hospitalized obese patients are two to three times more likely to develop VTE than general acutely ill hospitalized medical patients. Guideline recommended VTE chemoprophylaxis for general hospitalized patients may not adequately prevent VTE in obese patients, leading to the use of increased prophylactic doses in these patients. The dose-dependent hemorrhagic risk of VTE chemoprophylactic agents may place obese patients at an increased risk of bleeding, warranting the need to identify an optimum agent and dose. This retrospective, single-system observational study evaluated medically ill obese adult patients who received VTE prophylaxis,

either high dose UFH or weight-based enoxaparin, at doses of 7500 units every 8 hours or 0.5 milligrams/kilogram every 24 hours respectively. The study included hospital encounters occurring after implementation of high dose UFH or weight-based enoxaparin regimens until January 1, 2020. The primary outcome was occurrence of a major bleed as defined by the International Society on Thrombosis and Haemostasis. The secondary outcome of interest was VTE event. The proportion of major bleeds and VTE were compared between groups. A total of 264 patient encounters were selected from 2018 encounters, with 132 encounters per group. Of the 264 encounters included, the median BMI was 46.5 kilograms per meter squared. The median creatinine clearance was 125.4 milliliters/minute (mL/min) and 72 mL/min in the enoxaparin and heparin groups, respectively. Full results will be presented at local and regional conferences following completion of all planned statistical analyses.

Improving Screening Of Glucocorticoid Induced Osteoporosis in Rheuamtology

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Abstract/Case Study: Background: High doses of Glucocorticoids (GC) used by rheumatologists are associated with rapid bone loss and Glucocorticoid induced Osteoporosis (GIO). This risk is related to high daily dose and the cumulative dose of the GC. Objective: This quality improvement study examines if providing education to providers leads to an improvement in the identification, evaluation, and treatment of patients at risk of GIO. Method: A single center, prospective study enrolling patients over 40 years, receiving a total cumulative dose of GC of >5 grams or a single dose of >30 mg of prednisone or equivalent. A quarterly patient list was generated, and to date we have data from Q1 and Q2. Rheumatology providers attended an academic Journal Club, reviewing the ACR guidelines on GIO. Reminders were shared monthly. Continuous variables were analyzed using T-test or Mann-Whitney U test. Categorical variables were analyzed using Chi-square Tests or Fisher's exact tests. Statistical analysis was performed using SAS9.4, and p value <0.05 was considered statistically significant. Results: There was no demographic difference between Q1 and Q2. Most of our patients were aged above 55 years, white, female with a median BMI of 29 and with Medicare or Medicaid. Post-intervention, there was a statistically significant increase in vitamin D replacement (<0.01) and the use of bisphosphonates (<0.01), as well as a reduction in bone mineral density tests (0.02) within the at risk group while on GC. Conclusion: There was a significant improvement between the GIO pre (Q1) and post-educational (Q2) data, with increasing use of GIO preventive measures. Importantly, there was also a reduction in BMD testing of patients while still on GC. This research showed the importance of provider education as a means of disseminating information and improving the quality of care in a more cost effective manner.

Retrospective Study Comparing Office-based Opioid Treatment versus Medication-Assisted Treatment

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Abstract/Case Study: Ambulatory psychiatric setting medication-assisted treatment (MAT) has shifted from a traditional model of MAT combined with group therapy to the office-based opioid treatment (OBOT) comprehensive care approach. Current literature is scant on efficacy of interdisciplinary care coordination in treating OUD. Using a retrospective chart review, 124 patients were identified in an ambulatory clinic, who were treated with buprenorphine for opioid use disorder (OUD) by a waivered psychiatrist. One cohort group (pre-OBOT) was admitted between June 1st 2012 to September 1, 2016 (subjects=58). The second cohort group (post-OBOT) patients was admitted between September 1, 2017 and January 31st 2019 (subjects=66). Patients were followed up for 1 year to determine 12-month retention rates. MAT vs. OBOT was not statistically differ in retention of patients. Even a targeted analysis with only Medicaid patients did not reveal significant difference in the two cohorts. A number of previously parameters found to influence retention did not affect it in the combined OBOT/MAT data set. These included final dose of buprenorphine >16 mg, having at least 1 positive UDS, negative buprenorphine UDS, comorbid psychiatric disorders, gender, living with children, insurance types. Chronic pain was associated significantly with 12 month retention. Being in a relationship/married is known to be a strong protective factor in mental health, as was found in this study. Use of other substances (nicotine, marijuana and tramadol) are less likely to stay in buprenorphine treatment. Overall, the retention rate in both MAT and OBOT cohorts are higher than 70%. The two cohort groups varied only in that Medicaid patients in OBOT received care coordination. There was a trend that care coordination led to higher retention though it was not statistically significant. Further studies can be conducted on Medicaid patients.

Does De-Implementation of Low Value Care Impact the Patient-Clinician Relationship?

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Abstract/Case Study: BACKGROUND: Antibiotics for acute sinus infection, annual electrocardiogram (EKG) screening in asymptomatic, low risk patients, and population-based screening for vitamin D deficiency are examples of low value healthcare (LVC). In the United States, provision of LVC is prevalent (up to 20% of total health services), costly ($350 billion annually), and associated with patient harm. Initiatives to de-implement LVC have been modestly successful and rarely sustainable. Concern about negatively impacting the patient-clinician relationship has been cited by clinicians as a barrier to LVC de-implementation. METHODS: We designed an online survey aimed at assessing patients' perceptions of the impact of LVC de-implementation on the patient-clinician relationship. Carilion Clinic primary care patients (n=2400) were randomly selected to receive an email invitation to participate by reading one of four vignettes about a physician not providing a requested service (LVC antibiotics, EKG, vitamin D, or control) and responding to demographics questions and the Patient-Doctor Relationship Questionnaire (PDRQ-9). RESULTS: A total of 232 participants (53.4 + 15.9 years of age, 65% female, 93% white/Caucasian, 31% Medicare/6% Medicaid/58% Commercial, 21% high school/ 44% college/ 30% graduate) completed the full survey. A significantly lower PDRQ-9 score was

associated with the vignette about a clinician not providing LVC vitamin D screening (31.2) compared with antibiotics (38.9), EKG screening (37.5), and the control vignette (36.4) ($p<0.05$). Demographic variables were not correlated with PDRQ-9 scores. DISCUSSION: Results indicate that the effect of LVC de-implementation on the patient-clinician relationship may be service-specific, with vitamin D screening being particularly sensitive. This may be due to the popularity of vitamin D in the current scientific literature and widespread media. Findings of this study will be incorporated, along with our other preliminary studies, into the design of LVC de-implementation interventions that prioritize preservation of the patient-clinician relationship. This work was supported by a Carilion RAP Grant.

Race, Vitamin D, and COVID-19 using Propensity Score Methods

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Abstract/Case Study: With a well-established role in inflammation and immune function, vitamin D status has emerged as a potential factor for preventing transmission of COVID-19. The purpose of this study was to evaluate the moderating effect of vitamin D status, as measured by 25-hydroxyvitamin D [25(OH)D], on the relationship between race and the risk of COVID-19 positivity, and to compare propensity score (PS) model results to those obtained from classical bivariate and multivariable models. Electronic health record (EHR) data from TriNetX (unmatched n = 25,061; matched n = 19,146) were used to investigate the effect of vitamin D status on the odds of experiencing a positive COVID-19 test using multivariable logistic regression models with and without PS methodology. Having normal (at least 30 ng/ml) versus inadequate 25(OH)D (< 30 ng/ml) was not associated with COVID-19 positivity overall (OR = 0.906, p = 0.10), in white individuals (OR = 1.033, p = 0.77), or in Black, Asian, and Minority Ethnicities (BAME) individuals (OR = 0.887, p = 0.14). When 25(OH)D was analyzed on a continuum, a 10 ng/ml increase in 25(OH)D lowered the odds of having a positive COVID-19 result (OR = 0.926, p = 0.001) overall and among white (OR = 0.935, p = 0.002), but not BAME, individuals (OR = 0.991, p = 0.75). Models which use weighting and matching methods resulted in smaller estimated effect sizes than models which do not use weighting or matching.

Counting Respiratory and Heart Rates using new technology

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Abstract/Case Study: Inaccurate counting of the respiratory rate (RR) has been identified in literature since 1957. Monitoring the heart rate (HR) by telemetry is accepted as accurate for counting HR for patients; however telemetry allows patients more freedom to be more mobile with the risk of the patient becoming disconnected from the telemetry unit. Hillrom' has developed a therapeutic bed that provides contact-free, continuous monitoring for the patient's HR and RR through the EarlySense' technology bed surface. Monitored readings are updated twice per second. The purpose of this study was to evaluate the effectiveness of the in the Centrella Smart bed EarlySense' to accurately measure HR and RR of patients in adult progressive care units as compared to manual documentation. The IRB determined that the study did not meet the definition of human subject's research and qualified as a quality improvement activity. Data were extracted from the Electronic Health Record plus direct observation of respiratory and heart rate assessment. An alarm log was analyzed for number and reason for alarms. Of the 292 patients located on the cardiac telemetry unit, data were collected on 50 unique patients, resulting in 124 data sets)42.5%). There was no difference between the RR collected by the observer and the EarlySense RR (S = 430.5, P =.12), and no difference between the average RR from the documented RR and the EarlySense RR (S = 540.5, P= 0.09). The HR collected by the telemetry monitor also was not different from the EarlySense heart rate (S = -153.5, p-value = 0.5937). This bed may be useful in monitoring of patients.

Impact of the Influenza Vaccination on the Orthopedic Surgical Patient

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Abstract/Case Study: Background: Orthopedic surgical patients undergoing elective (total knee arthroplasty, total hip arthroplasty) or emergent procedures (hemi-arthroplasty or intramedullary nailing) were not receiving the influenza vaccination prior to hospitalization or discharge due to concerns of symptoms mimicking surgical site infection. Purpose: To discuss the impact of the influenza vaccination on orthopedic surgical patients during the influenza season. Methodology: Institutional Review Board approved retrospective study extracted data from the electronic medical record for orthopedic surgical patients ' 18 years who had a total knee arthroplasty, total hip arthroplasty, intra medullary nailing or hemi-arthroplasty during the influenza seasons between March 2014-March 2019 at two southwestern Virginia hospitals. Comparisons were made between emergent patients (who received the vaccination) and elective patients (who did not receive the vaccination) within two weeks of surgery using an a priori alpha of 0.05 for t-tests, non-parametric equivalent variations, and chi-square tests. Results: There were no statistical or clinically significant differences in temperature, white blood cell count or readmission status between specific orthopedic surgical patients receiving the influenza vaccine and those who did not. There were no significant differences in study outcomes between groups based on time of the vaccination. Patients who received the influenza vaccination greater than two weeks preoperatively had a higher readmission status. Conclusion: Orthopedic surgical patients in this study who received the influenza vaccination were not at greater risk for elevated

temperature or white blood cell count. Orthopedic surgery patients should receive the influenza vaccine prior to discharge if not previously immunized.

Longitudinal Study-Impact of Schwartz Center Rounds on Moral Distress

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Abstract/Case Study: Moral distress occurs when moral integrity is compromised and can affect any healthcare professional. The purpose of this study was to examine the impact of the Schwartz Center Rounds (SCR) on Moral distress. This longitudinal, quasi-experimental study examined SCR attendees from 2015 to 2019. Data were collected via a two-part survey comprised of demographics and Moral Distress Thermometer (MDT) readings pre-rounds and immediately post rounds. Most participants experienced either no change in moral distress (50.6%) or a decrease in moral distress (33.7%) after attending one of the SCRs. Participants who worked with adult populations had higher moral distress after participation for most topics. An increase in moral distress was associated with a longer time in the current position. Fifty percent of physicians had a decrease in their moral distress immediately following the rounds. SCRs is a promising approach to foster high-functioning teams while promoting wellness and mitigating moral distress among employees.

Electronic Clinical Opioid Withdrawal Scale (eCOWS)

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Abstract/Case Study: Opioid addiction has been a rising epidemic, with opioid withdrawal negatively impacting individuals physically, mentally, and emotionally. The current system of measuring opioid withdrawal involves a pen-and-paper method known as the clinical opioid withdrawal scale (COWS). This 11-item scale involves a clinician asking a patient questions to rate common symptoms of opioid withdrawal. The summed score of this scale indicates the severity of opioid withdrawal. The issue with this method is that it is slow and subjective; scores may vary based on the clinician, patient's mood, or a variety of other factors. A better alternative to the traditional method of COWS administration is an electronic clinical opioid withdrawal scale (eCOWS) which can objectively gather quantifiable patient data. This device can seamlessly monitor different physiological effects based on the clinical opioid withdrawal scale, to then communicate this information to an iPhone app, outputting a score indicating the severeness of symptoms. Objectivity and speed were two requirements in the eCOWS design. Data

representing a portion of the 11 COWS criteria can be gathered through a FitBit sense smartwatch which has an ECG, accelerometer, and additional technology useful in clinical settings. This FitBit sense will be put on the patient by a clinician, and the clinician can then open the iPhone app (created by the team using XCODE) to follow along with the prompts given. The clinician will then fill out a few subjective questions regarding the patient, all while data collected from the FitBit sense is streamed to the app to output a final COWS score. Currently, the graphical user interface (GUI) for the application is complete, but the integration of the FitBit is still a work in progress. The team hopes to finish the code by May, allowing for further research and testing of the eCOWS device.

A Qualitative Analysis of Patient Perspectives on Low Value Healthcare

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Abstract/Case Study: Background: Low value healthcare (LVC), defined as medical interventions that provide no direct benefit to patients, constitutes a significant percentage of spending within Virginia's health care system (1) and in the US as a whole (2). Many initiatives, such as the Choosing Wisely campaign (3), have sought to identify and reduce this type of healthcare spending; however, little research has been done to consider the role of the patient. Therefore, this study seeks to characterize patients' impressions of low value care as well as possible strategies to reduce it. Methods: Recruited via email using random sampling (n=500), adult Carilion Clinic primary care patients participated in a semi-structured interview (~25 min.) by telephone in early 2021. The interview consisted of questions about a vignette that described a clinician's decision not to provide a patient's requested antibiotic prescription or screening EKG that would be classified as LVC. Interview prompts included impressions of the low value service, the impact of LVC de-implementation on the patient-clinician relationship, and suggestions for the management of LVC. Interviews have been transcribed and a thematic, qualitative analysis will be conducted by the research team. Results: Of 36 patients who responded to the recruitment email, 24 participants completed the interview. Participant demographics mirror the local primary care patient population: 54.8 years of age, 54% female, 83% Caucasian, 33% Medicare/8% Medicaid/58% Commercial. Future results will include interview themes elicited from immersion crystallization analysis, a context map, and sample quotations. Discussion/Conclusion: This qualitative research seeks to better describe and document the variety of thoughts, solutions, emotions, praises, and grievances that patients in Southwest Virginia have about LVC. Additional participant insights gathered within the interviews regarding healthcare as a whole will serve to augment our findings. These results will be used to inform implementation strategies to reduce LVC.

Prehospital Lung Ultrasound (PLUS) Study

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Abstract/Case Study: To determine if Roanoke Valley prehospital paramedics can perform diagnostic lung ultrasonography with adequate accuracy to supplement their current diagnostic tools and training. 911 calls for respiratory distress are a large portion of the complaints reported by patients encountered by emergency medical services (EMS) providers. Although paramedics can provide treatments for many causes of dyspnea, they are not equipped with advanced diagnostic tools to determine the underlying etiology of patient's complaint. With limited diagnostic tools available to the paramedic on the ambulance compared to the emergency department (ED) setting, paramedics are poor differentiators of the various etiologies of respiratory distress. Prehospital patients that receive incorrect diagnosis and subsequent incorrect treatment are likely to require more aggressive management during their hospitalization compared to patients correctly diagnosed and treated by paramedics. Lung ultrasound is a highly accurate method of rapidly identifying a patient's underlying pulmonary pathology in the in-hospital setting but has little study in the prehospital environment. Other targets of ultrasonography in prehospital medicine have shown good results. This study is a randomized controlled trial in which paramedics from five (5) Roanoke Valley EMS agencies will be trained in performing lung ultrasound on patients experiencing respiratory complaints. This project was awarded a Carilion Research Acceleration (RAP) grant which allowed purchase of nine (9) Butterfly iQ+ ultrasound devices. These will be deployed to the EMS transport units of the participating agencies. Paramedics will be randomly assigned to utilize a lung ultrasound protocol or their current diagnostic methods to determine the etiology of respiratory distress. This will be compared to the ultimate diagnosis determined by the receiving ED for accuracy. The study outcome is the diagnostic accuracy of the lung ultrasound protocol versus the current ability of the paramedic to identify the etiology of the patient's dyspnea.

Creating Vital Signs Monitors for Low to Middle-Income Countries

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Abstract/Case Study: Hospitals in low and middle-income countries often have a shortage of nurses, especially during the night shift in the pediatric ward. Due to this, nurses cannot sufficiently check all of their patient's vitals throughout the night. This can result in children dying from treatable causes. Our research team has been tasked by the organization Team Malawi to create an affordable vital signs monitor for hospitals in Malawi. The device uses a PPG red-light sensor to take the heart rate and blood oxygenation level of the patient. A MEMS microphone with an extended low-frequency response is used to measure the respiration rate of the child. Continuous reading infrared technology is incorporated into the device to constantly measure changes in the temperature of the patient. The device is Bluetooth enabled and will connect to a central Android device, which will alert the nurses of any significant change or abnormality in a patient's vitals. The monitor runs on a rechargeable 5V battery, ensuring the reusability of the device. The device is easily cleaned and is immersible in bleach, which ensures the durability and reusability over time. The monitor sits inside an adjustable and removable strap that can attach across the chest of children from prenatal infants to five-year-old kids. Additionally, the monitor can be removed and attached to the wrist of an adult using a skin-safe adhesive for increased versatility. The strap itself is made of tire rubber and covered by fabric to provide comfort. Both the rubber and fabric are locally sourced in Malawi, enhancing the product's affordability. An affordable and reusable vital signs monitor is an innovative solution that will have a profound impact on combating the serious problem of high child mortality rates in low and middle-income countries.

Abstracts for Poster Presentation

Dentistry

Case Report: A Multidisciplinary Approach To Dental Trauma

Authors: Greta-Anne M. Castonguay, DMD, Carilion Clinic, Hospital Dentistry, gmcastonguay@carilionclinic.org;

Abstract/Case Study: The purpose of this case study is to familiarize non-dental providers with the management of a facial trauma case involving a dentoalveolar fracture and avulsed tooth with multiple dental specialties involved. Dental and facial trauma is a common problem, especially in children and adolescents. While tooth avulsion represents less than 3% of dental trauma cases involving permanent dentition, it is one of the most complicated conditions to manage. Prognosis of re-implanted, avulsed teeth depends on a variety of factors, thus appropriate management and treatment planning have a large impact on clinical outcomes. Ideal management of dental trauma cases involves multiple dental specialties dependent on the type and extent of trauma. Medical decision making and treatment outcomes of this clinical case are discussed, as well as recommendations for future cases of dental trauma. Clinical outcomes involving dentofacial trauma may be improved with an established protocol for assessing and managing trauma involving avulsed teeth.

Prevention, Early Detection, and Management of Osteoradionecrosis of the Jaw

Authors: Ameera Khalefa, DDS, Resident, PGY-1, Carilion Clinic Dental Care, amkhalefa@carilionclinic.org;

Abstract/Case Study: Osteoradionecrosis (ORN) of the jaw is a complication found in patients with a history of head and neck radiation. ORN is characterized by mucosal breakdown with exposed necrotic bone that fails to resolve spontaneously in a previously irradiated area. It is progressive and can severely impact quality of life. ORN is more likely to occur in the mandible, in patients who have had a history of surgical resection, and in patients who receive an IMRT dosage greater than 60 Gy. It is most often induced by trauma following radiation. This study reviews two cases following the protocol for prevention, diagnosis, and management of possible ORN in the dental setting, with an overview of risk factors, progression, and conservative treatment options. This includes a case in which ORN was identified as a possible risk of dental surgery after radiation and another in which active ORN was observed and managed in a clinical setting. While there are various methods of treatment indicated based on progression of ORN, prevention is the best treatment. Prevention of ORN involves dental examination and treatment prior to radiation, frequent follow-up during and after treatment, and communication among all providers involved in the patient's care. This study aims to introduce non-dental providers to possible risk factors, prevention, early detection, and management strategies of osteoradionecrosis of the jaws.

Dermatology

Pruritic papules and papulovesicles after diet alteration

Authors: Kiley K. Fagan, MD, Carilion Clinic, Dermatology, kkfagan@carilionclinic.org;

Abstract/Case Study: A healthy 31-year-old middle eastern male presented with a 3-week history of a waxing and waning, mildly pruritic eruption on the trunk after starting a ketogenic diet. Lesions would last 3-4 days and then heal with dark spots. Prurigo pigmentosa, also known as the "keto rash", is a rare acquired disorder of unknown origin that is strongly associated with ketosis, diabetes, and post-bariatric surgery. Mainstay of treatment is to reverse the ketosis with the option of treating with doxycycline. The disorder was recognized in this patient and after stopping the diet, the lesions quickly resolved in 1 week.

Dermatitis Artefacta Associated with Iron-Deficiency Anemia

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Steven Svoboda , BS, Virginia Tech Carilion School of Medicine and Carilion Clinic, Section of Dermatology, Department of Internal Medicine; Alex Holliday, MD, Virginia Tech Carilion School of Medicine and Carilion Clinic, Section of Dermatology, Department of Internal Medicine

Abstract/Case Study: Dermatitis artefacta (factitial dermatitis) is a rare factitious disorder characterized by self-inflicted skin lesions wherein the patient refuses to acknowledge his or her role in the injuries in order to assume a sick role. Self-injury can be either conscious or unconscious. We present a case of a 66-year-old female referred to dermatology for evaluation and treatment of progressive, severe, mutilating leg ulcerations. She had previously been evaluated and treated by her primary doctor, wound care, and acute care services with multiple rounds of systemic antibiotics for a presumed infectious cause of her severe ulcerations. At the dermatology office, her skin exam revealed angulated, geometric erosions and ulcerations with thickened, lichenified, scarred borders diffusely on the lower extremities and less severely on the face and upper extremities. Diagnosis of dermatitis artefacta was suspected and further confirmed with a biopsy. Chronic ulcerations improved rapidly with weekly application of occlusive unna boots to the most severely affected leg, which prevented her from inducing further wounds. Interestingly, her factitial dermatitis initially started just before she was hospitalized for severe iron deficiency anemia. At that time, her hemoglobin was 2.3 g/dL and iron and ferritin were nearly undetectable. Dermatology evaluation and improvement of her ulcerations also corresponded with hematology follow-up and improvement in her iron-deficiency anemia, prompting the question of whether or not the severe anemia was partially causative for her aberrant behavior. Iron deficiency anemia is commonly associated with behavioral disturbances, most notably pagophagia, but it has also rarely been associated with neurotic excoriations, a condition distinct from dermatitis artefacta in which patients admit to compulsively inducing skin lesions. This is the first known case of dermatitis artefacta occuring in the setting of severe iron deficiency anemia.

Family and Community Medicine

Prevalence and Correlates of Health Service Overuse in Primary Care

Authors: Michelle S. Rockwell, PhD, RD, Carilion Clinic/ VTCSOM, Family and Community Medicine, mrockwell@carilionclinic.org; John W. Epling, MD, MSED, Carilion Clinic/ VTCSOM, Family and Community Medicine; Jane Colwell, MSN, RN, Carilion Clinic, Clinical Advancement and Patient Safety; Beth A. Bortz, MPP, Virginia Center for Health Innovation, Smarter Care Virginia

Abstract/Case Study: The overuse of non-indicated health services is increasingly recognized as a threat to high-quality health care. The purpose of this investigation is to explore health service overuse in Carilion Clinic primary care and to identify factors associated with patterns of overuse. Insurance claims data were obtained from the Virginia All-Payer Claims Database for patients seen by a Carilion primary care clinician in 2019. The Medinsight Milliman Health Waste Calculator (HWC) was then used to classify 42 commonly overused services as "necessary" or "wasteful". For example, annual cardiac screening was considered wasteful unless performed in a patient with documented symptoms, risk factors, or family history. Colorectal cancer screening was considered wasteful if it did not meet recommendations of the USPSTF for modality, indication, or frequency. HWC data have been shown to have high sensitivity and specificity and are used widely in the health services literature. Our team plans to analyze HWC data for service frequency and ratio of wasteful to necessary services. We will compare Carilion's primary care data to state and national benchmarks and explore correlates of overuse (ex: ordering clinician specialty, age, gender, and practice region; patient insurer). We aim to identify services, factors, and trends that may be priorities for focus in future health service overuse interventions. This work is being performed in conjunction with the Virginia Center for Health Innovation and the Smarter Care Virginia project (https://www.vahealthinnovation.org/scv/).

Medicine

COVID-19 Vaccine Perceptions among Healthcare Workers

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Abstract/Case Study: Purpose : To understand the underlying reasons that some healthcare workers are reluctant to receive the COVID-19 vaccine. Using the data generated from this study, the goal is to develop targeted information and educational interventions to provide accurate vaccine information to Carilion Clinic employees and improve the acceptance rate of COVID-19 vaccines among healthcare workers. Methods : A quantitative cross-sectional survey of Carilion Clinic employees. The survey consists of multiple-choice questions about healthcare worker characteristics, their experience with COVID-19, their COVID-19 vaccine intentions, COVID-19 vaccine perceptions, and sources of information on COVID-19. Vaccine hesitancy is defined as those who have not already received the COVID-19 vaccine and who respond 'No' or 'Unsure' when asked about their intentions to get the vaccine soon; vaccine acceptance is defined as having already gotten the vaccine or answering 'Yes' when asked about intentions to get the vaccine soon. Five-point Likert scales will be used to assess a range of vaccine perceptions. We will calculate frequencies associated with each Likert scale response for each perception. We will use multivariate logistic regression to identify associations between vaccine perceptions and healthcare worker characteristics and the binary outcome of vaccine hesitancy or acceptance. We will also use two sample t-tests to examine differences in specific survey items between vaccine-hesitant and vaccine-accepting employees. We will use these findings to target interventions and information that addresses negative perceptions and barriers among vaccine-hesitant employees. Finally, we will identify trusted sources for health information among vaccine-hesitant employees and try to target tailored vaccine messaging through these platforms. Results & Conclusion: This is an ongoing project

Advance Care Planning (ACP) in the ED observation unit

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Abstract/Case Study: Epic has an Advanced Care Planning (ACP) Navigator to aid in finding materials collected for ACP. It is felt providers do not know how to access this information or understand what materials are available in the navigator. Further, no formal training exists at Carilion to provide education on EPIC ACP Navigator. The aims of this project are to increase advance care planning documentation among patients placed into ED observation, improve accessibility of documentation in EPIC Navigator by increased utilization of priority scanning, and to improve accuracy of ACP documentation. The QI project education is a 30-minute presentation by palliative care physician and fellow on proper completion of Advanced Medical Directive, Durable Do Not Resuscitate, Physician Orders for Scope of Treatment, and medical decision making capacity with decisional making hierarchy. Handouts on educational materials will be provided based on PowerPoint presentation. Education will be recorded on WebEx. Participation is mandatory for ED observation providers. Education to begin in April 2020. The

target population is ED observation patients > 65 years of age or patients > 18 years of age with 2 or more ED visits in the past year. Anticipate enrollment of 250 patients pre and post arms of educational study. Exclusion: Patients upgraded to inpatient status, psychiatry patients. Data analysis will include a 1-month educational period in April 2020. Post educational data from May-June 2020 with pre-educational retrospective data from May ' June 2019. Side arm of project to include proper ACP Note documentation for ED observation patients. Anticipate seeing 20% increase in ACP documentation once education preformed. Anticipate seeing 90% increase in usage of ACP Navigator in Epic once education preformed. Expect to improve patient care and quality of care by providing appropriate documentation of patient wishes.

Novel carbapenem integron and ciprofloxacin resistant gene in Pseudomonas aeruginosa

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Abstract/Case Study: Chronic and multidrug-resistant (MDR) phenotypic Pseudomonas aeruginosa (Pa) is a threat to hospitalized patients. Recently, WHO survey reported that carbapenem resistant Pa (CR-Pa) ranked second most critical-priority bacterium among 20 antimicrobial-resistant bacterial species. In the United States, CR-Pa was first reported in 2001 in an isolate producing the verona integron mediated carbapenemase. Class 1 integrons facilitate the acquisition and reassembly of wide variety resistant genes and play a major role in global dissemination. We report, a novel integron (In2020) containing an MDR-CR cassette and a newer ciprofloxacin resistance gene in the genome of a chronic clinical strain Pa CMC-097 isolated from a ventilator-associated pneumonia patient (VAP). A prospective study was approved and conducted by Carilion Clinic Institutional Review Board from 2010-2012. The strain was isolated from tracheal aspirates of a chronic VAP patient. The genome of CMC-097 was sequenced on the Illumina NextSeq platform at the VT Genomics Resource Center. The complete assembly of CMC-097 resulted in a circular genome of 7,044,064 bp with G+C content of 66.4% (CP065848). For the first time in Southwest Virginia, we identified a large 120278 bp chromosomal region coharboring MDR and virulence genes in CMC-097. This region contained: 1) a~15173 bp segment containing a novel class 1 integron (In2020) harboring blaOXA-2, aacA(6')-II), qac'E, sul1, and GNAT-N genes. The novelty of In2020 cassette was defined and named by INTEGRALL; 2) a 41056 bp pathogenicity genomic island (PAGI), containing a newer crpP-like gene coding for a CrpP4 variant. The PAGI also included a pil operon, encoding for t4ss virulence, mercury resistance, and mobilization-related genes. The combination of In2020 with an MDR-CR cassette and a PAGI with a newer crpP decreases the antimicrobials susceptibility and enhances virulence in P. aeruginosa, which is a signi'cant threat to the hospitalized patients.

The Cultured Patient: Lactobacillus Bacteremia After Eating Greek Yogurt

Authors: Kyle Admire, DO, Carilion Clinic, Internal Medicine, kjadmire@carilionclinic.org; Greg Karamian, MD, Carilion Clinic, Internal Medicine; Elvis Pagan, MD, Carilion Clinic, Internal Medicine

Abstract/Case Study: Background: Lactobacilli are gram-positive rod-shaped bacteria that colonize the gastrointestinal tract and are used in fermented foods or probiotics. They are difficult to culture and speciate and typically regarded as contaminants. Lactobacilli infections are exceedingly uncommon and are considered opportunistic infections. Case: We present the case of a 55-year-old female with refractory double-hit B-Cell Lymphoma with a mediastinal tumor on salvage RICE therapy after failing REPOCH who presented with a two-day history of fever. She was recently hospitalized with lactobacillus bacteremia and discharged on a prolonged outpatient course of meropenem, which she completed. Upon arrival, she was dyspneic and febrile to 103°F with leukocytosis, anemia, and thrombocytopenia. After developing severe respiratory distress requiring intubation, a CT scan demonstrated tumor encircling the now perforated esophagus, new mediastinal abscess, and chemical pneumonitis. Blood cultures again returned positive for Lactobacillus fermentum in addition to new Lactobacillus casei. The patient's husband reported that before admission the patient exclusively ate Greek yogurt which contained these lactobacillus species. Her condition deteriorated despite aggressive antibiotics, mechanical ventilation, and vasopressors. A multi-disciplinary meeting determined she was not a candidate for further treatment of her lymphoma or mediastinal abscess. Subsequently, her family elected to pursue terminal extubation and palliative measures. Discussion: True lactobacillus bacteremia accounts for 0.1% of all positive blood cultures and is usually considered contaminants when isolated. Our patient could not receive standard therapy of penicillin and aminoglycosides due to severe allergies. We hypothesize that her lactobacillus bacteremia came directly from seeding into the mediastinum, which is supported by her bacteremia persisting despite antimicrobial therapy because the infectious source was not addressed due to her severe disease. There are no guidelines regarding immunocompromised patients and probiotics, but we believe that they should have counseling on the risk factors of consuming exogenous bacteria.

Vision Loss due to Embolization of Caseous Mitral Annular Calcification

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Abstract/Case Study: Caseous mitral annular calcification (CMAC) is a rare and unfamiliar variant of mitral annular calcification (MAC). The prevalence of MAC is about 10.6% with CMAC occurring in 0.63-0.64% of these cases. Clinical context and multimodality imaging are effective in

differentiating CMAC from other cardiac lesions. A 75-year-old male with a history of peritoneal dialysis for end-stage renal disease, pacemaker placement for complete heart block, hypertension, and hyperlipidemia presented with sudden, painless, right eye vision loss. Visual acuity was 20/40, and the fundoscopic exam showed a branch retinal artery occlusion on the right. Electrocardiogram and telemetry monitoring did not identify any arrhythmias. Carotid duplex showed moderate left internal carotid artery stenosis. A suboptimal transthoracic echocardiogram revealed mild mitral regurgitation. Transesophageal echocardiogram (TEE) showed a 15 x 10 mm immobile cystic structure on the posterior mitral annulus not enhancing with Definity contrast or having any blood flow with Doppler flow mapping. Computed tomography angiography (CTA) of the heart showed a 13.8 x 21.7 x 20.4 mm mitral periannular lesion with peripheral calcification and central hypodensity consistent with CMAC and extensive MAC. TEE was essential in identifying the cystic lesion and CTA further differentiated the lesion into CMAC due to the presence of peripheral calcification, necrotic/hypodense center, and lack of systemic blood flow. CMAC is typically benign but has been associated with systemic embolization. Identifying CMAC in patients with systemic embolization changes management. In this case, surgical intervention and anticoagulation therapy is recommended. Unfortunately, our patient was not a good surgical candidate and over the course of several months developed calciphylaxis and passed away from septic shock. CMAC is rare but has been associated with embolic events. Surgical intervention and anticoagulation should be considered in patients whose CMAC is the most likely cause of embolization.

Twenty-Two Second Asystole Following Ticagrelor Administration

Authors: Faisal Dadi, MD, Carilion Clinic, Internal Medicine Residency, fdadi@carilionclinic.org; Chalak O. Berzingi, MD, Carilion Clinic, Cardiology; Alexander G. Vigh, MD, Carilion Clinic, Cardiology; Eric Williams, MD, Carilion Clinic, Cardiology; Yang Zhao, PharmD, Carilion Clinic, Pharmacy Residency; Hasan Kazmi, PharmD, Carilion Clinic, Pharmacy; Bradley Allen, MD, Carilion Clinic, Cardiology

Abstract/Case Study: A 73-year-old woman presented with progressive but acutely worsened atypical chest pressure and shortness of breath. Her ECG demonstrated lateral ST-T abnormalities and laboratory workup was remarkable for elevated troponins. She was taken for a left heart catheterization with successful PCI of an 80% occluded mid-LAD lesion. Approximately four hours later she became unresponsive with irregular breathing, though arousable with a sternal rub. By the time a provider was notified, the episode had resolved and the patient was asymptomatic with normal vital signs. Telemetry review demonstrated a 22 second period of asystole preceded by bradycardia without any prior evidence of PR prolongation. Laboratory investigations and an ECG were unremarkable. The patient was upgraded to the Cardiac Care Unit and a transvenous pacemaker was placed. Overnight she remained asymptomatic without further episodes of asystole. The patient noted no history of arrhythmias and an echocardiogram demonstrated no significant abnormalities. However, a review of her medication history showed that she received a loading dose of ticagrelor during her catheterization. Several case reports describe ticagrelor-

related asystole or heart block within 24 hours of administration of ticagrelor's loading dose. To our knowledge, this 22-second episode is the longest reported case. The proposed mechanism is via ticagrelor's inhibition of cellular uptake of adenosine, potentiating adenosine's negative chronotropic and dromotropic effects. A tool known as the Naranjo Scale, designed for use in clinical trials, can be used in causality assessments for suspected adverse drug reactions. This patient's score translated to a 'probable' adverse drug reaction. In suspicion for ticagrelor associated asystole, she was transitioned to clopidogrel. Electrophysiology was consulted but recommended against pacemaker implantation due to the event likely resulting from a reversible cause. She was monitored for 48 hours without any further arrhythmias and was ultimately discharged with a 14-day event monitor that was without findings.

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Making Sense of a Missense Mutation in Thrombomodulin

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Abstract/Case Study: Thrombotic microangiopathy (TMA) is a pattern of thrombosis that occurs in the smallest blood vessels of the body, especially the kidney. TMA etiologies include complement dysregulation, low ADAMSTS13, cytokine storm, and malignant hypertension (MHT). Many pivotal genetic predispositions to TMA have yet to be elucidated. Thrombomodulin mutations, as a precipitant of TMA, are of significant research interest. Thrombomodulin is expressed in endothelial cells and has critical roles in anticoagulation and inflammation. Its highly functional domains regulate protein C activation, the complement cascade, fibrinolysis, and cytokine activity. Here we present a patient with chronic kidney disease stage 4 (CKD IV), MHT, and TMA whose genetic analysis revealed a missense mutation in thrombomodulin and a class II mutation in G6PD. A 25-year-old female at 20 weeks gestation with severe chronic hypertension and CKD IV presented with acute kidney injury and hypertensive emergency to 240/130 mmHg. Diagnostic workup revealed thrombocytopenia, hemolysis, 12% ADAMSTS13, and normal complement. Kidney biopsy revealed longstanding TMA. Hereditary thrombotic thrombocytopenic purpura was suspected, given her low ADAMSTS 13 without an inhibitor. Despite pregnancy termination, MHT, hemolysis, and thrombocytopenia continued. She was eventually stabilized on eculizumab, fresh frozen plasma, and dialysis. Genetic analyses revealed normal ADAMSTS13 and complement genetics. Interestingly, a missense mutation in the thrombomodulin gene was discovered, along with a class II mutation in G6PD. In our patient, mutations in thrombomodulin and G6PD coincided with TMA and MHT. Similar mutations in thrombomodulin are reported in pregnancy-associated atypical hemolytic uremic syndrome (aHUS) and idiopathic nodular glomerulosclerosis with TMA and MHT. Single nucleotide polymorphisms in thrombomodulin cause 5% of aHUS cases as well. While the immensity of thrombomodulin's function has yet to be discovered, each thrombomodulin mutation unveiled provides a glimpse into its roles in cytoprotection and hemostasis.

Vitamin B12 deficiency: A new risk factor for venous thromboembolism

Authors: Alec C. Fletcher, DO, Carilion Clinic, Medicine, acfletcher@carilionclinic.org; Rebecca R. Pauly, MD, VTCSOM and Carilion Clinic, Medicine

Abstract/Case Study: A 41-year-old female acutely presents with 10/10 right chest pain. She denies shortness of breath, palpitations, or syncope. She is a nonsmoker, denies immobility, long car rides or air travel. She uses an estrogen vaginal ring. She is neither taking a proton pump inhibitor nor a vegetarian. She has not had weight reduction surgery. She noticed blood in her stool for several weeks. On examination: BMI of 22, BP of 110/60, HR 109, afebrile, RR 16, and room air oxygenation 98%. Lungs have decreased breath sounds at the right base. No lower extremity edema or erythema is present. She was diagnosed with pulmonary embolism by CT scan showing right upper and right lower lobe emboli with opacification in the right base

consistent with perfusion injury. Lower extremity doppler showed a deep venous thrombus of the left common femoral vein and a superficial thrombus of the left great saphenous vein. Echocardiogram showed normal right ventricular size and function and normal right atrial size. Labs revealed hemoglobin of 7-8 g/dL and MCV 81.2, iron 29 (26-154), Transferrin Sat 7%, TIBC 435 (259-492), B12 was undetectable (<150pg/mL), homocysteine was elevated at 32.7 umol/L (<10), and methylmalonic acid was elevated 1570 nmol/L (87-318). Patient was treated with Apixaban and Vitamin B12 intramuscularly. She remained hemodynamically stable. As an outpatient she underwent esophageal duodenal gastroscopy (EGD) and colonoscopy to evaluate her anemia. EGD was completely normal. Colonoscopy revealed a single polyp. No findings of inflammatory bowel disease were seen. This case emphasizes the importance of Vitamin B 12 deficiency leading to elevated homocysteine and methylmalonic acid levels impacting the clotting cascade. Testing Vitamin B12 is not routinely done in the work-up of thrombosis. This case should alert clinicians to look for Vitamin B 12 deficiency as a risk factor for venous thromboembolism.

In the Guise of ST-Elevation Myocardial Infarction

Authors: David L. Heredia, MD, Virginia Tech Carilion , Internal Medicine , dlheredia@carilionclinic.org;

Abstract/Case Study: Pericarditis involves inflammation of the pericardium, a sac-like layer that surrounds the heart. Infectious, infarction, iatrogenic, and idiopathic causes may all lead to this inflammation. The overall incidence of pericarditis is approximately 0.1 to 0.2% of hospitalized patients. Incidence of peri-infarction pericarditis in ST-elevation myocardial infarction (STEMI) has been purported to be around 1.2%. However, regional pericarditis figures outside of STEMI are elusive. A 73-year-old man without known cardiac disease but with diabetes mellitus 2 was transferred to our hospital due to chest pain and with an electrocardiogram (EKG) suspicious for anterolateral STEMI with an initial negative troponin. EKG from the outside hospital showed ST elevations in leads I, AVL, V4-V6. No obvious PR depressions were noted. Repeat EKG at our hospital showed similar findings. Patient demonstrated lower substernal discomfort, worsened by deep inspiration. Otherwise, physical exam including vitals were unremarkable. Laboratories were only notable for leukocytosis of 13.6. Patient denied any viral prodrome. Due to high suspicion of underlying coronary artery disease (CAD), he was taken for cardiac catheterization which showed severe two-vessel disease (large ostial obtuse marginal 3 lesion at 95%, proximal-mid left anterior descending lesion at 80%). Due to his multivessel disease, patient was deemed appropriate for coronary artery bypass graft (CABG). Mild pericarditis changes were observed during CABG. Patient was started on ibuprofen and colchicine(standard therapy for pericarditis). Notably, troponin remained negative throughout patient's hospitalization. Patient was subsequently discharged without further complications and with resolution of symptoms. Regional pericarditis is a phenomenon that can present in the setting of acute coronary syndrome or be unrelated to CAD. One should be cognizant that a negative troponin assay with focal ST

elevations and pleuritic chest pain does not preclude a new presentation of a severe underlying coronary disease that may warrant urgent intervention and treatment.

Late-Positive Troponin in the Setting of Hypertensive Emergency and STEMI

Authors: David L. Heredia, MD, Virginia Tech Carilion , Internal Medicine , dlheredia@carilionclinic.org;

Abstract/Case Study: Acute coronary syndrome(ACS) involves decreased blood flow to the heart that may lead to infarction and most commonly occurs due to thrombosis within the coronary arteries. Troponin release is typically seen within a few hours after onset to demonstrate damage to the myocardium, particularly for ST-elevation myocardial infarctions. Electrocardiogram(EKG) changes suggestive of infarct may be present prior to release of troponins. A risk factor for ACS is hypertension, and hypertensive emergencies have been associated with ACS. Hypertensive emergency is described as a systolic blood pressure greater than 180mmHg or a diastolic blood pressure greater than 120mmHg, with end organ damage. A 68-year-old man with a past medical history of hypertension, but without known coronary artery disease, presented to the emergency room due to chest pain with radiation to the head that had been ongoing for 1.5 hours prior to presentation. He was found to have blood pressure of 227/119 and ST elevations in leads II, III, aVF, V3, and V6. He was subsequently placed on a nicardipine infusion. Troponin was negative. Transthoracic echocardiogram showed left ventricular ejection fraction of 60-65% with severe hypokinesis in the basal inferolateral region. Patient was admitted for hypertensive emergency with concern for ACS. Cardiac catheterization found a 99% thrombotic lesion of the distal right circumflex artery for which he received a drug-eluting stent. Notably, troponin became positive more than 8.5 hours after symptom onset. Patient had a subsequent unremarkable stay and was placed on guideline-directed medical therapy. In this patient, the concern for his concomitant hypertensive emergency and myocardial infarction led to further investigation. It is important to keep in mind the patient's risk factors and that when there is high clinical suspicion, even if there are negative troponins(or late-positive troponins), further work-up with cardiac catheterization may be necessary.

Neurological Complications and Bias in a Case of COVID-19

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Abstract/Case Study: Introduction: SARS-CoV-2 is primarily a respiratory disease but has been associated with many neurological complications including Guillain-Barre syndrome (GBS), acute stroke and frontotemporal hypoperfusion, myasthenia gravis, encephalopathy with leptomeningeal enhancement, and dysexecutive syndrome in survivors. The prevalence of Covid-19 can also result in cognitive biases and diagnostic errors. Case Description: A 73-year-old female with a past medical history of breast cancer in remission, hypertension, and hypothyroidism was admitted to the hospital after several weeks of progressive weakness. She was diagnosed with COVID-19 three days prior to admission. On admission, her physical exam

was unremarkable with normal chest x-ray findings and there was no oxygen requirement. Her weakness was attributed to COVID-19. A thorough neurological exam was not performed. On hospital day five, a left-sided facial droop was noted. Brain MRI showed no acute changes. On hospital day eight, she had a sudden increase in oxygen requirements from ambient air to BiPAP with 100% FiO2, prompting transfer to the ICU, where profound muscle weakness (1/5) and areflexia was noted. The CSF analysis and neurology consultant confirmed Guillain-Barre syndrome, which was treated with intravenous immunoglobulin (IVIG). An acute ischemic stroke developed on day 12. Discussion: This case illustrates several of the neurological sequelae associated with SARS-CoV-2 infection. Reports, series, and epidemiologic studies have not proven causation and it is possible that lockdowns and social distancing have decreased the transmission of more typical GBS triggers. Acute cerebrovascular diseases have been seen in 6% of patients with COVID-19, including small and large vessel occlusion, cardiac embolism, intracranial hemorrhage, and cerebral venous sinus thrombosis. Possible mechanisms include a robust systemic inflammatory response, endothelial dysregulation, and certain treatments including IVIG. This case further demonstrates the problems of availability bias, anchoring, confirmation bias, and diagnostic momentum that is likely far too common during the current pandemic.

A Cat-Astrophic Infection: A Case of Pasteurella Multocida Peritonitis

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Abstract/Case Study: Infections such as peritonitis are common and potentially dangerous complications associated with peritoneal dialysis (PD) that may lead to PD failure. The most common source of infection that leads to peritonitis comes from accidental contamination during access of the catheter or its connections. Most of these pathogens are bacteria found on human skin. However, there are rare case reports of peritonitis secondary to Pasteurella Multocida; a zoonotic pathogen found in the mouth of domestic cats. This case report discusses a case of P Multocida peritonitis in a patient undergoing home continuous cycling PD (CCPD). A 32-year-old female presented to the hospital with abdominal pain, nausea and vomiting. The patient had a history of end stage renal disease on CCPD secondary to polycystic kidney disease. Physical exam demonstrated a tender abdomen without any evidence of a catheter exit site infection. Peritoneal fluid analysis demonstrated cloudy fluid with a WBC count of 13K with 98% neutrophils. The peritoneal gram stain grew 1+ gram-negative rods and was identified as P Multocida. The patient owned a one-year-old cat and a dog however denied recent bites or scratches from the animals. Upon further questioning, the patient admitted to the cat sleeping in her bed overnight during her CCPD sessions. The PD catheter was removed and the patient was transitioned to intermittent hemodialysis. She completed a fourteen day course of ceftazidime and recovered well. The suspected source of the P Multocida was the patient's cat that had direct access to the patient's dialysis supplies overnight. The cat likely bit the tubing or dialysis bags, thereby contaminating the peritoneal fluid and causing peritonitis. P Multocida

peritonitis represents a rare but dangerous complication for PD patients. Clinicians should be aware of the potential for transmission of this pathogen from domestic cats to PD patients.

The effect of IL-6 inhibitors on COVID related inflammatory response

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Abstract/Case Study: The purpose of this retrospective study is to determine if IL-6 related biological disease modifying antirheumatic drugs (bDMARDs), lead to fewer hospital admissions and less sequalae following COVID-19 in rheumatology patients on IL-6 bDMARDs for non-COVID-19 reasons. Multi-system inflammatory syndrome in adults (MIS-A) has been observed in patients following COVID-19 and some who never had COVID-19 yet tested positive with polymerase chain reaction (PCR) for the Corona virus after development of MIS-A symptoms. Symptoms vary and include fatigue, shortness of breath, tachycardia, headaches, myalgias, joint pains, cough, vomiting, diarrhea, intermittent fevers, and presents days to weeks after illness. MIS-A is a cytokine driven hyperinflammatory response, also known as 'Cytokine Release Syndrome' (CRS). IL-6 is the major driver of inflammation CRS. The study patients include rheumatology patients with COVID-19 on IL-6 inhibitor therapy prior to diagnosis with COVID-19. The comparator groups will include all other COVID-19 patients on bDMARDs and patients from the rheumatology clinic with COVID-19 not on bDMARDs. These patients will be compared to determine if IL-6 blockade prevents COVID-19, if IL-6 blockade protects against hospitalization for COVID-19 and the subsequent development of MIS-A. Laboratory testing will be compared, with the understanding that once IL-6 has been administered, CRP is not useful, as CRP levels are decreased with concurrent IL-6 inhibitor therapy. IL-6 inhibitors are approved for the use of CAR-T associated cytokine release syndrome. The symptoms of CAR-T associated CRS has many similarities with MIS-A. This has led to IL-6 inhibitor therapy being studied and used in severe COVID-19. Studies have shown IL-6 inhibitors such as tocilizumab and sarilumab in addition to standard of care have dampened the inflammatory response associated with COVID-19. Preliminary studies have demonstrated improved clinical outcomes in lung function and mortality with the use of selective cytokine inhibitor therapy.

Intravascular Large B-cell Lymphoma mimicking Lumbosacral Radiculopathy

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Abstract/Case Study: Intravascular large B cell lymphoma (IVBCL) is an aggressive, systemically disseminated, rare subtype of extranodal large B-cell lymphoma confined to the lumen of small- and medium-sized vessels. Diversity of presentation, lack of specific laboratory or radiological finding and absence of nodal involvement, poses a diagnostic challenge. Neurological manifestations are frequently observed in western population. CNS involvement is usually preceded by PNS involvement. We report a female who presented with sign and symptoms of

PNS involvement, including intractable radicular pain, moderate motor and sensory loss, along with saddle anesthesia and bladder incontinence. EMG/NCS showed L5/S1 polyradiculopathy. MRI of spine was unremarkable however MRI pelvis showed extensive inflammatory myopathy. MRI changes in gluteal muscles led to muscle biopsy which confirmed the diagnosis of IVBCL. Patient became encephalopathic during admission, MRI brain did not show any etiology except for small lacunar infarct. She was started on Solumedrol, however rapidly deteriorated and passed away. This case highlights the diagnostic challenges of IVBCL. The presentation was unique in terms of initial features resembling radiculopathy followed by rapid deterioration and possible CNS involvement. In a meta-analysis of 645 patients with IVBCL, CNS manifestations like encephalopathy, dementia and stroke were more commonly observed. PNS involvement was rare and mostly seen as myopathy and neuropathies. Tumor infiltration and occlusion of vasa nervosum is considered as a reason for peripheral nerve involvement. IVBCL presenting as sensorimotor axonal polyradiculopathy diagnosed with muscle and nerve biopsy has been reported. Rapidly progressive neurological manifestations or ones that cannot be explained, IVL should be suspected. A low threshold for muscle and nerve biopsy is needed when trying to establish an early diagnosis and treatment.

A case of herpes zoster ophthalmicus with external ophthalmoplegia

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Abstract/Case Study: Introduction: Herpes zoster (HZ) ophthalmicus is the manifestation of the HZ virus within the structures of the eye. There are approximately one million cases of HZ every year and about 30% of these cases involve ocular structures, which can manifest as ophthalmoplegia. This is typically a transient complication but may become permanent if it is caused by ischemia related to HZ vasculopathy. Neuroimaging is critical in these patients to rule out the vascular complications associated with HZ. Clinical presentation: A 79-year-old male with a history of heart disease with angioplasty, paroxysmal atrial fibrillation, hypertension, and hyperlipidemia presented due to worsening diplopia. He was recently diagnosed with HZ of the right V1 distribution that had progressed to involve the eye and manifest as uveitis with a sixth cranial nerve palsy. He then developed palsy of the third and fourth cranial nerves without loss of visual acuity. Computed tomography (CT) and angiography (CTA) of the head were completed to evaluate for potential ischemic vascular complications caused by HZ vasculopathy. The patient was treated with intravenous acyclovir with complete resolution of ocular symptoms. Discussion: HZ is a well-known cause of blindness but a much lesser-known cause of stroke. This occurs due to translocation of the virus from the trigeminal ganglia to the intracerebral vasculature. While the ocular palsies associated with HZ are typically transient, they always merit neurologic imaging to rule out ischemia or direct toxic effect caused by HZ. Fortunately, our patient did not have any ischemic complications from HZ and recovered quickly following initiation of treatment. Conclusion: HZ is relatively common and can manifest anywhere from the typical skin rash to the devastating neurologic insults associated with HZ vasculopathy. Worsening neurologic deficits in

the setting of HZ should be evaluated with neurologic imaging and treated promptly with intravenous anti-viral medication.

An EEG Captured Case of Migralepsy / Migraine Aura-Triggered Seizures

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Abstract/Case Study: Introduction: Migraine and epilepsy are common chronic neurological disorders presenting with paroxysmal attacks of transient cerebral dysfunction, followed by subsequent return to baseline between episodes. The term 'migralepsy' has been proposed to define migraine-triggered epileptic seizures classified by the ICHD-III as a complication of migraine with an aura. Case: A 55-year-old man with a 30-year history of migraine without aura presented with a new onset left parietal pain accompanied by visual disturbances occurring up to 20 times per day. His visual distortions were associated with kaleidoscopic pattern, flashes of shadows, and a right superior quadrantanopia lasting 20 minutes. In addition, he described discrete 2-minute episodes of scintillating scotomas in his right visual field. Ictal EEG demonstrated a left occipital onset focal aware seizure which correlated with his clinical symptoms. The patient was started on Valproic Acid and has remained asymptomatic. Discussion: The diagnostic criteria as set out by the ICHD-III for migralepsy and other syndromes with migrainous and ictal features remain a source of confusion for practitioners as there is much overlap in clinical manifestations of these entities. EEG should be obtained when there is clinical suspicion of ictal features present in patients presenting with headache.

Rare Late Complication of Paravalvular Leak Repair: Vascular Plug Embolization

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Abstract/Case Study: Case Presentation: A 64-year-old man with a history of surgical bioprosthetic aortic and mitral valves (2013), and severe mitral valve paravalvular leak (PVL) repaired using AmplatzerTM Vascular Plug II (AVP) 8 months ago presented with worsening dyspnea on exertion. The lung exam revealed bilateral crackles with oxygen saturation of 86% on room air. The cardiovascular exam showed 3/6 holosystolic murmur at the apex, 2/6 systolic and diastolic murmurs at the left upper sternal border, jugular venous distension, 2+ left and 1+ right radial pulses, 2+ dorsalis pedis pulses, and left arm blood pressure of 105/63 mmHg and 76/50 mmHg, on the right arm. Transthoracic echocardiogram revealed a new aortic bioprosthetic PVL. A transesophageal echocardiogram (TEE) showed a bioprosthetic aortic valve with a moderate PVL and a new rocking motion of the bioprosthetic mitral valve with a severe PVL and absent AVPs. Whole-body computed tomography angiography (CTA) revealed an AVP in the right

subclavian artery and two AVPs at the right common iliac artery bifurcation. The AVPs were retrieved percutaneously via the right common femoral artery without complications. Given the instability of the mitral valve, surgical repair was favored. The patient had a successful aortic and mitral bioprosthetic valve replacement. Discussion: The rate of major PVL after mitral valve replacement increases with time and can occur as late as 20 years from the procedure. Percutaneous repair is recommended for patients with either hemolysis or New York Heart Association Class III or IV HF symptoms due to PVL. It is successful in about 70-90% of cases. It reduced symptoms, and cardiac surgery and mortality rates. Embolization of AVPs after placement is a rare and unrecognized complication. Only two prior case reports noted embolization two months post-placement. To our knowledge, our patient is the third case of late AVP embolization.

Pneumocystis jirovecii pneumonia in Treatment Naive Chronic Lymphocytic Leukemia

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Abstract/Case Study: Pneumocystis jirovecii pneumonia (PJP) is a common opportunistic infection in immunocompromised hosts. Chronic Lymphocytic Leukemia (CLL) is a clonal malignancy of B lymphocytes and has inherent immune defects. Despite the characteristic immune incompetent lymphocytes, CLL is not often considered a risk factor for developing PJP. Treatment for CLL increases the risk for development of PJP. This case demonstrates a PJP infection in treatment naive CLL patient with dyspnea and pulmonary infiltrates. A 78-year-old man with a history of hypothyroidism presented to the pulmonary clinic for one month with dry cough and dyspnea on exertion. The patient was diagnosed one month earlier CLL. The patient no longer could perform his work as a farmer due to dyspnea. His physical exam was notable for bibasilar crackles. A CT chest with contrast showed patchy ground glass opacities predominantly on right side. Pulmonary function tests were significant for decreased DLCO at 54% predicted. He was empirically treated for community acquired pneumonia (CAP). He underwent bronchoscopy with bronchoalveolar lavage (BAL) after no improvement in symptoms with antibiotics. GMS stain from right middle lobe BAL sample showed Pneumocystis jirovecii cysts. Rest of the infectious workup was negative. Patient was started on atovaquone (due to significant allergy to sulfa drugs) pending glucose-6-phosphate dehydrogenase (G6PD) deficiency test. Atovaquone was changed to a clindamycin and primaquine after the patient was confirmed to not have G6PD deficiency and a prednisone taper. He completed a 21 day course. He no longer needed supplemental oxygen on follow up clinic visit. This case demonstrates the importance of understanding CLL to be an immunosuppressed state even prior to treatment and thus to keep PJP pneumonia on the differential for an untreated CLL patient with dyspnea and pulmonary infiltrates.

Nitrofurantoin Induced Interstitial Lung Disease

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Abstract/Case Study: Nitrofurantoin is a rare cause of interstitial lung disease, although it is a common culprit for medication induced lung disease. Nitrofurantoin pulmonary toxicity can present in many forms including acute to chronic interstitial pneumonia. This case highlights an insidious presentation of nitrofurantoin induced interstitial lung disease that showed resolution with the discontinuation of the medication. 74 year old female presented to pulmonary clinic for evaluation for unresolved pulmonary infiltrates. She had complaints of 4 months of cough and progressive dyspnea on exertion. Prior to the consultation, she was treated by her primary care provider with 2 separate courses of antibiotics; without any resolution of symptoms, and a week course of prednisone, which did improve her symptoms. The patient's only new medication was nitrofurantoin for recurrent urinary tract infections started 9 month prior. CT Imaging showed patchy areas of ground glass opacity predominately in the upper lobes in the central lung fields with bronchovascular distribution. The nitrofurantoin was discontinued. She underwent bronchoscopy with no endobronchial lesions and negative cultures. bronchial alveolar lavage (BAL) cell counts: 6% neutrophils,and 53% lymphocytes. The diagnosis of nitrofurantoin induced interstitial lung disease was made on the basis of the clinical impression and BAL cell counts. She was treated with a prednisone taper and supplemental oxygen due to the severity of her symptoms. Her repeat imaging demonstrated the resolution of the infiltrates. Nitrofurantoin has been prescribed for prophylaxis urinary tract infections in patients with predisposing factors. Nitrofurantoin is not a benign medication. It is a common medication to induce pulmonary toxicity, which can range from acute to chronic with a variety of radiologic patterns. Th pulmonary toxicity ranges in severity but can be fatal; and thus patients on prophylactic nitrofurantoin should routinely be assessed for possible lung toxicity.

Endocarditis, Osteomyelitis and Cryptococcus Meningitis oh MY

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Abstract/Case Study: Introduction: Cryptococcus neoformens is most commonly seen with immunocompromised patients, especially with patients with HIV infection, transplants, or immunodeficiency (especially with the CD4 cells). This infection can still be seen in an immunocompetent patient, and sometimes it is forgotten. Case: Patient ME was a 36-year-old female that was a trauma alert due to a fall two to three weeks prior to her admission. The patient was having complaints of left hip pain and right elbow pain. ME had a history of polysubstance abuse, with her drug of choice being heroin. CT of the abdomen and pelvis showed renal abscess along with left hip abscess. ME had blood cultures that were positive for MRSA. She was first started on Vancomycin but then had to be switched to Daptomycin due to renal failure. She had a murmur then the Transesophageal echocardiogram found vegetations. Therefore we have a patient with osteomyelitis, renal abscess (positive MRSA), and endocarditis. She kept having

headaches and spiked a fever. ME didn't have meningitis symptoms. New blood cultures showed budding yeast, and this was assumed to be Candidemia and patient was started on Andiflugin but then the culture returned to be Cryptococcus neoformens. Patient had a lumbar puncture that had the opening pressure being 27 cmH20 and positive culture and antigen. The patient had HIV antibodies, antigens, and viral load all remained negative. Her CD4 levels were also normal. Discussion: ME was not immunocompromised, and it was surprising that she developed this infection. When Cryptococcus is positive, it is good to get an HIV work-up and look for low CD4 levels. This patient only had symptoms of headache. This sometimes will be the only symptom seen. The patient's MRSA infection could have weakened her immune system and added to her risk for this disease.

Risks Factors in the development of Neuropsychiatric Lupus.

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Abstract/Case Study: Background: Systemic Lupus Erythematosus (SLE) is a chronic autoimmune disease with a complex and varied clinical presentation. Neuropsychiatric lupus (NPL) is particularly difficult to diagnose and treat. Objective: The purpose of this study was to examine the relationship between patient specific characteristics, socioeconomic factors, and SLE related autoantibody in the development of NPL in our patient cohort. Methods: This was a SLE single center, retrospective chart review study. Patients 18 and above, meeting the ACR 1997 criteria seen between June 1st 2015 and June 1st 2019 were included in this study. 629 were identified, and 263 patients with SLE were enrolled. Demographic data was collected. Continuous variables were analyzed using T-test or Mann-Whitney U test. Categorical variables were analyzed using Chi-square Tests or Fisher's exact tests. Statistical analysis was performed using SAS9.4, and p value <0.05 was considered statistically significant. Results: Of the 263 patients with SLE, most were White (148/54%), and African Americans (115/43%) with a small number of Hispanics patients (6/3%). We found no relationship between age, sex, race, and median household income (MHI) and NPL. We found no relationship between SLE specific autoantibodies and NPL. There was a significant association between the antiphospholipid antibodies (aPL) and NPL (<0.01). Though not statically significant, complement component 4 (C4) did show a trend towards significance (0.09). Analysis of aPL did not reveal a significant relationship between aPL positivity and race, sex, age or MHI. We did find a relationship between glucocorticoid use and NPLS, but not between NPL and immunosuppressive medications. Conclusion: In our cohort, there was no relationship between patient characteristics, socioeconomic factors, and NPL. There was a relationship between aPL antibodies, glucocorticoid use and NPL. Although not statistically significant, there was a trend towards significance between Compliment 4 (C4) levels and the diagnosis of NPL.

Salmonella-Related Mycotic Pseudoaneurysm Rupture with Femoral Bypass Graft Infection

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Abstract/Case Study: Mycotic pseudoaneurysm is an irreversible and localized dilation of an arterial wall caused by an infection. We hereby report a rare case of mycotic pseudoaneurysm caused by non-typhoidal salmonella. A 57-year old African-American male presented to the emergency department with severe right groin pain after slipping on ice. He had a significant vascular history including right aorto-femoral bypass graft performed 10 years ago. Five years later, he developed a 2.5 cm pseudoaneurysm which was repaired surgically and found to have an infected femoral graft which was excised, but graft cultures were negative at that time. CT angiography showed an enlarging saccular aneurysm at the aortic bifurcation with no leak. After admission, repeat CT angiography showed a fluid collection adjacent to the right aorto-femoral bypass graft with evidence of active extravasation. He was taken to the operating room, where he was found to have a right femoral pseudoaneurysm with extensive scarring and a purulent ulcerative lesion through the femoral artery stent. He underwent repair of the pseudoaneurysm with replacement of the infected graft. The operative cultures grew non-typhoidal Salmonella spp. The patient recalled no specific exposures; however, he did remember experiencing severe vomiting near the time of his previous femoral graft infection. Antibiotic therapy was started with IV ceftriaxone daily for six weeks after removal of infected graft with step-down to fluoroquinolone for several weeks. This case demonstrates the main features of a mycotic aneurysm, which can develop from hematogenous seeding of an existing aneurysm or extension from a contiguous site of infection. Salmonella species sometimes have predilection for damaged arteries, most frequently the aorta and rarely causes vascular graft infections, more predominantly in male patients. CT is the most useful diagnosing modality. Surgical interventions are always required along with prolonged parenteral antibiotic therapy for management of this complex infection.

Type-I and Type-III Kounis Syndrome in patient undergoing cardiac catheterization

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Abstract/Case Study: Kounis syndrome is defined as acute coronary syndrome caused by allergic or strong immune reaction to a drug or other substance. There are three recognized variants. Type I is characterized by allergic coronary vasospasm in patients without coronary artery disease Type II involves coronary artery spasm or plaque erosion in people with coronary artery disease. Type III occurs in the setting of coronary stent thrombosis or restenosis. We present a unique case of simultaneous Type I and III Kounis syndromes. 67-year-old male with history of

hypertension and prior smoking presented for outpatient left heart catheterization due to exertional angina and positive stress test. Coronary angiogram showed severe (90%) stenosis of proximal left anterior descending artery (LAD) which was revascularized with drug eluting stent (DES). Circumflex and right coronary arteries were free of severe stenosis. During the intervention, patient complained of generalized pruritus and warm sensation, and developed hypotension and respiratory distress requiring pressors and supplemental oxygen. He also developed generalized macular rash over his chest and arms consistent with an allergic reaction, most likely to contrast dye. He was treated with methylprednisolone, diphenhydramine, and epinephrine with hemodynamic and symptomatic improvement. Patient subsequently developed chest pain and further angiography revealed coronary artery spasm causing acute occlusion of the mid left circumflex artery. This was treated with nitroglycerin and low-pressure balloon angioplasty with restoration of flow. In the recovery unit, patient developed severe chest pain with ST elevations in AVL, V2, and V3 on electrocardiogram with reciprocal changes. He also developed hypotension requiring dopamine and phenylephrine infusions. Patient was emergently taken back for cardiac catheterization, and coronary angiography revealed acute thrombosis of his LAD stent. Patient underwent aspiration thrombectomy and required implantation of second drug eluting stent with flow restoration. Post-procedure course was uneventful, and patient was discharged on three days later.

Saddle Embolus to Left Main Coronary Artery in COVID-19 Patient

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Abstract/Case Study: Novel coronavirus infection (COVID-19) can lead to various life-threatening complications including thromboembolic disease. This case involves a critically ill patient presenting with multiple embolic complications of COVID-19. 49-year-old male with recent COVID-19 diagnosis was admitted to the hospital with dyspnea. Two days later, he developed angina with anterolateral ST-segment elevation on EKG. Emergent coronary angiogram revealed large non-occlusive saddle thrombus of distal left main coronary artery extending into left anterior descending and circumflex arteries. Aspirin, clopidogrel, heparin and tirofiban were initiated. Patient developed cardiogenic shock, and an intra-aortic balloon pump was placed. He was transferred to a tertiary care facility for potential aspiration thrombectomy versus surgical revascularization. Echocardiogram showed ejection fraction of 20% and left ventricular apical

thrombus. Four days later, the patient developed new aphasia, right-sided weakness, and facial droop. Brain MRI showed cardioembolic occlusion of the left middle cerebral artery, and prior antithrombotic therapy was continued. Over the next 2 weeks, he improved clinically and came off all hemodynamic support. Repeat angiogram revealed complete resolution of prior thrombosis. He subsequently achieved full neurologic recovery and was discharged. This is a remarkable case of a patient surviving to discharge despite serious COVID-19 thromboembolic complications. We suspect that this patient developed an acute coronary thrombus secondary to endotheliitis which subsequently led to severe myocardial dysfunction and cardiogenic shock. Early, aggressive, and sustained multi-agent antithrombotic therapy may have played an important role in the patient's overall survival, making it a promising treatment strategy meriting further investigation.

Nursing

Stretching Beyond Conventional Treatment for Inpatients with Substance Use Disorders

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Abstract/Case Study: Stretching Beyond Conventional Treatment for Inpatients Being Treated in an Acute Care Hospital with Substance Use Disorder Abstract Yoga has been found to be effective in outpatient settings to improve outcomes for individuals with substance use disorders but little research has been done in the setting of an acute care hospital with patients who are acutely ill. This pilot feasibility study was developed to look at how yoga might impact depression, anxiety, and pain in patients with substance use disorders hospitalized for 4 to 6 weeks for IV antibiotic therapy for serious infection. All patients enrolled in the Hope Pathway program were eligible to enroll in the study. The Hope Pathway (treatment as usual, TAU) included group and individual counseling sessions and peer recovery support partners. The yoga intervention included gentle chair movement and stretches, breathing exercises, and meditations based on the philosophy of Yoga for 12 Step Recovery developed by Nikki Myers. This pilot/feasibility study employed a pre-test post-test nonequivalent comparison group design using a convenience sample of hospitalized patients who were receiving treatment for infection on an inpatient unit specifically dedicated to care of this longer-term patient. The PROMIS® Global Health scale, Emotional Distress-Anxiety - Short Form 4a, and the Emotional Distress-Depression - Short Form 4a questionnaires were administered close to the date of admission, 2-3 weeks later, and then at discharge. There were no significant differences in the two groups in their responses on the pre-tests and post-tests and no significant change between pre-tests and post-tests. Study participants were also asked to write in a journal about their experience with the Hope Pathway and the yoga intervention. Overall, the journal responses indicated subjective benefits and a desire to continue with the yoga program.

Nursing Burnout with Substance Use Disorder Inpatients: A New Hope

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Abstract/Case Study: Purpose: Patients with conditions associated with substance use disorder (SUD) can exhibit incivil behaviors that are challenging for inpatient unit nurses. This project explored the impact of an SUD treatment pathway on RN burnout, retention, engagement, patient experience, and number of police calls. Significance: Little literature is reported about the effect of negative relationships with patients on nurses' job satisfaction or burnout. Specifically, there is a literature gap about acute care nurses caring for patients with SUD and nurses' burnout. Implementation: A psychiatrist, licensed clinical social worker and peer recovery specialists provided substance use therapy and support during admission for medical conditions. The Maslach Burnout Inventory for Medical Personnel measured emotional exhaustion, depersonalization, and personal accomplishment at pre-implementation in July 2018 and again at 3, 6, and 9 months post-implementation. Pre and post-intervention data for nursing turnover, staff engagement, patient experience, and the number of hospital police calls were compared. Outcomes: With a 58% response rate, the within factor repeated measures ANOVA for sum of scores for emotional exhaustion (p=0.0133) indicated decreased burnout at each survey post-implementation. There was no difference in depersonalization and personal accomplishment. There was a 36% decrease in RN transfers and voluntary RN turnover. The hospital's 2019 staff engagement survey results are pending. There was a slight increase in the percentage of patients responding 'always' to the patient experience questions related to communication with nurses, response of hospital staff, and staff worked together to care for you. The number of calls to hospital police during 7P ' 7A increased post-implementation. Implications for Practice: Further research is needed to determine the long-term implications of the pathway on nursing burnout. Limitations of the study were the small sample size and presence of other challenging long-term non-pathway patients.

Impact of Team-based, Interprofessional Clinical Ethics Immersion on Moral Resilience

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Abstract/Case Study: Noting that issues raised during clinical bioethics consults at a southeastern US hospital involve the application of basic ethical principles, the Clinical Bioethics Consultation Service developed and piloted an interprofessional ethics immersion. The goal of this 4-week immersion was to improve teamwork and collaboration, support resolution of basic ethical dilemmas, and develop on-site ethics scholars who apply basic ethical principles to challenging clinical situations. The impact of the immersion on ethical environment, team communication, and confidence in resolving of basic ethical dilemmas for interprofessional clinical teams was examined using follow-up interviews with seven of the eight participants from two ethics

immersion offerings. Findings support that an interprofessional ethics immersion training is a valuable strategy to improve ethics knowledge and resolve common patient care dilemmas. The unique aspects of this ethics immersion, team-based and interprofessional, are important considerations for ongoing development of clinicians to address the daily challenges encountered in healthcare.

Findings looking at barriers in obtaining an RN-BSN

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Abstract/Case Study: Purpose: What are the common challenges and barriers to enrolling in an RN-BSN program faced by nurses in Virginia? Relevance/Significance: IOM goal: 80% BSN prepared RNs by 2020. ANCC Magnet® 2019 standard1: SE6EO: Provide evidence of the organization progressing toward > 80% of professional registered nurses who have earned a baccalaureate or higher degree in nursing. Organizations seek information about what modifiable factors they can implement to support employees to enter and succeed in an RN-BSN program. Strategy/Implementation/Methods: Descriptive, statewide survey of the 29 hospitals in Virginia Magnet Consortium. Completion of the survey implied consent. Those who took initial RN exam as a BSN or higher were excluded. Surveys were given to AD and Diploma prepared nurses, and questions were tailored for: Those who completed an RN-BSN program and those not enrolled or in process in an RN-BSN program All p-values < 0.05 were considered statistically significant. This presentation reports analyses for the entire group of respondents * descriptive analyses * Chi-square tests on categorical variables Qualitative responses were grouped into themes Outcomes: There were several statistically significant differences found between the BSN group and the Non-BSN group. Marital status, age and costs played the most significant role in decision making. Conclusions: To support Virginia hospitals to achieve the goal of 80% nurses with a BSN, different approaches are needed. Ensure staff know about tuition assistance programs, prepare for the retirement of current BSN nurses, explore creative ways to overcome barriers, Cultivate a supportive environment.

Obstetrics/ Gynecology

Becoming a Parent as a Physician in Training

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Abstract/Case Study: Background/Objectives To encourage the emotional and physical wellness of trainees, many professional societies have advocated for formal policies to protect parental leave. However, parental leave policies lack uniformity across institutions, and some lack formal policies altogether. This study seeks to establish the norms of parental leave for residents and

fellows. Methods In fall of 2020 a survey was emailed to all Designated Institutional Officials (DIOs), asking for descriptions of formal maternity, paternity/co-parent, and adoptive leave. Respondents reported the number of days off these trainees can have while maintaining full salary and any additional days off the trainees can have while forgoing a salary. They were also asked about the availability of discounted and onsite childcare. Results Of the 829 DIOs who were emailed the survey, 91 (11%) responded. Responding institutions represented all geographic regions and institution types. Almost all institutions (91%) have formal leave of absence policies for trainees. Policies allow new mothers to have 0-150 days off (median 42) with full salary and 0-180 days off (median 84) while forgoing a salary. Male co-parents receive 0-90 (median 28) days off with full salary and 0-180 (median 82) days off while forgoing salary. Female and gender non-binary co-parents receive similar amounts, but more DIOs reported being 'unsure' of these policies. Adoptive parents receive 0-90 days off (median 30) with full salary and 0-365 days off (median 84) while forgoing a salary. Discounted childcare is available at 25% of responding institutions while onsite childcare is available at 20%. Significance This study identified vast differences in institutional policies regarding different types of parental leave. As trainee wellness becomes more emphasized, institutions may use this study's data to compare their own policies and adapt to industry norms which could lead to better uniformity in access to protected time off for residents and fellows who become parents.

Determining the human placenta microbiome in Type 2 Diabetes

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Abstract/Case Study: A prospective cohort study comparing Type 2 Diabetes and Control. Patients ages 18-40 who delivered between 37-41.6 weeks. Maternal data included Hgb A1c, BMI, weight gain, labor abnormalities, and delivery mode. Neonatal data included congenital defects, growth abnormalities, gestational age, gender, birth weight, apgars, and NICU admission. Placenta was collected at delivery. Four cuboidal sections 3-4 cm from cord insertion were collected. Tissue was frozen in liquid nitrogen. Samples were transferred to -80C freezer on dry ice. E.Z.N.A RNA Extraction kit was used for RNA extraction. NanoDrop was used to ensure appropriate yield. All samples were sent for 16s rRNA sequencing. Composite features include 34 total patients delivering between 37 to 41.6 weeks. Average hemoglobin A1c was 5.69%, ranging from 4.9-8.1%. Average BMI at admission was 36.5, ranging from 26-59. Average weight gain in pregnancy was 23.7 lbs, ranging from 1-67 lbs. 61% of patients delivered vaginally and 39% via cesarean. 70.6% of fetuses were female and 29.4% were male. Average birth weight was 3248g, ranging from 2010g - 4430g. Diabetic group had higher Hgb A1c (p-value 0.0025), larger BMI (p-value 0.0168), earlier gestational age (p-value 0.0012), and higher rate of cesarean (p-value 0.0111). No statistically significant difference in APGARs or birth weight. All placentas demonstrated high concentration yields of DNA. Further analysis of the samples for microbial

DNA resulted in no yield. The placentas showed no evidence of 16s rRNA gene amplification for a microbiome. Our results indicate no placental microbiome in either cohort. Pre-existing inflammatory conditions, such as Type 2 diabetes, did not significantly alter the placental environment. If placental microbiome does exist, than extremely low biomass may not have significant clinical implications.

Pediatrics

Addressing Poison Control Education Using SEEK Model

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Abstract/Case Study: Addressing Poison Control Education Using the Safe Environment For Every Kid (SEEK) Model Nyaz Ali MD, Amy Kryder MD, Ryan Fulton DO, Harsha Bhagtani MD; VT Carilion School of Medicine, Roanoke, VA Introduction: Pediatric poison exposure is common. In 2018, 2 million poisoning reported in US, 44% were children 5 years or younger. In the last three years at Carilion Children's, 440 poison exposures (5 years old and younger) were treated, of those 40 patients were between June and October 2020. SEEK is an evidence-based model to promote child wellness, through identification of and interventions around risk factors for child maltreatment. Our aim was to use seek model to identify the need for poison control contact information as it relates to children 0-5yrs of age from June to October 2020. Methods: Data collected using SEEK questionnaire during well visits at Jefferson Plaza Pediatrics clinic in Roanoke, VA. We included Neonate through 5 years. We excluded sick visits. SEEK at Carilion includes: screen, access, confirm positives, motivational interviewing, offer resources, refer to social work as needed, document, follow up. Results: We screened 540 patients and their families with SEEK from 6/30/20 to 10/1/2020. Screening was positive in 272 patients (50.4%). Need for poison control contact information comprised the largest proportion of positive screening including 115 patients (42%). Action was taken and resources were given to at least 30 of these patients, as documented. The action taken, included providing SEEK resources for poison control contact information. Conclusion: In our study, screening for poison control contact information was the largest percentage. We think this provides an insight and an opportunity to prevent a significant risk factor. We recommended to include questions about 'poison control contact' and the poison control phone number in the well visit templates. This is to effectively educate our patients and their families on poisoning prevention.

Not the Usual Thrombocytopenia in a Pediatric Patient

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Abstract/Case Study: Thrombotic thrombocytopenic purpura (TTP) is a thrombotic microangiopathy resulting from reduction in the activity of the von Willebrand factor cleaving protease a disintegrin and metalloproteinase with a thrombospondin type1 motif, member 13 (ADAMTS13). It is uncommon in pediatric population. In contrast, Hemolytic Uremic Syndrome (HUS), which is also driven by thrombotic microangiopathy, results from infection and toxin release that promotes thrombus formation, and often causing acute renal failure. HUS is much more common in children. In both diseases, children will present with thrombocytopenia and microangiopathic hemolytic anemia; however, HUS is typically seen after a prodrome of illness with abdominal pain and diarrhea in children, whereas TTP is seen in a previously healthy person. A 15-year-old male presented with 1-day history of abdominal pain, dark urine, rash with recent history of illness that included abdominal pain, vomiting and diarrhea 1 week prior to presentation. Reported nausea but denied any vomiting, diarrhea, or decreased urine output. On physical exam, patient presented in no acute distress, with a petechial rash on face abdomen and bilateral legs, systolic ejection murmur, abdominal tenderness, and bilateral costovertebral angle tenderness. He was found to have a fever, gross hematuria and proteinuria consistent with acute glomerulonephritis, thrombocytopenia, and a hemolytic anemia, however blood urea nitrogen was 22 mg/dL and serum creatinine was 0.62 mg/dL. His presentation was very concerning for HUS; however, due to the lack of uremia, oliguria, and urinalysis consistent with acute glomerulonephritis, which is not typically seen in HUS, further testing was done. TTP was considered due to patient having PLASMIC score of 7. On hospital day 3, his kidney biopsy was consistent with microangiopathic hemolytic anemia which can be seen in HUS; however, ADAMTS13 activity level was <3% which was consistent with a diagnosis of TTP associated with acquired severe ADAMTS13 deficiency.

Pharmacy

Evaluation of adverse events associated with droperidol use

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Abstract/Case Study: In 2001, the FDA mandated a black box warning on droperidol requiring an electrocardiogram (EKG) to evaluate QTc prolongation. However, more recent evidence suggests cardiac side effects are minimal with appropriate doses. This study evaluated associated adverse events and general droperidol use to ensure adherence of institutional safety questions. This retrospective, single-center review included all patients who received >1.25 mg of droperidol to assess safety question adherence and adverse events. Additional patients were randomly selected until a total of 100 patients were included. The primary endpoint was the composite of

adverse events associated with droperidol use. Secondary endpoints included individual incidence of adverse events associated with droperidol (QTc prolongation (‘500 msec), oversedation, extrapyramidal symptoms), incidence of repeat doses, dose based on indication/route, time between orders, concomitant QTc prolonging agents, and adherence of EKG orders prior to doses of >1.25 mg. There was a low overall incidence of adverse events (n=6) with the most common being over sedation (n=4). Most low dose (<1.25 mg) droperidol was used for intra-operative nausea/vomiting, medium dose (1.25-2.5 mg) for general nausea/vomiting, and high dose (>2.5 mg) for agitation/psychosis. Nine patients received repeat doses, most commonly 1.25 mg with no adverse events seen. The most common concomitant QTc prolonging agents were other antiemetics. Fifty-two percent of patients had EKGs ordered prior to droperidol administration and only 1 patient experienced QTc prolongation. The patient was administered 2 antiemetics and 2 doses of droperidol 10 hours apart. However, no adverse events were reported. Current practices at Carilion appear safe due to the low incidence of adverse events. The alert minimum for requiring an EKG with doses >1.25 mg will be increased to >2.5 mg. Adverse events should be monitored through SafeWatch.

Evaluation of a pharmacist-driven pediatric dose rounding protocol

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Abstract/Case Study: To reduce the risk of medication errors, Carilion Medical Center implemented a dose rounding protocol for pediatric patients to allow pharmacists to round specific medications to within 10% of the ordered dose. The purpose of this study was to determine the impact of a pharmacist-driven pediatric dose rounding protocol on the rounding of medication doses, measurable volumes of inpatient and discharge prescriptions, and potential cost savings. This single center, quasi-experimental study evaluated patients less than or equal to 18 years of age prescribed intravenous or oral liquid medications during an inpatient, observation, or emergency department encounter during August 1-31, 2019 (pre-group) or August 1-31, 2020 (post-group). The primary outcome of rate of measurable dose volumes was evaluated pre- and post-implementation of the dose rounding protocol. Secondary outcomes, including the number of discharge prescriptions impacted by pharmacist dose rounding, an evaluation of protocol impact, and prescriptions dose rounded to limit the number of packages per dose were evaluated using a cross sectional analysis of the post study group. Four hundred seventy-seven patients (204 pre-group, 273 post-group) and 1060 medications (572 pre-group, 488 post-group) were evaluated. The majority of patients were located in the Pediatric Medical-Surgical unit or Emergency Department, and the most commonly prescribed medications were analgesics and antibiotics. The rate of measurable volumes increased from 72% to 93% in the post-group (p = 0.0001). In the post-group, 197 patients had 313 medications (64%) dose rounded by pharmacists per protocol. Of the 55 discharge medications in the post-group, 21 prescriptions

(38%) matched inpatient orders that had been dose rounded by pharmacists. Twenty-four medications were rounded down to a whole package size resulting in an estimated cost savings of $117. Implementation of a pharmacist-driven dose rounding protocol significantly increased the rate of measurable volumes administered to pediatric patients at our institution.

Evaluation of discharge antibiotic prescribing patterns

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Abstract/Case Study: Background: Inappropriate antibiotic use includes not only non-indicated use, but also inappropriate antibiotic selection, duration, and dose. Many antibiotic regimens are completed after discharge from the hospital. Previous literature indicates that despite inpatient antimicrobial stewardship programs, inappropriate antibiotic use still occurs at higher than anticipated rates on discharge. The purpose of this study was to assess the appropriateness of discharge antibiotics at Carilion Clinic. Methods: This was a single-center, retrospective cross-sectional study in adult patients discharged from select progressive care and medical-surgical units at Carilion Roanoke Memorial Hospital. Patients with antibiotic discharge prescriptions for pneumonia or urinary tract infection (UTI), from June 1, 2019 through February 29, 2020 were evaluated for inclusion. Patients were excluded if they had a concurrent bacteremia, endocarditis, osteomyelitis, or prostatitis, were discharged with a chronic or suppressive antibiotic, or discharged against medical advice. Qualifying patients were randomly selected until 50 patients were included in each group. Demographic, clinical, antimicrobial and microbiological data were collected. The primary outcome was rate of appropriateness of discharge antibiotic regimen based upon Carilion Clinic guidelines for drug, dose, and duration. Secondary outcomes included all cause readmissions within 30 days of discharge, incidence of Clostridioides difficile infection, unplanned changes in medication attributed to initial therapy, and incidence of unplanned escalations of therapy and/or discontinuation of therapy. Descriptive statistics were utilized for analysis.

Evaluation of multi-dose container dispensing to patients under observation status

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Abstract/Case Study: Purpose: The Centers for Medicare & Medicaid Services (CMS) define observation status as 'ongoing short-term treatment, assessment, and reassessment'. Prior to admission medications are typically ordered for these patients but may not be clinically necessary. The objective of this study was to examine the dispensing of non-critical multi-dose products to patients admitted under observation status and the effect on pharmacy workflow and costs to patients and pharmacy. Methods: This study was determined not Human Subjects

Research by the Institutional Review Board. This was a single-center, retrospective review of observation patients during the month of January 2020 who were ordered a pre-specified multi-dose product from the prior to admission (PTA) medication list. Nine multi-dose products were selected based on non-critical indications and frequency of prescribing. Patients were excluded if they were transitioned to inpatient status. Data was collected to analyze product usage including the number of dispenses per product and medication administration. The number of re-dispenses and returns to the pharmacy were used to analyze the impact on pharmacy workflow. Additional information reviewed includes length of stay and cost using average wholesale price. Data analysis was performed using descriptive statistics. Results: Forty-seven patients were reviewed in the specified one-month timeframe. During a mean length of stay of 45 hours there was a mean of 1.8 administrations per product. Of the nine medications evaluated, five products contributed to a total of 29 dispenses, 4 re-dispenses and 4 products returned. Overall, there is an estimated total monthly cost to pharmacy of $2,170.71 extrapolated to $26,048.52 annually. Re-dispenses resulted in a waste of $202.96. Conclusions: Pharmacy workflow is minimally affected by dispensing of these products. The largest impact seen is the increased patient and pharmacy costs. Reducing the dispensing of these products would decrease the annual pharmacy drug costs and waste.

Evaluation of sulfonylureas and the risk of inpatient hypoglycemia

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Abstract/Case Study: The American Diabetes Association guidelines lists sulfonylureas as a preferred treatment, particularly for patients who require a low-cost add-on to metformin. Hypoglycemia, which is defined as a blood glucose reading less than 70, is a common adverse event of sulfonylureas. Glycemic goals for patients admitted to the hospital are 140 to 180 mg/dL. Therefore, the risks of continuing sulfonylureas may outweigh the benefits. The objective of this study was to determine whether patients admitted to Carilion New River Valley Medical Center (CNRV) who receive sulfonylureas were at increased risk for hypoglycemia. This was a single-center, retrospective chart review of 150 patients age eighteen years and older who received glipizide, glimepiride, or glyburide at any dose during their hospital stay from July 2019 to June 2020. Descriptive statistics were used to determine the rate of hypoglycemia associated with sulfonylureas. The mean age of the study population was 70 years and most patients were male and white. The average hemoglobin A1c for the study population was 7.6% and the mean serum glucose at admission was 202 mg/dL. Out of the patients analyzed, 25% had at least one hypoglycemic episode, with the majority of these classified as Level 1 hypoglycemia, which is serum glucose between 54 and 70 mg/dL. More than half of the 37 hypoglycemic patients

experienced a subsequent hypoglycemic episode. Out of the 37 patients who experienced hypoglycemia, it was found that 35% were 'nothing by mouth' and the dose of the sulfonylurea was still administered. The majority of hypoglycemic patients were on some form of insulin and seven patients were also on oral diabetes medications. Based on these results, continuing sulfonylureas puts patients who are admitted to CNRV at increased risk of experiencing hypoglycemia, especially if the patient is 'nothing by mouth' or on injectable glucose lowering medications concomitantly.

Antimicrobial usage in psychiatric patients following psychiatric pharmacist implementation

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Abstract/Case Study: The primary objective was to evaluate antimicrobial usage for urinary tract infection (UTI) among psychiatric patients following psychiatric pharmacist implementation. The Infectious Diseases Society of America (IDSA) has identified asymptomatic bacteriuria (ASB) as one area in which to decrease inappropriate antimicrobial prescribing. This issue persists in acute psychiatric populations. Previous studies provide evidence that pharmacist-led interventions on psychiatric units lead to significant increases in appropriate antimicrobial usage. Additional studies demonstrated an association between pharmacist involvement and significantly shorter length of stays with no significant difference in readmission rates. These data suggest clinically meaningful benefits of pharmacist involvement in psychiatric patient care. We sought to assess antimicrobial usage in patients with ASB and UTI pre- and post- addition of a psychiatric pharmacist to CNRV's inpatient psychiatric care team. This was a single center, retrospective pre-post- quasi experimental study of patients admitted to a 36-bed inpatient psychiatric unit. A team of psychiatrists, mid-level providers, and a psychiatric pharmacist manage patients' psychiatric and medical conditions. The pharmacist conducts comprehensive medication reviews each weekday, rounds with the care team, and provides psychiatric, general, and antimicrobial pharmacotherapy expertise. We obtained electronic health records of all unit patients with a positive urinalysis or urine culture or antibiotic ordered for UTI from October 2017 to August 2019 (pre-implementation), and from October 2019 to the initial design of this study in August 2020 (post-implementation). To date, 144 patients on antibiotics met study selection criteria, with 119 in the pre-implementation group and 25 in the post-implementation group. Among pre-implementation patients, 11.8% were determined to have received appropriate antibiotic therapy, compared to 64% in the post-implementation group. Appropriateness of antibiotics ordered on CNRV's inpatient psychiatric unit increased following psychiatric pharmacist

implementation. Data collection for positive urinalysis and urine culture patients continues, and full results will be presented on Research Day.

Fixed vs Weight-based Enoxaparin for VTE Prophylaxis in Trauma Patients

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Abstract/Case Study: Venous thromboembolism (VTE) is a common complication after major trauma. A fixed-dose enoxaparin dosing strategy is commonly used for VTE prophylaxis in the trauma setting. Recent data have shown subtherapeutic anti-factor Xa (anti-FXa) levels frequently occur with this protocol and suggests a weight-based dosing strategy may improve time to desired anti-FXa range (0.2-0.5 units/mL) with minimal adverse effects and lower VTE rates. This was a single-center, retrospective, quasi-experimental study of adult trauma patients receiving fixed-dose protocol (30 mg twice daily) between March 1, 2017 and July 31, 2017 and weight- based protocol (0.5 mg/kg twice daily) between January 23, 2020 and July 13, 2020. Trauma surgery patients were included if they received a twice daily enoxaparin dosing strategy with at least one peak anti-FXa level documented. Data was analyzed using descriptive statistics, Chi-square and Kruskal Wallis tests. 183 patients were included in the study, of which 90 received fixed- and 93 received weight-based enoxaparin dosing strategies. In the fixed-dose group, 48.9% of patients achieved an initial goal prophylactic peak anti-FXa level, compared to 74.2% of patients in the weight-based group ($p < 0.001$). Median time to goal prophylactic peak anti-FXa range was 65 hours in the fixed dose group and 29 hours in the weight-based group ($p < 0.001$). Median enoxaparin dose associated with goal anti-FXa range was 0.42 mg/kg and 0.50 mg/kg, respectively. No difference was seen in rates of thrombotic events, major bleeding, or in-hospital all-cause mortality. Rates of minor bleeding and hospital length of stay were significantly higher in patients who received a fixed-dose strategy ($p < 0.001$). Initial weight-based enoxaparin dosing of 0.5 mg/kg twice daily with anti-FXa-based dose adjustment led to increased attainment of initial goal prophylactic peak anti-FXa level and shorter time to goal prophylactic peak anti-FXa level with no increased risk of adverse effects.

Comparison of protocols for prophylaxis of atrial fibrillation post-cardiac surgery

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Abstract/Case Study: Atrial fibrillation is a common complication following cardiac surgery that can lead to thromboembolic complications, prolonged length of stay, and increased hospitalization costs. Prophylactic strategies can be implemented to reduce its occurrence. This study was designed to compare the updated postoperative atrial fibrillation (POAF) prophylaxis

protocol versus the previous protocol on the incidence of atrial fibrillation after cardiac surgery. This was a retrospective, single-center, quasi-experimental study of adult cardiac surgery patients who were initiated on the POAF protocol at Carilion Roanoke Memorial Hospital during July 1, 2019 - October 31, 2019 (Protocol A) and July 1, 2020 - October 31, 2020 (Protocol B). Patients were excluded if they were not initiated on a POAF protocol due to exclusion criteria defined in the protocols. The primary outcome was development of atrial fibrillation by post-operative day 21 or discharge, whichever was earlier, in the intention-to-treat population. The secondary outcomes included development of atrial fibrillation in the per-protocol population, rates of discontinuation of the POAF protocol, hospital length of stay post cardiac surgery, incidence of hospital readmission within 30 days due to atrial fibrillation, in-hospital mortality, incidence of in-hospital stroke, and incidence of safety outcomes (bradycardia, hypotension, QTc ‘500 ms). One-hundred and nine total patients met inclusion criteria, split between Protocol A (n=58) and Protocol B (n=51). Baseline characteristics were similar with two notable exceptions, there were more males in Protocol A (91.4%) compared to Protocol B (72.5%) and more elective surgeries in Protocol A (60.3%) compared to Protocol B (35.3%). Preliminary results in the intention-to-treat population report incidence of atrial fibrillation as 20.7% in Protocol A and 19.6% in Protocol B. Inclusion in the per-protocol population was 19% of patients in Protocol A and 80.4% of patients in Protocol B. Complete statistical analysis is currently in progress and final conclusions are pending.

Evaluation of heparin re-initiation in patients with a supra-therapeutic aPTT

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Abstract/Case Study: At CRMH, intravenous heparin infusions are managed by pharmacists and dose adjustments are implemented based on a protocol. When an activated partial thromboplastin time (aPTT) >180 seconds is reported, the heparin is held, an aPTT is rechecked, and heparin is re-initiated at a reduced rate. This evaluation compared different percentages of heparin rate reductions and whether subsequent aPTTs were sub-therapeutic, therapeutic, or supra-therapeutic in patients with an aPTT >180 seconds. Adult patients with an aPTT >180 at CRMH from March 2019 to April 2020 were enrolled. Patients were excluded if the aPTT was uninterpretable, received continuous renal replacement therapy or Impella®, pregnant, or COVID-19 positive. Descriptive and inferential statistics were used to analyze the data. A total of 64 individuals were included, 42% in the acute coronary syndrome protocol and 58% in the venous thromboembolism protocol. The primary objective was to evaluate if there was a difference in a six-hour therapeutic aPTT based on the percent reduction in the heparin rate. Secondary outcomes included percentage of patients with a therapeutic aPTT after heparin infusion re-initiation, amount of time heparin was held after aPTT >180 seconds before re-initiation, and incidence of safety outcomes. The majority of patients had a rate reduction over 30%, regardless of the indication. There was no significant difference found between heparin rate

reduction and the 6-hour aPTT post heparin re-initiation (ACS protocol, p=0.47, VTE protocol, p=0.43). However, there was a large proportion of patients with a less than 25% rate reduction who remained supra-therapeutic. There were no major bleeds or new clotting events seen 24-hours post aPTT >180 seconds in this study. Based on this study, no changes will be made to the heparin protocols. The pharmacy heparin peer review committee may expand sample size and re-evaluate for future protocol adjustments.

Insulin Prescribing at Discharge in Insulin Naïve Patients with T2DM

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Abstract/Case Study: The 2020 American Diabetes Association (ADA) guidelines recommend insulin initiation in the outpatient setting in patients with severe hyperglycemia defined as hemoglobin (Hgb) A1c ‘ 10%, symptomatic hyperglycemia, or uncontrolled hyperglycemia in patients already more than 2 anti-hyperglycemic medications. Disease state education and a structured follow-up plan may reduce rehospitalization by 30%. The purpose of this study was to describe insulin prescribing practices at discharge. In this retrospective, cohort study, charts were reviewed for all adult, insulin naïve patients with Type 2 Diabetes Mellitus (T2DM) being discharged home on insulin therapy from June 1, 2020, to August 31, 2020. Pregnant, incarcerated, or patients deemed comfort care were excluded. The primary outcome was to evaluate the insulin prescribing practices. Other pertinent outcomes included evaluating the percentage of patients receiving diabetes education and guideline-recommended follow-up after discharge. Descriptive statistics were used to describe baseline characteristics and outcomes. A total of 36 patients were included and the median age was 54.2 years. The median Hgb A1c was 12% and 69.4% of the patients were not on any anti-hyperglycemic medications prior to admission. Seventy-five percent of the patients were considered appropriate for insulin initiation at discharge. Seventy-two percent of the patients received diabetes education prior to discharge and 62% had scheduled follow-up appointments with their primary care provider at discharge. Sixty-one percent of patients did not receive all the transitions of care activities that previously have been shown to reduce hospital readmission. This study highlights that insulin is initiated in patients who do not meet the guideline recommendations at least 25% of the time. Provider education and development of an order set to guide discharge prescribing of insulin, supplies, and outpatient follow-up may help reinforce guideline recommendations.

Evaluation of a nursing driven electrolyte repletion protocol

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Abstract/Case Study: The objective of this study was to assess the percentage of time in which electrolyte replacement is appropriately ordered and dosed via the nursing electrolyte protocol. In this multi-center analysis, electronic health records (EHR) were retrospectively reviewed to

evaluate replacement of potassium, magnesium, and phosphorous per the critical care electrolyte repletion nursing protocol. Patients admitted to a Medical Intensive Care Unit between August 2017 and August 2020 who were ordered the electrolyte replacement protocol and experienced hypokalemia, hypomagnesemia, or hypophosphatemia were identified through the EHR. A total of 345 patients were analyzed for safety and efficacy of potassium, magnesium, and phosphorus repletion. Collected information included serum electrolyte level, time the level resulted, time repletion was ordered, dose ordered, time repletion was administered, serum creatinine, body weight and urine output. Eighty data points were included for potassium and magnesium, while twenty-nine data points met inclusion criteria for phosphorous. Eighty percent of the data was collected from CNRV, as CRMH seldom used the electrolyte order set that was analyzed. At CNRV, 97.4% of electrolytes were repleted safely, and the correct replacement dose was administered 72% of the time. From our findings, we concluded that the nursing-driven electrolyte protocol is safe and effective; however, there is an opportunity to ensure nurses are aware of appropriate repletion dosing.

Evaluation of Prophylactic Antibiotics in Pediatric Patients With Uncomplicated Appendicitis

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Abstract/Case Study: Background: Pre-operative antibiotic prophylaxis has shown to be effective in reducing surgical site infections in a wide variety of surgical procedures. Appendicitis is the most common cause of emergent abdominal surgery in the pediatric population. Current practice guidelines recommend the receipt of a single dose of antibiotics within 1-hour prior to incision for the prevention of surgical site infections in uncomplicated (simple) appendicitis. Our goal of this analysis was to evaluate our facility's compliance with the current recommended standard of care antibiotic regimen. Methods: This is a single-center, retrospective medication use evaluation conducted from June 2, 2019 through October 30, 2019 at Carilion Roanoke Memorial Hospital in Roanoke, Virginia. Patients aged 1 month to 17 years that had an uncomplicated appendicitis that underwent a laparoscopic appendectomy were included. The primary outcome was the percent of patients that received prophylactic antibiotics in accordance with the current standard of care defined as a single dose of antibiotics within one hour prior to incision and no post-operative doses. The secondary outcome was the percent of patients that received antibiotics post-operatively. Results: 67 patients were screened for eligibility of which 34 met inclusion criteria. A total of 47.1% received antibiotics pre-operatively of which 31.3% were given within 1-hour prior to incision. The primary outcome occurred in 11.8% (n=4) of patients as the majority (52.9%) received post-operative antibiotics. Conclusion: The majority of patients did

not receive the recommended standard of care prophylactic regimen as there is not a consistent process for the prevention of surgical site infections in uncomplicated appendicitis. Thus, prompting a standardized protocol to be created at Carilion to ensure each patient receives the standard of care.

Evaluation of Candidemia Management and Associated Clinical Outcomes

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Abstract/Case Study: Background: Invasive fungal infections due to Candida species are recognized as major causes of morbidity and mortality amongst hospitalized patients. Collective literature evaluating the impact of infectious diseases consultation (IDC) has supported a positive effect on survival in patients with blood stream infections. The purpose of this study is to evaluate local practices of candidemia management within Carilion Clinic and identify opportunities for antifungal stewardship. Methods: A retrospective, single health system cohort study was performed among hospitalized patients with candidemia who either received or did not receive an infectious diseases consultation between January 2014 to August 2020. Patients were included based on isolation of Candida species from at least one blood culture. Exclusions were death occurring prior to budding yeast identification in blood culture, transfer to palliative care within 48 hours of positive blood culture, positive cultures from outside facility, and were pregnant. The primary outcome was a composite of all-cause mortality and recurrent candidemia within 90 days of index culture. Secondary outcomes included overall compliance with candidemia management bundle items that included echocardiography, ophthalmologic evaluation, antifungal with proven susceptibility, source control and repeat cultures. Results: The study included 131 patients that received IDC and 62 that did not receive an IDC for candidemia during the study time frame. The population was 50.3% male sex and mean ± standard deviation age was 57.8 ± 17.2 years. Positive blood cultures were commonly from patients in an intensive care unit (53.1%) with a central line in place greater than 48 hours (70%). Candida albicans was the most common species in both the IDC and non-IDC group (48.1% vs. 41.1% respectively). The primary composite outcome occurred in 21.3% of patients who received an IDC and 29% of patients who did not receive IDC.

Evaluating the Impact of Light Settings on Patient Controlled Analgesia

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Abstract/Case Study: Carilion Medical Center (CMC) uses Alaris patient-controlled analgesia (PCA) pumps to deliver opioid medications. With this pump, patients utilize the dose request cord to administer medication. The pump has three light options for the dose request cord. The light

can be always on, always off, or only on when a dose is available to be administered. CMC has set the pump default for the dose request cord light to come on only when a dose is available. This pre- and post- quasi-experimental study evaluated adult patients prescribed fentanyl, hydromorphone, or morphine PCAs during an inpatient encounter at Carilion Roanoke Memorial Hospital during November 2 ‘ December 31, 2020 (pre-group) or January 1 ‘ February 28, 2021 (post-group). Patients receiving a PCA with the current default light setting were included during the pre-group assessment while patients receiving a PCA with the new light setting where the light is always off were included during the post-group assessment. The primary outcome was number of PCA doses attempted in 8-hour increments during the first 48 hours of therapy. Secondary outcomes included the maximum number of doses allowed per 8-hour increment, indication for PCA use, sedation scores, pain control, and safety outcomes. Fifty-six patients (36 pre-group, 20 post-group) were evaluated. The most commonly prescribed PCA type was hydromorphone for opioid naïve patients and 71% of patients were receiving a PCA for post-surgical pain control. There was no statistically significant difference in number of PCA doses attempted between study groups. Of the safety outcomes, no clinically or statistically significant differences were noted between blood pressure, respiratory rate, or oxygen saturations. The average sedation score in both groups was a RASS of 0 and POSS of 1. Adjusting the Alaris pump light setting does not impact pain management in those requiring patient controlled analgesia.

Evaluation of a rapid aspirin desensitization protocol

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Abstract/Case Study: Aspirin hypersensitivity can be a barrier to treatment for patients with an indication for chronic aspirin. Multiple studies have demonstrated the safety of aspirin desensitization. Historically, the process took 2-3 days and required close monitoring, but more recent literature has suggested the safety and efficacy of quicker desensitization. At Carilion Roanoke Memorial Hospital, methods of desensitization were previously inconsistent. This process was recently revised to a more standardized rapid desensitization over 6-18 hours. The objective of this study was to evaluate the safety of this rapid desensitization protocol. This study was approved by the Institutional Review Board. This was a retrospective, single-center analysis of adult patients initiated on the aspirin desensitization protocol since its revision in 2018. The primary endpoint was percentage of patients with successful desensitization to aspirin without an adverse reaction requiring pharmacological intervention. Secondary endpoints assessed reaction type, use of rescue medications, reaction provoking dose, and proper execution of the protocol by medical staff. Analysis was performed using descriptive statistics. Twenty patients were initiated on the rapid aspirin desensitization protocol since its implementation to time of this review. Of these, two patients required pharmacologic intervention due to a reaction. Neither reaction was documented and therefore they were unable to be assessed. Despite this, all twenty patients were able to successfully complete

desensitization to aspirin. Median time to desensitization was 5 hours and 1 minute and the protocol was appropriately followed in most cases. Overall, this evaluation demonstrated that CRMH's rapid aspirin desensitization protocol is safe for our patients.

Empiric Clindamycin Use and Return Rates in SSTI Patients

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Abstract/Case Study: This study was a medication use evaluation looking at clindamycin usage for skin and soft tissue infections (SSTIs) in the emergency department (ED) setting. Clindamycin is a poor empiric agent for the treatment of SSTIs due to the increasing resistance against common causative bacteria and adverse event profile. Patients included those who are at least 18 years old, diagnosed with a SSTI, and discharged on an oral prescription of clindamycin from any Carilion's ED. The primary endpoint was the 14-day return rate due to the combined incidence of non-adherence, adverse effects to clindamycin, and treatment failure. Treatment failure was defined as a return due to persistent infection. Key secondary endpoints included 7 and 30-day return rates, development of clindamycin resistance, return due to adverse effects, return due to treatment failure, return due to non-adherence, and dosing of clindamycin. Data was analyzed utilizing descriptive statistics. 59 patients were included with all clindamycin prescriptions written by ED providers. Baseline patient characteristics included 61% males, 36% patients with a reported penicillin allergy, and 44% purulent SSTI. The 14-day return rate was 15%, followed by a 17% 30-day return rate and an 8% 7-day return rate. No development of clindamycin resistance was noted. The ED returns were mostly attributed to treatment failure, making up 73% of all returns, and contributing to 100% of returns within 7 days. Adverse effects only made up 9% of the returns and non-adherence made up the remaining 18%. The most common clindamycin regimen was 300 mg four times daily for a duration of 10 days. Only 44% of providers followed the recommendations in Carilion's antibiotic dosing guidelines. Given the findings of this study, additional education opportunities exist within Carilion's ED on the proper usage of clindamycin.

Psychiatry

Partnering to Enhance Engagement in Maternal Mental Health iTHRIV Interviews

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Abstract/Case Study: Child Health Investment Partnership of the Roanoke Valley provides home visiting for mothers and children in the Roanoke Valley.' An ongoing collaboration between CHIP and Carilion sponsored by an iTHRIV grant aims to improve maternal engagement in mental

health services by linking at risk mothers to peer support.' The initial phase of this research project used semi structured interviews to enhance understanding of barriers mothers face when seeking mental health care. ' Methods: Twenty-one clients of CHIP who scored at risk on a PHQ-9 screening and were offered mental health resources were interviewed about their experiences with mental health referrals.' The clients provided verbal consent to participate and received a $25 gift card after completing the interview. ' Results: 5 of 21 women reported never having accessed any mental health care.' All the subjects had been served consistently by CHIP home visitors for 1-3 years.' Only 1/21 said that her home visitor had not spoken to her about mental health, and 2/21 said they had never been provided additional resources for mental health care.' Of the 19/21 women who reported receiving resources for mental health, 16 described positive experiences with mental health care and said they would recommend counseling and/or medication management to a friend or relative.' Those mothers who declined mental health services shared reasons such as: lack of time, lack of childcare, and experiences of child and adolescent mental health care that they had found invalidating or that had been involuntary.' ' Results of the study interviews inform the rest of the project. Home visitors from CHIP now ask mothers about barriers to following up with referrals to care. Peer Support is now included as an additional referral option for at risk mothers who are given resources for mental health care.

Bridge Over Troubled Waters: ED Shoreline into Outpatient Treatment

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Abstract/Case Study: Over 81,000 US citizens died from overdoses April 2019-May 2020. Carilion's Emergency Department (ED) has provided patients with an opioid use disorder (OUD) a bridge to treatment. Study questions: What is the success rate of transitioning patients into outpatient treatment from the ED? Do ED initiated buprenorphine and ED prescriptions facilitate transition? What factors improve crossing the bridge? In 16-months, 41 ED doctors completed waiver training requirements for prescribing buprenorphine. A protocol was developed for initiating buprenorphine in the ED for OUD patients in withdrawal. Per protocol 7-10 day scripts were provided to patients appropriate for outpatient care. Peer linkages were initiated by phone or in person. Rapid access to outpatient treatment was provided. Chart reviews were conducted for 400 patients, 202 met inclusion criteria. The key outcome studied was rate of successful transitioning from ED to outpatient care: 68.8% of patients transitioned from ED into outpatient services. Providing buprenorphine in ED significantly increased likelihood of crossing bridge (OR: 2.22, p= .036). Of 132 patients admitted into outpatient treatment, 81.8% remained in treatment ' 1 month. Patients linked with a peer were twice as likely to cross bridge than patients without a peer (OR=2.103; p=.09). The increase in transitions when the ED prescribed buprenorphine did

not reach significance. Average prescription duration was 8 days; average wait to see an outpatient prescriber was also 8 days. Following ED physicians' waiver training, they reported the rewards of having a tool to help patients; patients reported a respectful ED experience. Initiating buprenorphine provided immediate relief, followed by a high likelihood of treatment, especially when supported by a peer with lived experience.

COVID-19 Effects in Adult Ambulatory Psychiatry: Using PROMs and Telemedicine

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Abstract/Case Study: OBJECTIVE To examine COVID-19 effects on US adults in ambulatory psychiatry, utilizing telehealth with data from a measurement-based care system, evaluating impacts on psychiatric functioning. METHODS This observational study included measurement-based care data collected from November 2019 through May 2020. Patient Reported Outcome Measures were examined for changes in symptomatology over treatment course and resulting from the pandemic. Adult patients initiating or continuing psychiatric care (in-person or virtually through telemedicine) were included in analyses if they completed at least one measure. Psychiatric functioning was evaluated for psychological distress (Brief Adjustment Scale-6), depression (Patient Health Questionnaire-9), anxiety (Generalized Anxiety Disorder-7), alcohol use (US Alcohol Use Disorder Identification Test), and substance use (Drug Abuse Screening Test-10). Adverse effects related to COVID-19 were measured by the COVID-19 Event Checklist. RESULTS 872 patients participated in the measurement-based care system completing at least one patient-reported outcome measure, with engagement ranging from 33 to 74%. Completion rates were significantly different for payor status (P-Value 0.0008) and diagnostic group (P-Value 0.0000). Baseline psychological distress only varied for alcohol and substance use. Within-person declines in mental health before and after the pandemic were statistically significant only for anxiety (P-Value 0.0301). Significant financial and mental health impacts, despite presence of resiliency behaviors, were reported early in the pandemic. CONCLUSIONS Measurement-based care is helpful in determining treatment progress and is especially critical for evaluating mental health effects of the pandemic. Patient engagement in psychiatric services incorporating measurement-based care may serve as a protective factor during a global crisis. Key Words Measurement-based care, Patient-reported outcome measures, COVID 19, ambulatory psychiatry, telemedicine

Sleep State Misperception Disorder in a Hospitalized Patient with MDD

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Abstract/Case Study: Introduction: Sleep State Misperception Disorder is the poor judgment of ones sleep duration. Sleep state misperception is poorly understood. About 5% of the clinical population may be affected. It is believed to be most prevalent among young to middle aged adults. It was found to be prevalent among chronic insomniacs who slept objectively more than 6 hours in a sleep lab. The psychological profile of those with this disorder include depressive, anxious-ruminative traits and poor coping resources Case Description: Patient is a 16-year-old female admitted to the inpatient Child and Adolescent unit with depression and anxiety for the last 3 years. She also reported insomnia and tried multiple medications for including melatonin, Seroquel, and Trazodone. Mother reported that patient slept well at home. It was hypothesized that the patient likely has Sleep State Misperception Disorder. Discussion: Patient was given a sleep diary worksheet from the American Academy of Sleep Medicine. Patient kept track of her sleep as well as nursing staff. The diary was then compared with nursing reports. It was found that the patient had sleep misperception. Despite sleeping greater than 7 hours with less than 2 awakenings she felt she had multiple awakenings and poor sleep. We discussed the results with the patient and her mother and reinforced that patient should not be taking multiple medications for insomnia. Medication regimen was adjusted from Seroquel to Trazodone. Patient had improved sleep and sleep perception after discussion of findings. Additionally, CBT was used to target cognitive distortions related to sleep. Patient was discharged in a stable condition back to her home. Conclusion: The use of a sleep diary may be a useful tool to use on inpatient units to help patients gain better insight. Raising awareness of Sleep State Misperception Disorder can help to avoid polypharmacy in patients.

Attitudes and Practices regarding Perioperative Pain Management in MAT Patients

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Abstract/Case Study: BACKGROUND: Patients with substance use disorders including OUD are more likely to present for surgical intervention compared to the general population. Buprenorphine has emerged as the preferred option for Medication-Assisted Treatment (MAT) of OUD due to ease of use and milder side-effect profile relative to other agents. The perioperative pain management of patients with OUD on Buprenorphine is fraught with numerous challenges due to unique pathophysiologic, pharmacodynamic, psychosocial factors that may impact treatment. Management of patients in this population is hampered by a dearth of high-quality evidence leading to inconsistencies in expert guidelines and recommendations, and by extension, clinical practice. In addition, there exist several myths, misconceptions and biases held by clinicians towards patients with underlying OUD requiring pain management, which further worsen treatment outcomes. RATIONALE: We seek to assess the current knowledge, attitudes and practices of clinicians involved in the management of perioperative pain in patients with OUD on buprenorphine in a tertiary hospital setting in Southwest Virginia. In addition, we seek to identify and characterize existing challenges and limitations regarding the

management of patients in this population. Information gathered will inform the development of algorithms, job aids and institutional guidelines which may be generalizable to similar institutions. METHODS: A digital study questionnaire will be developed by our research team using a web-based tool (Qualtrics or Survey Monkey). This will be 32-item survey including 5-point Likert scale, multiple choice, single-answer, and free text sections. The sections will be structured to gather information from four domains: 1) Clinician demographics; 2) Access to- and knowledge of existing guidelines governing pain management in the setting of OUD; 3) Current practices, beliefs, and attitudes; 4) Challenges faced and suggested solutions. Knowledge questions will be designed based on peer-reviewed publications and published guidelines on the subject, as identified by literature review. RESULTS: pending

Obsessive Compulsive Disorder, Treatment challenge with medical comorbidity

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Abstract/Case Study: Obsessive Compulsive Disorder, Treatment challenge with medical comorbidity OCD is defined as having obsessional thoughts which are intrusive, persistent, recurrent leading to anxiety and distress which are relieved by performing rigid routines or rituals that are driven to be performed. Patient is a 17-year-old male with no past psychiatric history, medical history significant for being treated for leukemia in childhood, received chemotherapy from ages 3-6, currently in remission, developed splenomegaly, thrombocytopenia, veno-occlusive disease, esophageal varices, had GI bleed 2 years ago, s/p banding procedure, anemia of chronic disease, GERD, presented with anxiety and distress related to obsession symptoms individually at separate time frames since childhood. The obsessions consist of behaviors such as snapping fingers bilaterally in a fashion, winking, whistling in a certain amount of time and pattern, painting miniature figures, sliding jaw and clenching teeth. Two years ago, having hypersexual thoughts towards children, cannibalistic thoughts, of taking a bite of somebody's arm and current admission due to having obsessional homicidal thoughts of hurting his parents and grandparents. His obsessions are relieved with gag reflex or mimicking the act of strangulating someone or holding a gun. GI specialist was consulted before initiation of SSRI, due to the patient's sensitive labs including thrombocytopenia, leukopenia, and elevated Bilirubin. After obtaining GI opinion patient was started on 12.5 mg of Zoloft, patient responded well, and was further titrated to 50 mg. CBT+ medication showed improvement in the patient's symptoms and was discharged with continuity of the same care on the outpatient. Of note, if the patient was to have platelet drop, the plan was to monitor as he would recover quickly. However, asked the parents to monitor for bleeding diathesis. Learning Objectives: Identification of OCD symptoms, and challenges of the OCD symptoms with medical comorbidity as discussed above in the abstract.

Creating a Child/Adolescent Skills Group to Reduce Inpatient Acuity

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Abstract/Case Study: To create a standardized and focused coping skills group for inpatient child and adolescent unit, with a goal of reducing externalizing behaviors that contribute to unity acuity. All patients admitted to the inpatient Rehab 3 Child and Adolescent Psychiatry unit included in a thirty-minute group therapy session three days per week over eight weeks. These Skills Group sessions were implemented as part of standard of care for the unit. A total of twelve sessions were created to introduce and practice coping skills adapted from fundamentals of both Cognitive Behavioral Therapy and Dialectical Behavioral Therapy, which were shown in other contexts to increase the tolerability of uncomfortable emotions, improve communication skills, and to help individuals recall and choose heathier coping strategies than they previously have. Creating regular and consistent exposure to these skills may impact the hospital treatment milieu by reducing the overt expression of dysregulated behaviors. Externalizing behaviors may include verbal outbursts which can disrupt group dynamics and trigger reactions in other youth, overt aggression in the form of verbal threats, physical aggression directed toward objects or others, and self-harming behaviors, which can include both non-suicidal self-injury and suicide attempts. The acuity of inpatient units is a complex interaction between staff to patient ratio, staff expertise, patient ability to self-regulate, environmental and space considerations and the effectiveness of treatments provided. Addressing any of these factors could impact the overall safety of patients and staff and would be anticipated to decrease overall milieu acuity. Unit acuity data was gathered for 14 day prior to implementation of group, and daily for 8 weeks during implementation. Once completed, the pretest data will be compared to 4 within-test blocks of 14 days during the 8 weeks of implementation to see if any changes in acuity can be observed over 2-week intervals.

Effectiveness of START NOW Psychotherapy in OBOT: Clinical Trial Results

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Abstract/Case Study: BACKGROUND START NOW (SN) is a manualized, skills-based group psychotherapy originally developed and validated in a correctional population resulting in a decrease of reportable behaviors. The SN modality, manual and facilitator guide were adapted to an outpatient substance use disorder clinic (specifically opioid use disorder) population. METHODS One hundred and thirty-nine OUD patients were quasi-randomized to participate in SN (n=78) or Treatment-As-Usual or TAU (n=61) weekly groups in additional to Medication Assisted Treatment (MAT). RESULTS Assessments of behaviors (impulsivity, aggression and

interpersonal problems), retention in treatment and drug screen results indicated non-inferiority of the SN arm as compared to TAU. Some differences among specific sub-populations may be meaningful. Both patient and clinician satisfaction were positive for the SN program. CONCLUSIONS This study suggests that SN may be an opportune treatment for outpatient clinics focusing on SUD.

Surgery

Finding treatment targets for traumatic brain injury and post-traumatic epilepsy

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Abstract/Case Study: Focal traumatic brain injury (TBI) induces astrogliosis, a process essential to protecting uninjured brain areas from secondary damage. However, astrogliosis can cause loss of astrocyte homeostatic functions and possibly contributes to comorbidities such as post-traumatic epilepsy (PTE). Scar-forming astrocytes seal focal injuries off from healthy brain tissue. It is these glial scars that are associated with epilepsy originating in the cerebral cortex and hippocampus. However, the vast majority of human TBIs also present with diffuse brain injury caused by acceleration-deceleration forces leading to tissue shearing. The resulting diffuse tissue damage may be intrinsically different from focal lesions that would trigger glial scar formation. Here, we used mice of both sexes in a model of repetitive mild/ concussive closed-head TBI, which only induced diffuse injury, to test the hypothesis that astrocytes respond uniquely to diffuse TBI and that diffuse TBI is sufficient to cause PTE. Astrocytes did not form scars and classic astrogliosis characterized by upregulation of glial fibrillary acidic protein was limited. Surprisingly, an unrelated population of atypical reactive astrocytes was characterized by the lack of glial fibrillary acidic protein expression, rapid and sustained downregulation of homeostatic proteins and impaired astrocyte coupling. After a latency period, a subset of mice developed spontaneous recurrent seizures reminiscent of PTE in human TBI patients. Seizing mice had larger areas of atypical astrocytes compared with non-seizing mice, suggesting that these atypical astrocytes might contribute to epileptogenesis after diffuse TBI.

Improving Consistency and Completeness in Clinical Photography

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Abstract/Case Study: Background: High quality clinical photography in plastic surgery is important for accurate portrayal of pre-surgical features and post-operative changes. Even minor variation in technique, positioning, and lighting can dramatically alter the utility of images and reduce their value to both the clinician and patient. Guidelines have been established for clinical practice; the aim of this study was to improve photographic consistency and completeness through implementation of an educational program for staff at our academic practice. Methods: Educational sessions with immediate feedback were held with clinical staff on two separate days within a one-week period. Photography standards checklists were provided to clinical support staff, and posing standards posters were placed in work areas. One hundred consecutive adult patients were audited prior to the educational session, and an additional one hundred consecutive patients were audited one year after the intervention to assess improvement and durability of intervention. Results: Before the educational sessions, only 67% (67/100) of photograph sets met standards for completeness, with 41% of these (28/67) having inconsistencies in positioning or lighting that would make them unacceptable for comparison purposes, resulting in only 39% of patients having a complete and consistent photograph set. One year after the intervention, 93% of patients (93/100) had complete photograph sets, with 1% (1/93) with positioning inconsistency. Conclusions: A simple and short educational session, combined with easy access to standardized references, can significantly improve quality and consistency of clinical photography and produce durable benefits to plastic surgery practices.

Osteocutaneous Radial Forearm Flap for Foot and Ankle Limb Salvage

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Abstract/Case Study: Purpose: Reconstruction of bony deficits of the foot and ankle due to trauma, infection or avascular necrosis are challenging due to the often poor blood supply to the wound, limited local options and unique soft tissue requirements of the area. We report the early results of 5 consecutive cases of foot and ankle reconstruction using a vascularized osteocutaneous free tissue transfer from the radial forearm for limb salvage. Methods: A retrospective chart review of foot and ankle injuries reconstructed with osteocutaneous radial forearm free tissue transfer at a level 1 trauma center over one year was performed. Five cases were identified. Indications included infection, blunt trauma and ballistic trauma. All patients in the series suffered complex wounds involving loss of bone and soft tissue coverage. Mean patient age was 44 years old (range 31-57 years). Results: There were no bone flap failures or thrombotic events. Bone healing was confirmed in all patients (n=5). One patient suffered partial loss of skin paddle (n=1). All patients ultimately achieved union, and full weight bearing was achieved at 12.6 ± 5.8 weeks after surgery. No patient required flap debulking. Conclusions: Osteocutaneous radial forearm free tissue transfer provides a reliable means of foot and ankle reconstruction in otherwise unsalvagable limbs. This flap allows for stable, weight-bearing bony reconstruction with thin, sensate, supple soft tissue coverage that does not impair patient ability

to utilize normal footwear. Use of a modern contoured prophylactic radius plate allows harvest of a large graft with minimal donor site morbidity.

Student (in Alphabetical Order)

Profile of a Child with 16p11.2 microduplication and 15q11.2 microdeletion

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Abstract/Case Study: This is the case of a 9-year-old patient, Ms. G, with several rare chromosomal anomalies predisposing her to intellectual disability and numerous neuropsychiatric conditions. In addition, her social history of trauma and abandonment increased her risk for psychopathy. Initially, Ms. G presented to the Carilion Roanoke Memorial Hospital (CRMH) Pediatric Inpatient Psychiatric Rehab due to escalating self-harm behaviors and auditory hallucinations. The previously diagnosed 16p11.2 microduplication and 15q11.2 microdeletion put her at increased risk for schizophrenia. The patient's own description was often "my brain tells me to do bad things." However, the clinical team did not observe any thought disorganization, or response to internal stimuli typical of schizophrenia, and the formulation was that these symptoms reflected intrusive recollections related to her trauma and developmental delays, rather than frank auditory hallucination. Formal neuropsychiatric supported this, as she demonstrated no impairment in reality testing on the Rorschach Performance Assessment System (R-PAS). Testing also revealed a full-scale IQ of 75 on the Wechsler Abbreviated Scale of Intelligence-II (WASI-II), placing Ms. G in the 5th percentile for intelligence. Notably, her scores on the Vineland-3 Parent Rating Form indicated Ms. G was <1 percentile in communication, socialization, and daily living skills. These scores reflect a more profound impairment than would be expected given her FSIQ score alone. Taken together, this testing and clinical observation suggest Ms. G does not demonstrate all the conditions reportedly conferred by either chromosomal anomaly alone. Rather, she displays a complex intellectual disability with a pronounced social impairment. In this poster, we will describe this patient's unique psychiatric presentation and how it differs from previously reported cases of either individual chromosomal anomaly.

Adolescent mental health emergency department presentations in the COVID-19 pandemic: a case series

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Abstract/Case Study: The coronavirus disease 2019 (COVID-19) pandemic has dramatically affected physical, mental, and social wellbeing of adults and children alike. An increased prevalence of mental health disorders has been largely attributed to restrictions and reduced social mobility related to the pandemic. Children are particularly vulnerable to social isolation and derive much of their social interaction from school and extracurricular activities. When most schools shifted to virtual learning at the beginning of the COVID-19 pandemic, reports of loneliness, fear, and behavioral disturbances in children increased. Data from prior pandemics also reported greater PTSD symptoms in children who experienced isolation or quarantine. Social distancing and the transition to virtual schooling have not only contributed to emotional distress in school-age children and their families but also restricted access to school- and community-based physical and mental health resources. While total pediatric ED visits experienced an initial decline in the early months of the pandemic, mental health visits appear to have increased relative to pre-pandemic levels. This raises concerns about the combined impact of pandemic-related psychosocial stressors and limited in-person healthcare access on children's mental health. Children without prior psychiatric diagnoses who were unable to establish psychiatric care during the pandemic or unwilling to begin care virtually may have turned to the ED once mental health concerns reached a high acuity. Here we present four cases of previously healthy, high-achieving children who presented to a pediatric ED for suicidal ideation or thoughts of death self-described as primarily or solely brought on by the COVID-19 pandemic. The cases illustrate a rapid decline in children with no prior mental health concerns, varied responses to the stress of the pandemic, and difficulties families encountered in establishing mental health care during a pandemic.

Factors Affecting Female Plastic Surgeons' Decision to Leave Academic Medicine

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Abstract/Case Study: Introduction: Plastic surgery has seen notable growth in female trainees in the past decade, but female representation in academia continues to lag with female plastic surgeons being more likely to leave academia for private practice than their male counterparts. The purpose of this study is to systematically identify factors associated with women deciding to enter and ultimately leave academia. Methods: IRB exemption was obtained. Twenty-two practicing female plastic surgeons were selected based on experience, region, race, and practice type. Virtual interviews examining training experience, first job selection and departure, and workplace culture were conducted based on a script. Responses were anonymized and reported in aggregate. Results: Of the 22 women interviewed: 7 were in academia, 8 were in private practice, and 7 left academia for private practice. Of those entering private practice after residency, only 25% initially planned on private practice, with the rest undecided or planned on

academia. Practice content was more important to those going into academia (50% vs 37.5%), while supportive environment and location were more important to those in private practice. Women who stayed in academia were more likely to have female mentorship than those who left (42.8% vs 14.2%). Those who left academia for private practice cited perceived gender inequity (85.7%) followed by lack of flexibility (71.4%) as reasons for leaving. Satisfaction with current workplace culture is highest in those currently in private practice (87% Extremely or Very Satisfied), versus 33% of participants currently in academia. Conclusion: Our qualitative analysis suggests that the factors influencing why female plastic surgeons enter and leave academia are multifactorial, including practice content, geography, mentorship, work place culture, and perception of gender equity. This rich qualitative data is currently being used to design a validated survey tool to further elucidate factors contributing to women leaving academia and propose meaningful solutions.

Intraoperative Ketorolac in Breast Surgery: A Double-Blinded Randomized Controlled Trial

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* Student's Mentor: James Thompson, MD, Carilion Roanoke Memorial Hospital, Surgery; Div of Plastic Surgery

Abstract/Case Study: Introduction: Better intraoperative pain control using non-narcotic analgesics, such as ketorolac, has been shown to reduce postoperative pain and opioid consumption. However, ketorolac use has been limited in breast procedures due to concerns of hematoma formation. Our objective is to analyze the safety and efficacy of ketorolac in outpatient plastic surgery breast procedures in a prospective randomized double-blinded trial. To our knowledge, this study would be the first prospective analysis of hematoma rates following ketorolac use in breast surgery. Here we report data from our interim safety review demonstrating a 0% hematoma rate across all groups to date. Methods: Adult patients undergoing outpatient breast surgery were randomized to receive 15 mg ketorolac, 30 mg ketorolac, or saline placebo intraoperatively. Hematoma formation was assessed before discharge and at the first post-operative appointment. Additionally, patients recorded bi- daily pain scores using a 10-pt Likert scale and total opioid consumption, which were collected at their post-operative appointment. Results: Currently, 19 patients have been enrolled. Based on our data & safety monitoring (DSM) review, this prospective cohort has a 0% hematoma rate after an average follow-up time of 9.2 days. Data for post-operative pain and opioid use were collected for an average of 8 days following surgery and is similar between groups at this time. Conclusion:

This double-blinded randomized trial is designed to assess the risk and benefit of ketorolac administration intraoperatively in outpatient breast surgery. Patient accrual is ongoing, but our interim data safety review shows no increase in hematomas in the ketorolac groups. There is a lack of prospective data on ketorolac use in breast surgery within the field of plastic surgery, but the preliminary results of this study suggest ketorolac may have clinical benefits with no increase in hematoma rates.

Can suvorexant help inpatients admitted with Covid-19?

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Abstract/Case Study: Delirium in the setting of Covid-19 infection has been found to be common and is associated with poorer overall outcomes. Strategies to mitigate delirium severity are needed. Lack of sleep is considered a risk factor for incident and severe delirium. In a prospective case series of patients hospitalized for Covid-19 infection, we examine the impact of the hypnotic, suvorexant, the first FDA-approved dual-orexin receptor antagonist, on the severity of delirium. A series of 34 patients who were seen by C/L Psychiatry in the setting of Covid-19 infection were prescribed suvorexant at bedtime in an open-label non-randomized fashion. We assessed for the severity of delirium prior and post suvorexant with the CAM-S delirium severity scoring short and long forms, using patients as their own controls. The impact of suvorexant on delirium severity will be explored.

GWIMS Creates a Safe Space for Sharing #MeToo Narratives

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* Student's Mentor: Rebecca Pauly, MD, Carilion Clinic/VTCSOM, Internal Medicine

Abstract/Case Study: Sexual harassment is prevalent in medicine and science, with recent studies showing 30% of female clinician-researchers experienced sexual harassment. It is imperative to give women in medicine and science opportunities to reflect on such discriminatory experiences, increase awareness of available resources for support, and foster solidarity among all levels of training. The Group on Women in Medicine and Science (GWIMS) chapter at the Virginia Tech Carilion School of Medicine (VTCSOM) organized a narrative-based panel discussion with the purpose of providing a space to discuss shared personal narratives with a panel of institutional leaders. We solicited de-identified narratives from all women affiliated with VTCSOM, Carilion Roanoke Memorial Hospital and Fralin Biomedical Research Institute. We

specifically requested stories of experiences of gender-based discrimination and misconduct in medicine and/or science. A panel of diverse female institutional leaders was assembled to facilitate dialogue and discussion during the event. A post event survey was sent out to all attendees. 87.5% of responders were 'satisfied' with the event, and 100% felt that the event created an open and supportive atmosphere. 88% reported an increase in comfort level in seeking support and 50% reported increased awareness of resources at our institutions. A 6-month follow-up survey was sent to evaluate the longer-term sustainability of the event. 76% of respondents continued to feel empowered after the event and 88% reported that attending the event continues to have a meaningful impact on their professional interactions. 50% reported continued awareness of resources available. Institutions can successfully provide a space for #MeToo discussions, and groups such as GWIMS are uniquely equipped to sponsor these events. Sharing narratives is a valuable experience with a sustained impact. Including multi-generational women in medicine and science as well as institutional leadership provides a meaningful platform to emphasize solidarity, foster resilience, and promote career advancement for women.

Post-operative thromboprophylaxis with oral rivaroxaban versus subcutaneous enoxaparin in gynecologic-oncology

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Abstract/Case Study: Perioperative venous thromboembolism (VTE) is the most common preventable cause of in-hospital death in the US. While current guidelines recommend perioperative pharmacologic prophylaxis for patients undergoing abdominal/pelvic surgery for a malignancy, there is limited evidence comparing methods of thromboprophylaxis. We aim to determine the incidence of post-operative VTE among gynecologic cancer patients stratified by method of pharmacologic VTE prophylaxis. Women who underwent a laparotomy for a gynecologic malignancy and received extended post-operative thromboprophylaxis with subcutaneous enoxaparin or oral rivaroxaban from 2010-2017 were included. The primary outcome of VTE incidence was defined as deep venous thrombosis and/or pulmonary embolism within 30 days and 90 days of surgery. The secondary outcome of incidence of major bleeding events was defined as a re-admission or repeat surgery for bleeding/acute blood loss or transfusion for acute blood loss anemia. Wilcoxon Two Sample Test and Fisher's Exact Test were performed to determine the rate of VTE, stratified by method of thromboprophylaxis. A total of 315 women were included, of which 233 (74%) received enoxaparin and 82 (26%) received rivaroxaban. The incidence of VTE at 30 days in the enoxaparin group was 1.7% (4/233) compared to 1.2% (1/82) in the rivaroxaban group (p=1.00). The cumulative incidence of VTE at 90 days in

the enoxaparin group was 4.3% (10/233) compared to 2.4% (2/82) in the rivaroxaban group (p=0.74). Major bleeding events were 0.4% (1/233) in patients receiving enoxaparin compared to 3.7% (3/82) in those receiving rivaroxaban (p=0.06). No significant difference was seen in incidence of VTE or rate of major bleeding events following laparotomy in patients with gynecologic malignancies who received enoxaparin versus rivaroxaban for extended thromboprophylaxis. Rivaroxaban may be an effective and safe alternative for extended thromboprophylaxis. Given the small sample size, these findings should be taken with caution but provide support for future prospective studies.

Delay Discounting in Inpatient Psychiatric

Authors: Caroline C. Woods, MS, VTCSOM, Medical Student, ccwoods@carilionclinic.org; Navroop Kaur, MD, Carilion Clinic, Psychiatry

* Student's Mentor: Anita S. Kablinger, MD, CPI, FAAP, FAPA, FACRP, FASCP, Carilion Clinic, VTCSOM, Psychiatry

Abstract/Case Study: We are researching the role of impulsivity through delay discounting (DD) in inpatient psychiatry patients to see if DD score can be predictive of a patient's length of stay or readmission rate. DD is the devaluation of a reward when it is not immediately available; a higher score indicates greater impulsivity. Psychiatric diagnoses have been found to exist along a continuum of DD scores, with anorexia nervosa and obsessive compulsive disorder having a low score, and addiction and depression having a high score. This has not been extensively studied in acutely ill inpatient psychiatric populations. We are administering the 5-trial adjusting DD task to patients voluntarily admitted to the inpatient psychiatric unit. Additional information collected at admission includes: PHQ-9 survey of depression, AUDIT-C alcohol assessment, Fagerstrom smoking survey, DAST 10 drug abuse screening, and socioeconomic data. At discharge we administer the 5-trial DD and the PHQ-9 survey for a second time. For a year following discharge we are following readmission to the inpatient unit and admissions to the emergency department (ED). Our statistical analysis is going to be a linear regression plotting the DD score against 3 dependent variables: 1. readmission to inpatient psychiatry OR admission to the ED; 2. utilization of the ED specifically for mental health/substance use purposes; 3. utilization of the ED for any purpose. We will do a generalized regression looking at the DD score and number of readmissions. Finally, we will do a non-parametric Spearman correlation looking at DD score and length of stay in inpatient psychiatry. Our hypothesis is that a higher DD score will correlate to more readmissions to inpatient psychiatry and admissions to the ED over the year following discharge. We hope the DD task can be used as an interdisciplinary treatment tool in the future care of psychiatric patients.

2020 Abstract Submissions (Alphabetical by First Author)

Faculty/ Staff

Title: Respiratory Rate, Opioid Administration, and Early Warning Systems

Authors: Donna C. Bond, DNP, RN, CCNS, AE-C, CTTS, FCNS, CRMH, Nursing, DCBond@Carilionclinic.org;

Abstract/Case Study: Respiratory rate is an independent predictor of adverse outcomes, more sensitive in predicting impending physiologic compromise than heart rate and blood pressure changes. Multiple studies document counting respiratory rate is inaccurate/missing. Patients who receive an opioid not related to a procedure have the potential for respiratory compromise. Methodology: This retrospective, descriptive study examined vital signs (pulse, blood pressure and respiratory rate) occurring within 72 hours of all patients who experienced a 'code blue' or 'rapid response' 24 hours after admission in calendar year 2017 & 2018 on Medical-Surgical and Progressive Care units. The Carilion Clinic IRB determined the study did not meet the definition of human subject research and qualifies as a quality improvement activity. Results: Normal heart rate was recorded in 65% of patients, normal blood pressure recorded in 54% of patients, and normal respiratory rate was recorded in 83% of patients. In this study, blood pressure and pulse were less likely to be normal compared to the respirations (p=<0.001). Seventy percent of patients in this review received an opioid within 72 hours prior to their event with a total of 3875 doses of opioids administered to 499 patients. Twenty-three percent of patients received an opioid within four hours of the event. The early warning indicator system failed to produce a warning in ¼ of the patients; however, the early warning system is dependent on several factors including correct documentation of vital signs. Accurate counting of respiratory rate is a fundamental yet extremely vital assessment to prevent respiratory compromise. The elevated number of 'normal' respirations calls into question the accuracy of the recorded respiratory rates. More study is warranted to examine the effect of additional monitoring equipment and accurate respiratory assessment enforcement on activation of the early warning system in units with less monitoring technologies.

Title: Using carbon dioxide to determine ACH in ambulances

Authors: Randall Collins , BSN, RN, Carilion Clinic , Infection Control , rcollins@carilionclinic.org; Maimuna Jatta, MSN, RN CIC , Carilion Clinic, Infection Control

Abstract/Case Study: Background Emergency Medical Services often transport patients with suspected/confirmed airborne diseases such as Mycobacterium tuberculosis. These pathogens are contagious and have potential to remain suspended in the air for extended periods of time. The timeframe for pathogen removal by airing out ambulances is not well defined. This study evaluates the time required to effectively remove these airborne pathogens from ambulances by determining the air changes per hour (ACH). Methods We measured the ACH in twenty ambulances of various models using the concentration decay method with carbon dioxide (CO2) as a tracer gas. Individually, we evaluated the relationship between temperature, humidity, volume, and air exhaust velocity with ACH. Linear regression was used to measure the line of best-fit for CO2 concentration over time, where the gradient of the line represented ACH for each ambulance tested. Environmental factor influence was examined by correlation coefficients with an alpha = 0.05. Statistical analyses were performed using R version 3.6.1. Results Under the conditions studied, the measured air change per hour ranged from 14.62 to 40.9 ACH. Using the Centers for Disease Control and Prevention guidelines for airborne contaminant removal by 99.9% efficiency, the amount of time required to air out ambulances based on maximum and minimum measured ACH is 21 and 35 minutes respectively. Changes in humidity, volume, temperature, and exhaust velocity all demonstrated significantly weak relationships with ACH ($r < 0.2$, $p < 0.001$). Conclusion This study found that the CO2 concentration decay method can be used to determine ACH,

which is necessary to determine the amount of time required to effectively remove airborne pathogens in an ambulance. This study shows that 21-35 minutes is an effective timeframe to air out the ambulances. Environmental factors have a weak relationship with ACH and therefore is a relatively unimportant factor in air out timeframe.

Title: OBGYN RESIDENT RESEARCH: CURRENT RESIDENCY PROGRAM PRACTICES, PRODUCTIVITY AND BARRIERS

Authors: Emily Evans-Hoeker, MD, Carilion Clinic, Obstetrics and Gynecology, eaevanshoeker@carilionclinic.org; Mariah Rudd, MS, Virginia Tech Carilion School of Medicine, Office of Continuing Professional Development; Amanda Murchison, MD, Carilion Clinic, Obstetrics and Gynecology; Samantha Harden, PhD, Virginia Tech, Human Nutrition, Foods and Exercise

Abstract/Case Study: BACKGROUND: Unlike other aspects of Obstetrics and Gynecology (OBGYN) residency training, the research education curriculum is not standardized nationally. OBJECTIVE: To explore the national landscape of OBGYN resident research program structure, curriculum, and productivity. METHODS: A cross-sectional survey of all 2019 US OBGYN residency program directors was conducted, using an email listserv for distribution. Data were analyzed using descriptive statistics, measures of association and odds ratio determination. RESULTS: Sixty one of 195 (31%) program directors completed the survey. Most reported conducting ‘ 4 research didactics per year (57%) and no dedicated research rotation (69%). Ninety-seven percent require a research day presentation. Programs with research didactics customized by post-graduate year, a research rotation, or allocated protected time dedicated to the research director role had higher odds of publishing resident research (OR 2.01 [1.47’2.76], OR 2.45 [1.86’3.24] and OR 1.38 [1.05’1.8], respectively). Program directors cited faculty knowledge or comfort (26%), resident time (27%), and resident interest (22%) as barriers to a successful research program. Mentoring and support from faculty/staff (36%), a dedicated research team (14%) and having residents interested in academics (14%) were cited as factors contributing to a successful program. CONCLUSIONS: Our findings confirm that practices vary by residency program, though there are shared aspects spanning most programs such as a dedicated resident research day. Further, we have identified barriers to resident research and factors contributing to a successful resident research program. These findings can be used to improve OBGYN resident research programs.

Title: Surgical methods for endometrial polypectomy and associated endometrial injury

Authors: Emily Evans-Hoeker, MD, Carilion Clinic, Obstetrics and Gynecology, eaevanshoeker@carilionclinic.org; Adrienne Uphoff, MD, Carilion Clinic, Obstetrics and Gynecology; Grace Lee, MS, Virginia Tech Carilion , School of Medicine; James Casey, MD, Carilion Clinic, Obstetrics and Gynecology

Abstract/Case Study: BACKGROUND: Intrauterine procedures have the potential for endometrial injury, possibly leading to formation of intrauterine adhesions and infertility. Methods for removal of endometrial abnormalities, such as endometrial polyps, have traditionally been performed with sharp curettage or hysteroscopic scissors, however, the use of hysteroscopic morcellators has become more common in recent years. It is unclear which method, if any, is associated with lower frequency of

endometrial injury. OBJECTIVE: To determine if the frequency of endometrial injury differs between methods for removal of endometrial polyps. DESIGN: Retrospective cohort study MATERIALS AND METHODS: Pathology samples from polypectomy procedures performed on women ages 18-50 were included in the study. Because the myometrium is deep to the endometrium and is not itself a target of these procedures, the presence and proportion of myometrium on surgical pathology samples were used to indicate endometrial injury. Pathology samples were re-evaluated by a single, blinded pathologist to measure the primary outcome of presence and proportion of myometrium. Secondary outcomes included operative complications and mention of myometrium on the initial pathology report. Data were evaluated using chi square analysis. RESULTS/SIGNIFICANCE: Interim analysis of 195 of the 473 (41%) pathology samples demonstrated increased reporting of myometrial tissue on initial surgical pathology with morcellator use (46 % of morcellator pathology reports), in comparison to traditional D&C (8%), and hysteroscopic scissors (3%) ($p < 0.01$). There was no difference in the overall presence of myometrium, presence of isolated myometrium or the proportion of myometrial tissue noted on the blinded pathology review. There was no difference noted in surgical complications. CONCLUSIONS: Interim analysis demonstrated increased reporting of myometrial tissue on initial surgical pathology with morcellator use, however, no difference was found on re-evaluation of samples.

Title: Factors associated with biochemical pregnancy during non'IVF fertility treatments

Authors: Emily Evans-Hoeker, MD, Carilion Clinic, Obstetrics and Gynecology, eaevanshoeker@carilionclinic.org; Ellen Lockhart, MS, Carilion Clinic, Health Analytics and Research

Abstract/Case Study: Background: Biochemical pregnancy, defined as positive pregnancy test without subsequent visualization of pregnancy on ultrasound, occurs in 14% - 22% of pregnancies and is not well understood. A pregnancy that progresses to a clinical pregnancy and is subsequently lost in early gestation is referred to as a spontaneous abortion (SAB) and is much more thoroughly studied. Treatments for prevention of SAB have been identified however, similar decreases in biochemical pregnancies with these treatments have not been noted, suggesting a unique pathophysiology for biochemical pregnancies. Objective: To identify patient and fertility treatment cycle characteristics that are associated with biochemical pregnancy. Materials and Methods: A secondary analysis of two randomized trials assessing fertility treatments was performed-- PPCOS II (clomiphene versus letrozole for polycystic ovarian syndrome), and AMIGOS (gonadotropins versus clomiphene versus letrozole for unexplained infertility). Primary and secondary outcomes included biochemical pregnancy, clinical pregnancy and negative pregnancy test. Patient and treatment characteristics were evaluated using chi square analysis and ANOVA with pairwise comparisons. Results: There were 1650 patients included in the analysis. Age, race, BMI, alcohol use, and smoking were not associated with biochemical pregnancy rate, however, a lower percentage of patients suffering a biochemical pregnancy reported a history of gastrointestinal and musculoskeletal diseases in comparison to patients with negative pregnancy test and those with a clinical pregnancy. Associations between fertility treatment cycle characteristics and biochemical pregnancy rate are still under investigation. Conclusions: Although previous studies have demonstrated that patient characteristics such as age, race, BMI, alcohol use and smoking are associated with SAB, our study did not demonstrate a similar association with biochemical pregnancy. Interestingly, gastrointestinal and musculoskeletal diseases were less commonly seen in patients

suffering a biochemical pregnancy. Our data further support the notion that the pathophysiology of biochemical pregnancy differs in comparison to SAB.

Title: Impact of Nurse-driven Infection Prevention Initiative in ICU

Authors: Maimuna Jatta, MSN,, RN CIC , Carilion Clinic , Infection Control, mjatta@carilionclinic.org; Meagan Griggs, BSN, RN , Carilion Clinic , Nursing ; Ellen Harvey, DNP, RN, ACNS-BC, CCRN, TCRN, FCCM, Carilion Clinic , Nursing

Abstract/Case Study: A preventable hospital-associated condition, Catheter-Associated Urinary Tract Infection (CAUTI) increases morbidity, mortality, and hospital length of stay and cost. Neurologic and injured patients are at high-risk for adverse outcomes associated with bladder dysfunction. Thus, higher utilization, reinsertion and infection rates related to indwelling urinary catheter use is reported in these complex populations. What is the impact of an innovative nurse-driven initiative to reduce CAUTI incidence in a neurotrauma intensive care unit (NTICU) to a Standardized Infection Ratio (SIR) <1.0? A nurse-led interprofessional team utilized a Define-Measure-Analyze-Improve-Control model to implement an evidence-based CAUTI prevention initiative. Study was conducted in 12-bed unit providing care to neurologic and injured patients in a level one trauma. Cornerstone interventions included conduct of a staff culture of safety survey; revision of ICU Fever and Bladder Management Guidelines; interprofessional education; and use of a trial without catheter (TWOC) checklist to assess for catheter removal readiness. To sustain improvements, a nursing clinical team leader (CTL) driven initiative included daily patient rounds and audits of catheter care bundle and guideline compliance over a two-year period. Infection rates, device utilization rates and SIR were compared pre and post intervention. CAUTI rates decrease about 40% post intervention (CAUTI rate 2017, 5.48; 2018, 2.91). Sustained through 2019 (2.77). The SIR for CAUTI reduce nearly 50% from 2.0 in 2017 to 1.06 in 2018. Sustained at 1.01 in 2019. No significant change in the utilization rate was noted. There is a significant decrease in catheter re-insertion 2019 (17%) compared to 2018 (24%), 2017 (23%). At the unit level, a CTL driven initiative sustains quality improvements in catheter care bundle and guideline compliance, significantly reducing CAUTI incidence in a NTICU. Innovative use of an additional assessment checklist for catheter removal readiness may further support CAUTI reduction in high-risk neurologic and injured ICU populations.

Title: The Use of Cleviprex in Stroke Patients

Authors: Courtney B. Johnson, RN, Nurse, 7S ICU/ CCU, cbjohnson@carilionclinic.org; Samantha Tonon, RN, Nurse, 7S ICU

Abstract/Case Study: We wish to introduce Cleviprex as a newer anti hypertensive drug that many nurses are not familiar with in the use on our stroke patients. Our unit is a newly accredited unit accepting stroke patients and this knowledge will be helpful to us and many others. At this time, we are only familiar with the use of Cardene for blood pressure control. We will have an introduction of side affects we should look out for, administration, dosages, and titration. This will aid our nurses in preparing to use this drug in a safer manner.

Title: Descriptive analysis of pharmacological management of agitation in TBI patients

Authors: Anita Kablinger , MD, Carilion Clinic , Psychiatry , askablinger@carilionclinic.org; Elham Rahmani, MD, Carilion Clinic , Psychiatry ; Tricia Lemelle, MD, Carilion Clinic , Psychiatry

Abstract/Case Study: Background Aggression and/or agitation is a common symptom among patients suffering from TBI. However, there is a paucity of evidence and guidelines on how to manage these symptoms in patients suffering from TBI. Several systematic reviews have been published during the past 10 years on which pharmacological agents to use for the management of agitation and/or aggression in TBI patients. These articles caution the practitioners against using benzodiazepines and typical antipsychotics in these patients. They caution against using haloperidol as current evidence suggests that this medication is likely not effective in management of agitation/aggression in addition to possible adverse effects. Despite this evidence, the clinical experience of the investigators indicate that benzodiazepines and atypical antipsychotics (including haloperidol) are frequently used in the management of agitation and/or aggression in patients suffering from TBI and patients are often discharged on such medications Objectives The primary objective of this study is to describe which psycho-pharmacological agents are administered to patients with agitation and/or aggression in the context of TBI Methodology Retrospective Epic records used for this study. The patients who have been admitted to Carilion Clinic's inpatient facilities with a diagnosis of TBI from March 30, 2013 up to March 30, 2018 and an MD psychiatric consult has been requested and completed for them during the course of admission will be included Results Preliminary data demonstrate benzodiazepines and typical antipsychotics are frequently used for the treatment of patients with TBI. Medication with evidence such as Valproate and Carbamazepine are either not used or used in combination with other medications. Conclusion Preliminary data suggests that health care providers may benefit from training on how to manage agitation and/or aggression in patients suffering from TBI.

Title: Effects of Prehabilitation on Functional Recovery Following Total Knee Arthroplasty

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Abstract/Case Study: The aim of this study is to determine the effectiveness of an individualized pre-surgery exercise program (prehabilitation) on functional outcomes following Total Knee Arthroplasties (TKA). It is hypothesized that patients who participate in prehabilitation pre-TKA will demonstrate greater functional outcomes compared to those who do not participate in prehabilitation. Prehabilitation is proposed to increase strength, balance and endurance with less post-surgical decline and improved recovery rate (Swank, et al., 2011). Current literature on the effectiveness of prehabilitation remains unconvincing regarding post-surgical outcomes due to variability in methods employed. To address this, methodology should focus on more robust interventions. Subjects were

recruited from Carilion Orthopedic Center in Roanoke, VA after scheduling a TKA and were randomly assigned to an intervention (IG) or control group (CG). Both groups received care outside of the current study including a home exercise program, pre-surgery education and post-surgical rehabilitation. The IG participated in a supervised prehabilitation program consisting of individualized strengthening, balance, flexibility, and manual therapy interventions. Measures were taken at four points: baseline (T1), 1-2 weeks pre-surgery (T2), one-month post-surgery (T3), and three-months post-surgery (T4). The IG participated in an average 14.89 prehabilitative sessions (range=8-20, SD=3.769). There were no statistical differences between groups regarding participants' demographics. Statistically significant between-group differences were found in the Knee Injury and Osteoarthritis Outcome Scale-Sport (KOOS-sport) at T2 ($p=0.007$). The IG demonstrated significant prehabilitation (T1-T2) and long-term changes (T1-T4) in the Timed-Up-and-Go (TUG), 6-minute walk test (6MWT), KOOS-Activities of Daily Living (KOOS-ADL) and KOOS-sport (p values$< 0.001, 0.007, 0.001, 0.001$ and $0.013, 0.007, 0.001, 0.001$ respectively). CG demonstrated significant long-term changes in KOOS-ADL scores ($p=0.021$). Prehabilitation demonstrates improved pre-TKA functional outcomes; however, these changes were insufficient for creating significant between-group differences. Intensity and frequency of prehabilitation did not provide statistically significant improvements compared to current standards of care.

Title: Combating Stigma and Opioid Use Disorder: SBIRT for Orthopedics

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Abstract/Case Study: Introduction SBIRT (Screening, Brief Intervention, and Referral to Treatment) is an evidence-based practice effective in reducing substance misuse in at-risk persons/early stage substance use disorder. This project examines an SBIRT training curriculum developed for a novel environment, the orthopedic clinic, specifically targeting the risk of opioid misuse: identifying at-risk patients and modifying care in alignment with risk level. SBIRT's role in decreasing bias against patients with opioid use disorder (OUD) is explored, as is the use of brief interventions and referrals for treatment. Methods Nineteen orthopedic providers were instructed in a curriculum consisting of a 1.25 hour online component and 2.5 hour interactive small group session, including universal screening (Opioid Risk Tool) and motivational interviewing. Participants tracked the number of patients screened over the subsequent 6 weeks and whether they received intervention. Participants completed the Medical Condition Regard Scale (MCRS) and a post-training survey. Results MCRS scores increased from 44 to 53 ($p<0.01$), showing decreased stigma towards patients with OUD and pain. One thousand seventy-one patients were screened by fourteen participants. Two hundred nineteen received brief intervention, and 4 were referred for treatment. Patients who screened as medium-risk were 5.8 times more likely to receive intervention (brief intervention or referral) than patients who screened as low-risk or were not screened. This number increased to 8.4 times for patients scoring high-risk ($p<0.01$). Seventeen participants would recommend the training to their colleagues. Discussion Orthopedic providers were able to incorporate SBIRT into their clinic workflow. Patients screening as medium- or high-risk for opioid misuse based on the Opioid Risk Tool were more likely to receive intervention than patients who screened as low-risk or were not screened. Significant improvements in the regard of orthopedic surgeons towards patients with OUD were documented, including an increase in satisfaction, and decreased perceived difficulty working with patients with OUD and pain.

Title: Ultrasound Guided Volar Transthecal Digit Block

Authors: Jonathan Nogueira, DO, Carilion, Emergency Medicine , jrnogueira@carilionclinic.org; Michelle Clinton, MD, Carilion, Emergency Medicine; Janet Young, MD, Carilion, Emergency Medicine; Michael Jones, MD, Carilion, Emergency Medicine

Abstract/Case Study: Digital nerve blocks are performed frequently in the ER. The aim of this study was to establish if ultrasound may be used to assist with visualizing the needle during the volar transthecal (VT) digital block injection. A convenience sample of adults requiring digital anesthesia for minor surgical procedures on the fingers or thumb in the ER, and were retrospectively enrolled into the study. A VT digit block was performed by injecting anesthetic into the flexor tendon sheath at the palmar digital crease. The volume of anesthetic ranged from 3-5ml. Sterilization of the digit prior to injection was performed with chlorhexidine, and the use of sterile gel with sterile probe cover. A high frequency linear probe was used to visualized in longitudinal axis, the penetration of the needle into the aponrosis of the flexor tendon sheath. Successful digital anesthesia was defined as complete loss of pinprick sensation of the digit and the ability to complete the anticipated minor surgical procedure. Primary outcome measures were anesthesia success rate. Between November 2017 and November 2019, 30 patients (31 digits) requiring digital anesthesia were enrolled into the study. The mean age of patients was 45 years old (median 46; range 18-74). Twenty-three (76%) were male, and seven were female (23%). Three of the thirty-one were of the first digit/thumb. Overall, the ultrasound guided VT digital nerve block technique was successful in 30 (96.7%) of the 31 digits, (95% confidence interval, 88.43% to 100%). Mean anesthetic volume was 3.7ml. No adverse events were reported. The VT digital block is a safe and effective method for digital anesthesia of the proximal interphalangeal joint to the distal digit. This is the pilot study to investigate further a blinded study of ultrasound guided vs transthecal digital block.

Title: Culturing Practices and their Effects on CAUTIs in an ICU

Authors: Harsh H. Patolia, BS, Virginia Tech Carilion School of Medicine, Carilion Clinic, patohh16@vt.edu; Maimuna Jatta, MSN, RN, PCCN, CIC, Infection Disease, Internal Medicine; Anthony Baffoe-Bonnie, MD, Infectious Disease, Internal Medicine

Abstract/Case Study: Background: Pan-culturing is a widely practiced during fever work-up in intensive care units. We assessed how panculturing in our neurotrauma ICU was associated with unit National Health and Safety Network (NHSN) defined catheter associated urinary tract infection (CAUTI) rates. We also explored the 'time of shift' and its influence on provider culturing practices to help target culturing stewardship interventions. Methods We conducted a retrospective analysis of electronically abstracted clinical culture orders over a 36-month period in a neurotrauma ICU. Quarterly pan-culture episodes were correlated with CAUTI episodes and rates on the unit. We also compared daytime and nighttime urine culture rates. Results Quarterly CAUTI rates were positively correlated with frequency of pan-culture episodes on the neurotrauma unit. ($R=0.69$, $p=0.013$). The majority (75%) of unique clinical cultures were ordered during the daytime, however, the night shift provider was 1.5 times (CI 1.2,1.9,$p<0.05$) more likely to order a urine culture if a culture was being ordered compared to the day shift provider. Conclusion Our mostly automated data abstraction process offers quantitative evidence of the effect of culturing practice patterns on a health care acquired infection (HAI). It is scalable and can be adopted across any electronic medical record (EMR) to help target culture stewardship efforts.

Title: Measurement-Based Care Adoption Strategy

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Abstract/Case Study: Background: Measurement-Based Care (MBC) is evidence-based, can improve patient outcomes and objectively document success. Studies show most psychiatric providers do not utilize MBC in their own practices citing lack of time, and a belief that their clinical judgment supersedes a measurement tool. The study purpose was to determine if an office-based strategy to proactively and regularly report to providers their patient's scores affected treatment outcomes and overall adoption of MBC. Methods: The study entailed a mixed methods design with a pre-test/post-test quantitative measurement and a semi-structured qualitative interview with providers following data collection. Office staff facilitated completion and electronic medical record entry of the Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7) patient self-report measurement tools for depression and anxiety on each patient at every visit. Trended scores were proactively reported to providers prior to the visit during months 3 through 6. Score comparisons were made prior to and after the reporting period. Qualitative questions explored usefulness of MBC and the effectiveness of proactive reporting. Results: Dependent t-tests measured differences in the means of both the PHQ-9 and GAD-7 scores at three measurement point comparisons. Qualitative data was recorded, transcribed, and coded for thematic pattern identification. Results showed significant reduction on scores for both depression and anxiety over the full measurement period with statistically significant decreases in anxiety scores during the intervention period. Qualitative responses showed no provider accessing scores prior to the the reporting intervention but all finding utility in and recommending adoption of MBC at the end of the study period. Conclusion: An office process that assists with routine collection of patient data, consistently reporting it to providers, can facilitate adoption of MBC to guide treatment decisions and produce evidence of positive outcomes. Successful change may be obtained with a team approach to the removal of barriers.

Student

Title: Divergent ferrochrome receptor identified on novel locus in Pseudomona aeruginosa

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*** Student's Mentor: Jayasimha Rao, PhD, Virginia Tech Carilion School of Medicine, Radford University Carilion, Dept of Basic Sciences, Dept of Infectious Diseases**

Abstract/Case Study: Pseudomonas aeruginosa is a gram-negative bacterium that causes life-threatening infections in humans. Genotypic mutations and phenotypic variations are key features of its antimicrobial resistance and adaptation to host environments. Pyoverdine-associated genes and divergent receptors play key roles in acute Pseudomonas infections. This study addresses the heterogeneity of ferrichrome-iron receptor (fpvA) expression, its effect on pathogenicity and propensity to cause acute infections clinically. Genetic and phenotypic variation of clinical isolates of P.aeruginosa were identified by genome sequencing. An IRB-approved prospective study collected 38 P. aeruginosa clinical isolates stored at Carilion Medical Center. Two genetically unrelated clinical strains were

selected: PA097 and PA115. These isolates were characterized by pyoverdine quantification in planktonic culture filtrate at OD405nm. Multiplex PCR was performed using primers for fpvA receptors. Quantification of iron acquisition was done on chrome azurol agar. Genomes for PA115 and PA097 were sequenced by Illumina Next Generation. Genome assembly reveals a 6.3Mb genome in PA115 with G+C content of 66.4%. Seven insertion sequence elements were located. We found a 101kb locus for pvD and a highly diversified fpvA associated with an insertional element (IS3). PA115 exhibits rich green pigment of pvd followed by PAO1 and PA097 in LB media and in Planktonic culture filtrate for quantitative estimation of pvd. On CAS agar, PA115 showed high iron uptake by orange pigment compared to lower pigmentation in PAO1 and PA097. We confirmed the ferrichrome-iron receptor as fpvAIIb in PA115 by Multiplex PCR seen in sequencing of PA115. We found genetic and phenotypic variations of clinical isolate of PA115 from an acute pneumonia patient. The novel IS element found in its receptor gene locus suggests an increased role in pvd expression and iron uptake from the host. Increased pvd expression and diversified fpvAIIb association with an IS3 element may indicate higher virulence in the PA115 strain.

Title: Particle-Mediated Histotripsy for the Treatment of Catheter-Associated Urinary Tract Infections

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*** Student's Mentor: Eli Vlaisavljevich2, PhD, Virginia Tech, Department of Biomedical Engineering and Mechanics**

Abstract/Case Study: BACKGROUND: Urinary catheters often become contaminated with biofilms, resulting in catheter-associated urinary tract infections (CAUTIs) that adversely impact patient outcomes. Histotripsy has previously shown the ability to treat biofilms on glass slides and surgical meshes. Here, we investigate the potential of histotripsy and particle-mediated histotripsy for the treatment of CAUTIs. METHODS: Tygon tubing samples were assigned to histotripsy and control groups after luminal inoculation with bacterial biofilms consisting of Pseudomonas aeruginosa (strain PA14). A 1 MHz histotripsy transducer was used to generate conventional and particle-seeded histotripsy for biofilm removal. Ultrasound and optical imaging were used for guidance and monitoring. Biofilms were quantified using 0.1% crystal violet and optical density was measured at 590nm via plate reader, and colony forming units were compared using single plate-serial dilution spotting. RESULTS: Histotripsy produced precise cavitation clouds within the lumen of tygon, silicon latex, and clinical catheters. Treatment with conventional histotripsy reduced luminal biofilm signal by 99% (Fig 1A). Treatment with nanocones and microbubbles significantly reduced the histotripsy cavitation threshold while still removing 88% and 84%, respectively. Finally, treatment with conventional histotripsy showed a bactericidal effect in a dose dependent manner, killing up to 99.9% of bacteria after 6 passes through the tube (Fig 1B). CONCULSIONS: Histotripsy and particle-seeded histotripsy provide a new modality for removing bacterial biofilms from catheter-based medical devices and provide a sterilizing potential

for implantable medical devices. Future studies are planned to investigate histotripsy for the treatment of in vivo patient catheters.

Title: TBD: Tuberculosis Determined

Authors: Miranda E. Gerrard, BS, Virginia Tech Carilion, School of Medicine, miran13@vt.edu; Melanie Prusakowski, MD, Carilion Clinic, Pediatric Emergency Medicine; Lisa Uherick, MD, Carilion Clinic, Pediatric Emergency Medicine

*** Student's Mentor: Lisa Uherick, MD, Virginia Tech Carilion School of Medicine**

Abstract/Case Study: A five-month old girl presents to the emergency department for diarrhea, fussiness, and fevers. She had just returned home from a two month visit with her grandmother, who was recently diagnosed with tuberculosis. Chest x-ray (CXR) showed no evidence of an acute cardiopulmonary process. On two separate follow-up appointments with her pediatrician, she was gaining weight well. Within a month of her first ED visit, however, she again presented with cough and decreased appetite. The emergency medicine team documented a normal exam. The patient fed well, produced a wet diaper, and was discharged home with the diagnosis of viral illness. At her next well-child check two weeks later, she had lost 7% of her body weight and was admitted for failure to thrive. Her admission physical examination was significant for fussiness, tachycardia, and pulmonary rales. CXR demonstrated right upper lobe consolidation and bilateral diffuse millet seed pattern opacities. Interferon gamma release assay (IGRA) was positive, making the diagnosis of pulmonary miliary tuberculosis. Tracheal aspirate and sputum culture later confirmed the diagnosis. She was treated with on isoniazid, rifampin, pyrazinamide, and pyridoxine and made a good recovery. In infants, tuberculosis can be asymptomatic, resemble a common viral illness, or cause failure to thrive. Providers should therefore be mindful of nonspecific symptoms with TB exposure. Poor growth in an infant should alway be a red flag to be investigated. This case reinforces recommendations that pediatric patients who are exposed to adults with TB receive testing with tuberculin skin testing or IGRA. These screening measures should be followed regardless of a normal CXR. Our case highlights the importance of early screening of exposed children and recognition of the nonspecific symptoms of infants with Mycobacterium tuberculosis.

Title: Signet Ring Cell Carcinoma in the Duodenum: Primary Where?

Authors: Miranda E. Gerrard, BS, Virginia Tech Carilion, School of Medicine, miran13@vt.edu; Mohamad Mouchli, MD, Carilion Clinic, Department of Gastroenterology; Douglas Grider, MD, Carilion Clinic, Department of Pathology

*** Student's Mentor: Mohamad Mouchli, MD, Carilion Clinic, Department of Gastroenterology**

Abstract/Case Study: A 66-year old woman presented to her gastroenterologist with severe anemia. Esophagastroduodenoscopy revealed an ulcerated duodenal mass. Biopsy showed signet ring cell (SRC) carcinoma, Figure 1A. One year prior she underwent transurethral resection for invasive high grade papillary urothelial carcinoma with few foci of SRC, identical histologically and immunohistochemically to the duodenal SRC, Figure 1B. Six months later, she underwent a radical cystectomy and hysterectomy for the high grade invasive papillary urothelial carcinoma after completing four cycles of chemotherapy with no positron emission tomography (PET) evidence of metabolically active disease. No SRC was found in the cystectomy specimen. Differential diagnosis of a duodenal SRC includes primary duodenal,

gastric metastasis, breast metastasis, and rarely metastases from another primary site. A metastatic gastric primary is the most common origin of SRC in the duodenum, either by direct extension or lymphovascular invasion. Further, SRC represents 35-45% of gastric carcinomas and only 0.24% of bladder malignancies. There are only rare reports of urothelial carcinoma metastatic to the small bowel, and none with signet ring cell morphology. This case demonstrates the necessity of clinical pathologic correlation that includes past medical history with review of prior material. Without this review, it is a formidable task to determine whether a SRC is primary or metastatic from a common or uncommon site.

Title: Epidemiological Characterization of a Private Nepali Emergency Department

Authors: Miranda Gerrard, B.S., Virginia Tech Carilion School of Medicine, Emergency Department , miran13@vt.edu; Dakota Buhrman, B.S., Virgnia Tech Carilion School of Medicine, Emergency Department; Grace Lee, B.S., Virginia Tech Carilion School of Medicine, Emergency Department; Richard Dykstra , M.D., Virginia Tech Carilion School of Medicine, Emergency Department; Kamal Thapa, M.D., Hospital for Advanced Medicine & Surgery Nepal, Emergency Department

*** Student's Mentor: Brian Meier, M.D., Carilion Clinic Roanoke Memorial Hospital , Emergency Department**

Abstract/Case Study: Background: International emergency medicine research has been challenged by overwhelming data outside of westernized settings. Areas of the world with greater disease burden also suffer from lack of emergency medical services. Successful implementation of these services requires basic understanding of the problems likely to be faced. Epidemiologic and chief complaint driven data collection is crucial for planning and developing emergency care in low- and middle-income countries. To date, there has been very limited data reported in Nepal, a low-income country where Emergency Medicine is still in its infancy. There is a critical need to formulate a baseline data set inclusive of key characteristics of patients served in Nepalese Emergency Departments. This study analyzes these factors for patients presenting to the Hospital for Advanced Medicine and Surgery (HAMS) in Kathmandu, Nepal. Methods: ED visits between September 2017 and April 2018 were analyzed. Medical records consisted of paper charts written in English. Data collected included demographics, chief complaints, diagnoses, procedures, treatments, and admission rates. Results: 970 patient charts were included for review. 53% of patients were male. 13% were pediatric patients. The overall admission rate was 32%. The most common chief complaint category was abdominal (21%) followed by injury (19%), infectious (16%), and respiratory (14%). Most frequently utilized diagnostic testing was lab work (56%), followed by Xray (39%), ultrasound (9%), CT (5%), MRI (1%). The top diagnoses included soft-tissue injuries, fractures, and viral fevers. Paracetamol was the most common prescription across all patients. Conclusions: These data characterize a patient population presenting to a private Nepali emergency department. Such data will be beneficial for training local healthcare providers, and implementing quality improvement measures, and identifying areas for resource allocation. Also, these data contribute to expanding foundational knowledge of global emergency medicine, allowing comparison both locally and internationally.

Title: Knowledge deficiencies in Lyme disease management: pregnant/pediatric therapies and reporting

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*** Student's Mentor: Stephanie Lareau, M.D., FAWM, FACEP, Carilion Clinic; Virginia Tech Carilion School of Medicine, Department of Emergency Medicine**

Abstract/Case Study: Introduction: The incidence of Lyme disease has risen in the southeastern US, and Virginia is now classified as an endemic location. Complications of Lyme include meningitis, cardiac failure, and death. It is vital that providers can recognize and appropriately treat this disease. Objective: To assess knowledge of providers/students in SW Virginia regarding Lyme testing/treatment and identify education opportunities. Methods: Providers and students in SW Virginia (n=161) completed an anonymous survey containing thirteen knowledge questions on Lyme management, with an assessment of confidence (Likert scale, 1-10) and perceived barriers. Kruskal-Wallis testing compared confidence to level-of-training and knowledge. Pairwise comparisons were performed using Dunn's test. Spearman correlation compared confidence to knowledge. Results: Knowledge scores averaged 72.2%±19.4%. Knowledge was high regarding tick removal (94.4%), endemicity (87.0%), and antibiotic therapy for erythema migrans rashes without known tick bite (82.6%). Knowledge was low regarding reporting guidelines (17.4%) and treatment of pregnant/pediatric patients with erythema migrans rashes but no known bite (54.7% and 62.7%, respectively). Knowledge varied between levels-of-training (Kruskal-Wallis, p<.001). Knowledge was high for PA/NPs (85.0%±10.4%, Md=84.6%) and attendings/fellows (79.4%±14.6%, Md=84.6%), and was low for EMTs (40.4%±17.1%, Md=46.2%) and RNs (53.0%±18.1%, Md=53.8%). Pairwise comparison did not identify knowledge differences between attendings/fellows and PA/NPs. Confidence varied between levels-of-training (Kruskal-Wallis, p<.001), was highest for PA/NPs (7.0±1.8, Md=7.0) and attending/fellows (6.6±2.0, Md=7.0), and was low for EMTs (3.5±2.1, Md=3.5) and RNs (4.0±2.0, Md=4.0). Confidence positively correlated with knowledge via Spearman correlation (rs =0.45, p<.001). Self-identified barriers included lack of knowledge (22.5%, n=32/142), concerns symptoms were due to another source (20.4%, n=29/142), and concerns about unnecessary antibiotics (18.3%, n=26/142). Conclusions: Knowledge of Lyme disease management among SW Virginia providers shows deficits in management of pregnant/pediatric patients and in reporting guidelines. Educational interventions can target these gaps in knowledge.

Title: Examination of Anticancer Properties of American Mistletoe Extract

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*** Student's Mentor: Robin L. Davies, Ph.D., Radford University Carilion, Biology**

Abstract/Case Study: Aqueous extracts of the European mistletoe, Viscum album, are used as complementary and alternative medicine therapy for cancer patients. European mistletoe extracts are reported to suppress cancer cell growth in vitro. Few studies have investigated the effects of the American mistletoes. In this study, organic and aqueous extracts of an American mistletoe, Phorodendeon leucarpum, were prepared and tested against human cancer cell lines. Three methods were employed using dried leaves. In the organic extraction method, crushed leaves were extracted with ethanol. The ethanol extract was dried, dissolved in methanol, and extracted with hexane. The hexane and methanol fractions were dried, and the methanol fraction was dissolved in deionized water,

extracted with ethyl acetate, and dried. Serial dilutions were made for each dried fraction using dimethyl sulfoxide. In addition, extracts of whole leaves and of crushed leaves were prepared by soaking in deionized water. A human fibrosarcoma line, HT1080, and a human colon cancer line, HCT-15, were exposed to all extracts for 48 hours and subjected to an MTT (3-(4-dimethylthiazolyl-2)-2,5-diphenyltetrazolium bromide) cytotoxicity assay. The aqueous fraction from the organic extraction had a statistically significant effect upon the growth of the HT1080 cells. Furthermore, the aqueous preparation made from crushed leaves reduced HT1080 survival to 58% of control values. The results from the aqueous extraction confirm earlier results with fresh mistletoe leaves. Results for the aqueous extraction against the HCT-15 cell line were inconclusive and further testing is needed. Further studies also will involve the exploration of alternative extraction strategies. Chemical characterization of extracted products will be conducted, as will testing on additional human cancer cell lines.

Title: Inexpensive Peritonsillar Abscess Model for Ultrasound Diagnosis

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*** Student's Mentor: Keel E. Coleman, D.O. , Carilion Clinic , Carilion Clinic**

Abstract/Case Study: Peritonsillar abscesses (PTA) are one of the more common head and neck soft tissue infections encountered in the emergency department. These patients can quickly become critically ill with the dangers of airway compromise and further local spreading. Emergency medicine (EM) residents need practice to properly identify and to minimize procedural complications. A major tool used in the emergency department that can help prevent complications is the use of ultrasound which can minimize both radiation and procedure related complications. Here we design and implement a low-cost trainer for residents to use ultrasound to diagnose and drain a PTA. An airway was modeled using readily available woodshop tools, Styrofoam wig heads, and balloons filled with a fluid mixture containing coconut lotion, water, and fragrance beads. With emergency medicine clinical faculty guidance and the use of ultrasound, learners are able to identify a peritonsillar abscess and subsequently demonstrate drainage of fluid with a needle and syringe. The efficacy of the content was assessed by evaluators observing proper ultrasound, procedure set up, and drainage of PTA. The majority of users agreed the model provides a realistic image of the disease for diagnosis by ultrasound with a score of 3.6 and felt more comfortable identifying and draining peritonsillar abscesses with scores of 3.7 and 3.6 respectively. This study demonstrates with minimal build and optimized instruction time, we can improve residents' comfort in performing this procedure and allow for important simulation experience in a safe, controlled environment.

Title: Pediatric Inpatient Learning Environment Project

Authors: Simran Sandhu, BS, Virginia Tech Carilion School of Medicine, Medical Student, ssandhu@carilionclinic.org; Brenna Keane, MD, VTCSOM, Pediatrics; Harsha Bhagtani, MD, VTCSOM, Pediatrics

*** Student's Mentor: Harsha Bhagtani, MD, VTCSOM, Pediatrics**

Abstract/Case Study: Background: Inpatient clerkships offer a unique academic experience by allowing medical students to learn through inclusion in an already functional team (Karani et al, 2014). Effective learning during these clerkships is a multipronged issue strongly influenced by team dynamics (Torre et

al, 2005). Learning is optimal when students are integrated within a team (Schiller et al, 2017). Additionally, the importance of impromptu learning, is often over looked (Bing-You et al, 1992). Our inpatient pediatric rotation had M3 medical students work in a separate room. This resulted in repeated feedback of dissatisfaction with team integration. Objectives: In an effort to optimize learning and integration, our study aimed to determine if physical proximity between resident teachers and students improves how students perceived their ability to learn and collaborate with the team. Methods: Between July 2018-June 2019, 41 M3 medical students participated in this pilot study. For the first six months, a group (n=20) remained in a separate medical student workspace. The second group (n=21) transitioned to a combined conference workspace over the last six months. Both groups completed surveys regarding their perception of efficiency, communication and teamwork based on setting. Qualitative comments were collected throughout. Satisfaction was rated on a 10 point scale, all other questions were based on a five point Likert scale. Questions included rating satisfaction, feelings of involvement, communication and team efficiency. Results: Nonparametric statistical test was conducted for significance using a Wilcox rank sum test, $p < .005$. All four questions yielded statistically significant results. Overall, there was a significant increase in satisfaction following workspace changes. Students felt that the team was able to work more effectively and inclusively in this manner. Discussion: The perceived improvement is an important finding as it created a more conducive learning environment with the simple solution of physical proximity between resident teachers and medical **students.**

Title: Myeloid and lymphoid neoplasm with eosinophilia with PCM1-JAK2 Fusion

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*** Student's Mentor: Michael S. Stumpe, MD, Carilion Clinic, Pathology**

Abstract/Case Study: Title: Myeloid and lymphoid neoplasm with eosinophilia with PCM1-JAK2 Fusion Authors: Natalia M Sutherland, Kerilyn N Godbe, Michael S Stump Abstract: A 43 year old man with a three year old history of an unspecified myeloproliferative disorder with thrombocytopenia presented to the Emergency department with body aches and myalgias 6 months post splenectomy. Work up revealed a PCM1-JAK2 fusion, a rare finding that has only been reported less than 50 times since 1990 to this author's knowledge. The case report explores various ways PCM1-JAK2 fusion can present, in addition to comparing this case to the other 47 known cases. This comparison sheds light on ways the currently developing WHO guidelines for the PCM1-JAK2 fusion genes could be improved.

Title: Primary Cutaneous Nocardiosis in an Adolescent with Crohn Disease

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*** Student's Mentor: Joshua Eikenberg, MD, Section of Dermatology, Virginia Tech Carilion School of Medicine, Internal Medicine**

Abstract/Case Study: Nocardia is an aerobic, gram-positive, partially acid-fast bacteria that often manifests as pulmonary infection since the primary route of entry is via the respiratory tract. As an opportunistic organism, Nocardia primarily affects immunocompromised individuals. Infection with Nocardia is uncommon. Primary cutaneous nocardiosis which is caused by percutaneous inoculation is

even more rare. Here we report a case of primary cutaneous nocardiosis in an adolescent with Crohn disease receiving treatment with adalimumab and azathioprine. Early identification and treatment are important to prevent disease progression and to avoid severe complications. Diagnosis is made principally by culture. Given that culture results may take up to two weeks to return, primary cutaneous nocardiosis should be maintained in the differential for any superficial cutaneous infection that arises in individuals undergoing treatment with immunosuppressive agents.

Title: Disseminated Verrucosis Secondary to Ustekinumab in Patient with Crohn Disease

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*** Student's Mentor: Joshua Eikenberg, MD, Section of Dermatology, Virginia Tech Carilion School of Medicine, Internal Medicine**

Abstract/Case Study: Ustekinumab is a biologic agent with FDA approval for the treatment of moderate-to-severe plaque psoriasis, psoriatic arthritis, ulcerative colitis and Crohn disease. It functions to inhibit interleukin (IL)-12 and IL-23, pro-inflammatory cytokines that play an important role in cell-mediated immunity against viral, bacterial, and fungal pathogens. Due to its immunosuppressive effect, ustekinumab may increase the risk of infection and reactivation of latent infections, including human papilloma virus. To the best of our knowledge, there is only one case in the literature documenting an association between ustekinumab and disseminated verrucae which occurred in the setting of treatment for psoriasis. Here we present the first case report of ustekinumab-induced verrucosis occurring in the setting of treatment for Crohn disease.

Title: DEVELOPMENT AND ASSESSMENT OF EDUCATIONAL MATERIALS REGARDING THE BEERS CRITERIA

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*** Student's Mentor: Mark Hamill, MD, Carilion Clinic, Trauma/Surgical Critical Care**

Abstract/Case Study: Introduction: The Beers Criteria for Potentially Inappropriate Medication (PIM) use is a list of medications that should be used with caution in adults aged 65 and older due to multiple risks. Our previous study found that 71.2% of all geriatric trauma patients at Carilion Clinic had been prescribed at least one PIM prior to their hospital presentation. The objective of this study was to develop and assess an educational system that could be distributed to providers to increase awareness regarding PIMs. Methods: Printed educational materials (PEMs) detailing the risks associated with PIM use in the geriatric population were developed, along with survey instruments assessing providers' commitment to change. Questions gauged providers' familiarity with the PEMs, what clinical changes they anticipated making, and their commitment level to making these changes. A two-month follow-up survey assessed the actual implementation of the contemplated changes. The materials were distributed through email via the REDCAP system. Results: The initial PEMs and survey were distributed to 475 providers. Overall, 44 (9.2%) fully completed the initial survey. On average, providers responded that they were familiar with 72.1% of the PEM content, ranging from 96.6% for geriatric providers to 69.7% for non-geriatric providers. The two most commonly listed commitments were to avoid specific PIMs and to review patient medication lists. On the follow-up survey, 100% of providers

reported either ‘fully’ or ‘partially’ following through with their original commitments. Conclusion: Our PEMs and surveys demonstrated varying familiarity with the risks associated with PIMs in the geriatric population, with non-geriatricians being less aware. While respondents communicated a commitment to change their practice, our efforts were hampered by overall low response rates. Based on the level of commitment and follow-through demonstrated, this method of trauma outreach might be extremely effective if participation rates could be improved.

Title: Nonsyndromic bilateral second branchial cleft fistulae: A case report

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*** Student's Mentor: William P. Magdycz, MD, Carilion Clinic , Otolaryngology**

Abstract/Case Study: Branchial cleft anomalies are rare congenital malformations that result from the abnormal persistence of branchial clefts during embryogenesis and manifest clinically as cysts, sinuses, or fistulae. In greater than 95% of cases, branchial cleft anomalies originate from remnants of the second branchial cleft. Identification of branchial cleft anomalies, particularly branchial cleft fistulae, are clinically important as these findings may be part of a larger syndromic clinical presentation such as the branchio-oto-renal syndrome, which necessitates further workup. Branchial cleft anomalies are bilateral in approximately one percent of cases; however, bilateral second branchial cleft fistulae are, for unknown reasons, much rarer. To the best of our knowledge, there have been less than ten cases of bilateral second branchial cleft fistulae recorded in the literature. In this report, we present the case of a 50-year-old women with acute-onset left-sided pain, drainage, and swelling in the lower one-third of her neck. The patient reported a history of bilateral ‘cysts’ in the lower one-third of her neck for most of her adult life, which have frequently become infected. She denied a personal or family history of renal anomalies or hearing loss. Computed tomography scan with intravenous contrast of the soft tissues of the neck revealed bilateral soft tissue tracts beginning in the region of the tonsillar fossa and extending bilaterally along the anterior borders of the SCM down to the skin surface near the level of the thyroid, consistent with bilateral second branchial cleft fistulae.

Title: Pleural lipomatosis: An often-forgotten intrathoracic tumor

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*** Student's Mentor: Evelyn M. Garcia, MD, Carilion Clinic , Radiology**

Abstract/Case Study: Lipomas are benign mesenchymal neoplasms that arise from adipocytes. Most lipomas are found in the subcutaneous tissue; however, they can be present throughout the body. Lipomas arising from the thoracic pleura are exceptionally rare and sparsely reported in the literature. While typically asymptomatic, pleural lipomas may cause compressive symptoms such as nonproductive cough, chest pain, and dyspnea if they reach adequate size. A CT scan is usually sufficient for the diagnosis and typically reveals well-defined nodules with homogenous fat attenuation of approximately -50 to -150 Hounsfield units. Management is dependent on various factors including tumor size and location, associated symptoms, and age of the patient. Pleural lipomatosis, although exceedingly rare,

should be maintained in the differential diagnosis for any well-defined, fat-attenuating pleural mass identified on conventional radiologic studies. Here we report a case of pleural lipomatosis associated with bilateral pleural effusions identified in an 83-year-old male presenting with acute onset dyspnea.

Title: Necrotizing Fasciitis Post Small Bowel Obstruction Repair in Exploratory Laparotomy.

Authors: Kermit Zhang , B.S., VTCSOM, School of Medicine , kzhang92@vtc.vt.edu; Varun Kavuru, B.S., VTCSOM, Virginia Tech Carilion School of Medicine

*** Student's Mentor: Miguel Matos , D.O., Carilion Clinic , Trauma/Critical Care**

Abstract/Case Study: Necrotizing fasciitis (NF) is a rare infection commonly caused by group A Streptococcus (GAS) bacteria of the deep soft tissues resulting in rapid progressive destruction of the skin, subcutaneous fat, and muscle fascia. The median mortality rate is high, ranging from 25% to 35%, due to the rapid progression of the infection, and often results in septic shock. Despite the advent of clinical diagnostic tools such as the laboratory risk indicator for necrotizing fasciitis (LRINEC), the infection encompasses a broad range of symptomatic presentations that make initial assessment and intervention challenging. Trauma is often the most common identifiable etiology, generally involving external injuries and surgical wounds. However, the incidence of NF as a surgical complication in the literature is rare with no clear association between infection risk and the type of procedure performed. In our review of the literature, multiple studies have shown lower infection rates of surgical wounds for laparoscopic surgery. To the best of our knowledge, there have been ten cases of NF associated with such a procedure: colonic surgery in three patients, cholecystectomy in two patients; total hysterectomy in two patients; and radical prostatectomy in three patients. Intraabdominal cases are equally scarce, with only 14 cases of NF, most frequently due to perforated appendicitis, cited in the literature. Herein, we report the case of a 66 year-old woman who recently returned from vacation in Mexico, presenting with symptoms of uncomplicated small bowel obstruction (SBO) who later developed NF post-exploratory laparotomy. Possible causes of necrotizing fasciitis associated with laparoscopic surgery include but are not limited to the direct spread to the abdominal wall from an abdominal abscess, the laparoscopic port incision site, and the hematogenous spread of toxin-producing bacteria from a site distant from the infection.

Title: Prenatal Presentation and Diagnosis of Baraitser-Winter Syndrome Using Exome Sequencing.

Authors: Kermit Zhang, B.S., VTCSOM, School of Medicine , kzhang92@vtc.vt.edu; Alexis Disilvestro, MD, Carilion Clinic, Maternal Fetal Medicine; Eleina Cox, MS, Fulgent Therapeutics LLC, Genetics

*** Student's Mentor: Kelly Usrey, MS, Carilion Clinic, Maternal Fetal Medicine**

Abstract/Case Study: Baraitser-Winter cerebrofrontofacial syndrome (BWCFF) is a rare autosomal dominant developmental disorder associated with missense mutations in the genes ACTB or ACTG1. The classic presentation of BWCFF is discerned by the combination of unique craniofacial characteristics including ocular coloboma, intellectual disability, and hypertelorism. Congenital contractures and organ malformations are often present, including structural defects in the brain, heart, renal, and musculoskeletal system. However, there is limited documentation in regards to its prenatal presentation that may encourage healthcare providers to be aware of this disorder when presented throughout pregnancy. Herein we describe a case of a pregnancy with large cystic hygroma and omphalocele.

Whole exome sequencing (WES) was performed and a de novo, heterozygous, likely pathogenic mutation in ACTB was detected, c.1004G>A (p.Arg335His), conferring a diagnosis of BWCFF.

Resident/ Fellow

Title: A Case of Cardiac Tamponade Associated with Central Line Placement

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Abstract/Case Study: Each year over five million central venous catheters are inserted. With the subclavian approach, catheter malposition and hemo-or pneumothorax were the most common complications based on a meta-analysis of over 4000 central lines. Here, we describe a rare case of subclavian central line-associated cardiac tamponade. A 41-year-old woman with a history of sickle cell-beta thalassemia presented with acute diffuse myalgia. Her vital signs were notable for hypertension (175/102 mmHg). On admission, her hemoglobin was 6.5 g/dL and peripheral access was unable to be obtained. Immediately after an unsuccessful right subclavian vein central line placement, patient developed acute chest pain and dyspnea. She became hypotensive despite fluid resuscitation and required intubation and vasopressor initiation. Compared to her admission chest X-ray, her X-ray after the attempt showed a widening of the mediastinum and a mild cardiac enlargement. In the ICU she was in refractory shock requiring four vasopressors. Echocardiogram showed a large pericardial effusion with right atrial and ventricular diastolic collapse. Emergent pericardiocentesis drained 400 mL of sanguineous fluid followed by improved hemodynamics with rapid weaning off all vasopressors. Computed tomography of the chest revealed extensive bilateral middle and basilar lung consolidations but no vasculature abnormalities. Patient's respiratory status improved, she was extubated, and she recovered well. Our patient's symptoms and chest X-ray findings after the attempt are suggestive of blood extravasation due to traumatic right subclavian puncture and tamponade development due to catheter tip entering into the pericardial space. Out of a few reports of cardiac tamponade post central line placement, only one patient did not suffer death or severe anoxic brain insult. Our case highlights a further need for simulation-based training with ultrasonography in applying practice guidelines for central venous access provided by the American Society of Anesthesiologist Task Force during and after residency to decrease the rate of complications.

Title: Late Dumping Syndrome in a Severe Major Depressive Disorder Patient

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Abstract/Case Study: Major depression has been found in some studies to lead to gastric dysmotility due to autonomic instability, which can lead to delayed gastric emptying. We present a 62-year man admitted for severe major depressive disorder with suicide attempt. Patient had hiatal herniorrhaphy done while on the inpatient unit due to recurrent esophageal regurgitation. Procedure was well tolerated with no post-op complications. One month later, rapid response got a code blue about the

patient having a seizure episode and losing consciousness. Random blood sugar revealed hypoglycemia of 44 mg/dl and patient responded after correction of hypoglycemia. Non-contrast CT ruled out ischemic stroke. He was admitted to the medicine unit for observation but had few more episodes of hypoglycemia which usually occurred 1-2 hours after meals. Patient had no history of diabetes mellitus and other possible causes of hypoglycemia including insulinoma, adrenal insufficiency, hypopituitarism and self-injection with insulin. He was seen by gastroenterology and was diagnosed to have late dumping syndrome. It is more common for patients post-esophageal or post-gastric surgery to have early dumping syndrome from rapid gastric emptying, which usually occurs immediately after eating. Late dumping syndrome whose pathophysiology is not well understood, occurs in about 0.1 to 0.3 % of patients after a gastric bypass surgery. Patient's mood was depressed and he was ruminating about death while on medicine floors admission but as his mood and suicidal thoughts improved together with some dietary changes, so were his hypoglycemic episodes. We believe that his severe major depressive disorder could play a part in the delayed gastric emptying leading to increase in insulin secretion without food available for absorption in the duodenum. Also, delayed gastric emptying due to depression possibly led to dumping of food in the duodenum 1-2 hours after eating causing a insulin surge leading to hypoglycemia.

Title: Evaluation of bivalirudin waste in the cardiac catheterization lab

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Abstract/Case Study: Purpose: Bivalirudin is an expensive direct-acting synthetic antithrombotic agent that has been approved as an alternative to unfractionated heparin for patients with acute coronary syndromes who are undergoing percutaneous coronary intervention (PCI)(1). Cardiac catheterization lab nurses often reconstitute bivalirudin ahead of time to prepare for PCI cases. However, once the provider evaluates the patient, it may not be needed, and the waste becomes an expense of the hospital. This evaluation compared the amount of bivalirudin that was reconstituted with the amount administered to determine if there was significant wasting of bivalirudin. Methods: This retrospective, single-center review included patients between May 2019 to August 2019 at Carilion Medical Center. Information collected from the patients were: patient demographics, IV heparin use prior to admission, indication for catheterization, outcome (PCI, diagnostic, CABG or medical management without balloon angioplasty or stent deployment), and amount of bivalirudin waste. Results: Three hundred seventy-seven bags of bivalirudin were removed from the automated dispensing cabinet for 301 patients. Seventeen bags of bivalirudin among 16 patients were wasted. Two patients had missing documentation in the electronic medical record. Waste occurred in 3 patients with CAD, 5 patients with NSTEMI/unstable angina, and 6 patients with STEMI. Of those patients, 11 had an outcome of PCI, 1 had diagnostic angiography, and 2 underwent medical management or CABG. Three patients with diagnostic catheterizations had an unidentified indication for using bivalirudin while the others included uses such as advanced diagnostic imaging that required engaging the coronary arteries or pork allergy.' Conclusion: Only 5% of bivalirudin waste was discovered, but the estimated cost was $19,890 based on the average wholesale price. References: 1. Stone GW, McLaurin BT, Cox DA, et al. Bivalirudin for patients with acute coronary syndromes. The New England Journal of Medicine. 2006;355(21):2203-16.

Title: Finding treatment targets for traumatic brain injury and post-traumatic epilepsy

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Abstract/Case Study: Focal traumatic brain injury (TBI) induces astrogliosis, a process essential to protecting uninjured brain areas from secondary damage. However, astrogliosis can cause loss of astrocyte homeostatic functions and possibly contributes to comorbidities such as post-traumatic epilepsy (PTE). Scar-forming astrocytes seal focal injuries off from healthy brain tissue. It is these glial scars that are associated with epilepsy originating in the cerebral cortex and hippocampus. However, the vast majority of human TBIs also present with diffuse brain injury caused by acceleration-deceleration forces leading to tissue shearing. The resulting diffuse tissue damage may be intrinsically different from focal lesions that would trigger glial scar formation. Here, we used mice of both sexes in a model of repetitive mild/ concussive closed-head TBI, which only induced diffuse injury, to test the hypothesis that astrocytes respond uniquely to diffuse TBI and that diffuse TBI is sufficient to cause PTE. Astrocytes did not form scars and classic astrogliosis characterized by upregulation of glial fibrillary acidic protein was limited. Surprisingly, an unrelated population of atypical reactive astrocytes was characterized by the lack of glial fibrillary acidic protein expression, rapid and sustained downregulation of homeostatic proteins and impaired astrocyte coupling. After a latency period, a subset of mice developed spontaneous recurrent seizures reminiscent of PTE in human TBI patients. Seizing mice had larger areas of atypical astrocytes compared with non-seizing mice, suggesting that these atypical astrocytes might contribute to epileptogenesis after diffuse TBI.

Title: Eagle syndrome: A rare case of atraumatic cervical neck swelling

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Abstract/Case Study: Painful neck swelling is a common emergency complaint but can present diagnostic challenges. Eagle syndrome is a rare clinical entity in which a pathologically elongated styloid process or ossified stylohyoid ligament produces a constellation of symptoms in the head and neck region of unilateral cervicofacial pain, globus sensation, and dysphagia. While the majority of Eagle syndrome cases are found serendipitously or with chronic complaints, spontaneous, atraumatic fractures of an elongated styloid process can occur with serious complications including airway impingement. In this report, we present the case of a 50-year-old with a spontaneous, atraumatic fracture of an elongated styloid process associated with hematoma formation and radiological findings of airway impingement, which demonstrates the importance of awareness for this rare condition.

Title: Symptom Frequency Preceding Non-Hereditary Young Onset Colorectal Cancer Diagnosis

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Abstract/Case Study: The incidence of patients under fifty years of age diagnosed with non-hereditary colorectal cancer is increasing. While some risk factors associated with this cancer have been elucidated, others like gastrointestinal symptoms preceding diagnosis have not been identified. We aimed to assess the frequency of gastrointestinal and non-gastrointestinal related signs and symptoms preceding cancer diagnosis in young patients and assessed its survival impact. In this retrospective observational study, we randomly selected patients < fifty years old with histopathologic diagnosis of non-hereditary colorectal adenocarcinoma at Carilion from 2002-2017. Patients with inflammatory conditions or predisposing genetic syndromes were excluded. Demographics, gastrointestinal symptoms, procedures (index colonoscopy), and mortality were obtained. The cumulative mortality risk among symptomatic patients was estimated using Kaplan Meier curves. One hundred and thirty-nine patients (Mean age, 41.6±6.9 yrs; 53.2% males) with non-hereditary colorectal cancer were identified. Presenting signs and symptoms included rectal bleeding (45.3%), abdominal pain (36.0%), diarrhea (23.0%), constipation (18.7%), weight loss (17.3%), nausea with vomiting (10.8%), rectal pain (2.2%), bloating (2.2%), microcytic anemia (17.3%), and others (12.9%). Cancer was diagnosed after a mean of 4.5+11.4 months with rectal cancer as the most common site (31.4%), followed by sigmoid cancer (25.4%). Twenty-eight patients (20.1%) were asymptomatic at time of diagnosis, 95 (68.5%) had between 1 to 3 signs or symptoms, and 16 (11.5%) had more than 3 signs or symptoms. Roughly 17% of the patients presented with advanced disease; the majority (94.4%) had 1 to 3 signs or symptoms. The median survival was lower in patients with more signs and symptoms (>3) on initial presentation (P=0.046). Non-hereditary colorectal cancer diagnosis was delayed in young patients by four and a half months and rectal bleeding was the most common presenting symptom. The survival of patients with more signs and symptoms was decreased compared to patients with less on presentation.

Title: Project DeFT, De-adopting Fecal Occult Blood Testing: Quality Improvement Project

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Abstract/Case Study: Introduction: In-hospital testing for gastrointestinal hemorrhage with guaiac fecal occult blood testing (gFOBT) is a low-value test that is not recommended by gastroenterological societies nor Carilion Roanoke Memorial Hospital's (CRMH) gastroenterologists. Aims: We aimed to assess the current impression of gFOBT usefulness in the inpatient setting within CRMH's internal medicine residency program and tracked changes in resident knowledge of gFOBT indications after providing educational sessions regarding the most up to date gFOBT guidelines. Methods: A three-question survey regarding gFOBT usefulness for gastrointestinal bleeding workup (Q1), whether gFOBT is required before gastroenterology consultation (Q2), and if gFOBT is appropriate for gastric samples (Q3) was emailed to residents. Shortly thereafter, residents were provided a five-minute lecture on

gFOBT indications and contraindications, with recommendations to discontinue its hospital use. An identical post-survey was then sent to all residents to assess for knowledge improvement in gFOBT utility. Results: The sample size for pre-survey and post-survey responses included fifty and thirteen IM responders, respectively. Sixty-four percent of residents correctly responded to Q1 and Q2 during the pre-survey, and seventy-six percent responded correctly to Q3. Twenty-four residents attended the lecture, and post-survey results revealed one hundred percent of residents responding correctly to Q1 and Q2, while nearly eighty-five percent responded correctly to Q3. Conclusion: Initial survey results revealed over half of IM resident responders understood gFOBT indications in the hospital, and three quarters recognized their futility in gastric sampling. Responders demonstrated knowledge improvement through post-survey results following lectures based on post-survey data. Future directions include expanding this project to family and emergency medicine (EM) residencies, as they also often investigate inpatient gastrointestinal hemorrhage. Another avenue for advancement would be to create continuing medical education literature for IM and EM attendings as well as advanced care providers, with the goal of completely eradicating gFOBT from the hospital.

Title: Preprosthetic Surgical Management of Maxillary and Mandibular Bony Exostoses

Authors: Nader Burpee, DMD, Carilion Clinic, Carilion Dental Clinic, ndburpee@carilionclinic.org;

Abstract/Case Study: Background and Overview: The author reports the case of a patient with osteoporosis managed with bisphosphonate medication (Fosamax) and presenting with rarely seen maxillary and mandibular bony exostoses. The patient was assessed through clinical examination and radiographic analysis, and bony exostoses were removed in order to allow use of removeable denture prostheses. Case Description: A 53year-old woman, receiving treatment for osteoporosis via bisphosphonate medication (Fosamax) with a desire for dentures presented with large, bilateral maxillary bony exostoses and multiple mandibular bony exostoses. With informed consent and discussion over the potential risks of MRONJ, maxillary and mandibular exostoses were surgically removed under IV sedation. After eight weeks healing, complete upper and lower removable complete denture prostheses were fabricated and delivered to the patient. Conclusions and Practical Implications: The cause of maxillary and mandibular exostoses is unknown, but genetic factors, environmental factors, masticatory hyperfunction, and continued growth cycles have all been proposed as causative factors. Due to the nature of denture use within the oral cavity, the undercuts created by exostoses must be removed in order to fabricate a prosthesis that fits comfortably, can be retained in the oral cavity, restores natural anatomical contours including cheek fullness, lip support, allows for proper phonation, and accommodates masticatory function. Due to the variable nature of exostoses growth patterns, complete visualization of the surgical area is an essential component to successfully removing the bony growths and establishing anatomically correct alveolar ridges. Dentists must also be comfortable with hard and soft tissue anatomy to carry out the removal process with patient safety as a top priority. Preprosthetic surgery is an important skillset for any dentist to develop, allowing them to take their patients from an edentulous state to one reestablishing function, phonetics, and esthetics via prosthetic appliances.

Title: Simulated Fascia Iliaca Nerve Blocks: Horizontal vs 45-degree Approach

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Abstract/Case Study: Background: Ultrasound (US) guided fascia iliaca blocks provide safe, effective analgesia to hip fracture patients while limiting opioid administration making it an important skill for EM physicians to master. There is minimal objective data evaluating the effectiveness of models in improving provider confidence and accuracy for this procedure. In addition, there is minimal data considering the optimal angle of approach to improve visualization and successful placement. We hypothesized that a short educational program would increase providers' procedural competence. Methods: The design module used a standardized, 20-minute lecture on the fascia iliaca block technique. Trainees at a level 1 trauma center performed simulated blocks with a pork model including plastic wrap to recreate the fascial plane. Water balloons and spaghetti recreated the neurovascular bundle. Learners used two needle approaches (45-degree and horizontal) with echotip needles during simulation. US faculty reviewed video clips of each procedure. Needle visualization, placement accuracy and comfort level were assessed by participants and faculty. Accuracy of needle placement and quality of visualization were assessed by faculty using a 10-point visual analog scale. Statistical analysis considered overall comparative data. Results: Twenty-five participants (n=25) were included in the study. US needle visualization using a horizontal approach was scored higher by learners than a 45-degree angle approach (difference between groups = 13.6%). The horizontal needle approach, when compared to the 45-degree approach, was demonstrated to improve needle visualization by a mean 38.5% ($p<0.01$) with placement accuracy improving 15.5% ($p=0.09$) when assessed by faculty reviewers. Participant comfort level increased by 73.9% following the training session. Conclusion: This nerve block simulation model demonstrated effective training, superior needle visualization, and enhanced placement accuracy with the horizontal approach compared to the 45-degree approach.

Title: Analyzing Outcomes of Digital Amputation

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Abstract/Case Study: Purpose: To examine the relationships between clinical factors (smoking, diabetes, peripheral vascular disease, dialysis, indication for amputation, level) and time-to-death and time-to-revision among digital amputation patients. Methods: The medical records for all primary or revision amputations over 10 year s (2008-2018) by board certified hand surgeons at a level 1 trauma center were reviewed for indication and patient factors. 484 amputations among 360 patients met inclusion criteria, with 358 performed for trauma and 126 for infection or necrosis. Time-to-death and time-to-revision were analyzed within the populations utilizing Kaplan-Meier methodology with comparisons using univariate Cox proportional hazards. Results: Among trauma patients (N=256), survival rates at 5 and 10 years were 94.4% and 77.7%, respectively. Among infection/necrosis patients (N=104), survival rates at 5 and 10 years were 57.3% and 17.5%, respectively. Statistically significant differences in time-to-death among infection/necrosis patients were observed for diabetes ($p=0.0094$) and dialysis ($p=0.0035$). Among all amputations, statistically significant differences in time-to-revision were observed among subpopulations. Patients requiring amputation due to an infection/necrosis had over a 2-fold increased odds of requiring revision (HR=2.17, 95% CI=1.14-4.13, $p=0.0177$). Conclusions:

The probabilities of mortality and revision amputation are significantly predicted by diabetes, peripheral vascular disease, and dialysis. Within matched populations, amputation for infection/necrosis has a mortality hazard ratio of 3.19 (CI1.47-6.93) and a mortality and/or revision hazard ratio of 2.56 (1.54-4.25). The prognostic implications of this data should be considered by hand surgeons when counselling patients on likely outcomes and may prompt discussions related to goals of care when facing this population.

Title: Volume/EF discrepancy between QPS and Corridor4DM in Nuclear Cameras

Authors: Charles Cui, MD, Virginia Tech Carilion School of Medicine, Cardiology, cqcui@carilionclinic.org; Matthew D. Roby, MD, Virginia Tech Carilion School of Medicine, Cardiology; Matthew M. Schumaecker, MD, Virginia Tech Carilion School of Medicine, Cardiology

Abstract/Case Study: Left ventricular volume and systolic function are vital to clinical management of patients who undergo myocardial perfusion imaging stress testing. There has been no study comparing the two common software used for analysis, QPS and Corridor4DM to determine if there is a significant difference in their values for end diastolic volume, end systolic volume and estimated ejection fraction. A retrospective chart review of 300 patients was conducted in patients who underwent myocardial perfusion imaging. 220 of those patients were identified to have undergone ragadenosen as the stress modality and 74 patient with treadmill as the stress modality. 6 patients were excluded due to inadequate data measurements. In the treadmill group, 4DM measured end diastolic volume (EDV) higher by an average mean difference 14.4 compared to QPS. End systolic volume (ESV) was higher as well on 4DM by an average mean difference of 5.2. Both values were statistically significant on a paired T test with p value <.0001 which was used in the setting of a non-normal distribution. In the lexiscan group, 4DM again demonstrated a higher EDV and ESV with average mean difference higher of 18.7 and 9.7 respectively. Both values were significant on paired t-test with p value <.0001. Regarding ejection fracture, there was no significant difference between the two software in the treadmill group. However, in the lexiscan group, QPS was slightly higher by an average mean of 0.75 which was significant on paired T test with p value 0.0043. With both stress modalities, 4DM measures EDV and ESV significantly higher than QPS. Ejection fraction difference is not significant in the treadmill group and only mildly increased for QPS in the lexiscan group. This clear discrepancy should be noted in interpretation of future data using the two software for MPI studies.

Title: Emergent Placement of Transcaval Impella CP in Cardiac Arrest

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Abstract/Case Study: Transcaval/Caval-aortic approach involves arterial access from the inferior vena cava into the abdominal aorta. In patients with arterial disease that precludes traditional methods, a transcaval access has been well documented for placement of transcatheter aortic valves (TAVR) for severe aortic stenosis. We report the use of a transcaval Impella CP in a patient with refractory cardiac arrest following an anterior STEMI. A 59 year old Caucasian woman with a medical history of coronary artery disease presents with an anterior ST elevation myocardial infarction (STEMI). After intervention to

the mid left anterior descending artery (LAD), she develops ventricular fibrillation arrest. With vasospasm in both femoral and subclavian arteries, access was limited for mechanical support. A transcaval Impella CP was placed emergently during cardiac arrest. Following 45 minutes of cardiopulmonary resuscitation, patient obtained return of spontaneous circulation (ROSC) and was transferred to the cardiac intensive care unit where she demonstrated purposeful movements. To our knowledge, a case report of transcaval Impella CP during cardiac arrest has not been published. As the patient population develops more significant vascular disease, alternate means of arterial access is essential. In the setting of heroic measures in the catherization lab, patient had improved perfusion with transcaval access. As demonstrated in this case, emergent transcaval access is both a feasible and effective method of obtaining arterial access in patients who do not have other options.

Title: Revascularization with Discordant Invasive and Non-invasive Physiologic Lesion Assessment

Authors: Charles Cui, MD, Virginia Tech Carilion School of Medicine, Cardiology, cqcui@carilionclinic.org; Matthew Cauchi, MD, Virginia Tech Carilion School of Medicine, Cardiology; Jacek Slowikowski, MD, Virginia Tech Carilion School of Medicine, Cardiology

Abstract/Case Study: When there is conflicting data between invasive and non-invasive physiologic lesion assessment, cardiologists need to understand the nuances of each modality to provide high-quality patient care. This case highlights the importance of a systematic approach to evaluating intermediate lesions in a patient with typical angina, negative invasive fractional flow reserve (FFR) and positive non-invasive coronary flow reserve (CFR) by PET imaging. A forty-eight-year-old female with active tobacco abuse presented with typical, exertional chest tightness with radiation to the jaw. A cardiac catheterization notable for a 40%, eccentric lesion at the ostium of the LAD. An FFR value of 0.90 was measured and revascularization was deferred. The patient continued to have exertional angina despite medical therapy and underwent a gated myocardial perfusion imaging study with PET. This demonstrated a reversible, moderate to severe area of ischemia in the territory of the LAD with compromised CFR at 1.82. The patient underwent surgical revascularization with LIMA-LAD with complete resolution of symptoms. For many, FFR remains the current 'gold standard' for invasive physiologic assessment in angiographically intermediate coronary lesions. However, reliance on these recordings may result in a failure to recognize true ischemia due to several procedural and patient-specific factors, owing to false negative findings. Given the patient's persistent symptoms of typical angina, additional ischemic risk-stratification was warranted and resulted in a significant change in patient care. In summary, revascularization of intermediate lesions should be physiologically evaluated with both invasive and non-invasive modalities, especially when clinical suspicion is high, and findings are discordant. Currently, there is no consensus regarding the combined use of FFR and CFR in these scenarios. Ultimately, cardiologists must rely on their understanding of coronary physiology as it pertains to both testing modalities when discussing revascularization.

Title: Factors Affecting R01 Grant Funding Among Academics Neurosurgeons

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DO, Carilion Clinic, Virginia Tech Carilion, Neurosurgery; Eric A. Marvin, DO, Carilion Clinic, Virginia Tech Carilion, Neurosurgery; Mark R. Witcher, MD, PhD, Carilion Clinic, Virginia Tech Carilion, Neurosurgery

Abstract/Case Study: Purpose: Recent studies have reported a gender and medical degree disparity for those receiving Research Project Grants in surgical specialties. The aim of the present study is to analyze factors among academics neurosurgeons that correlate to higher amounts of R01 grant monies awarded. Methods: The National Institutes of Health Research Portfolio Online Reporting Tools Expenditures and Results database was queried for neurosurgery funding between 2008 and 2018. Grant recipients were categorized among type of degree, secondary degree(s), professorship, gender, and h - index. Data was analyzed with statistical methods. Results: The National Institutes of Health awarded 480 R01 grants totaling $182,482,644 to 81 allopathic neurosurgeons between 2008 and 2018. No osteopathic neurosurgeons were awarded an R01 grant during this timeframe. There was a significant difference for type of professorship on the total awarded amount at the $p < 0.05$ level for the three types of professorship [$F(2,78) = 4.85$, $p < 0.01$)]. There was a significant difference for magnitude of h ' index on total R01 monies ($p < 0.00001$). Males accounted for the majority of R01 monies (93.99%); however, no significant difference between average amount awarded and gender was identified ($p = 0.86$). A secondary degree was without significant difference for R01 amount awarded ($p = 0.75$). Conclusions: The present study establishes a medical degree disparity for academic neurosurgeons who receive an R01 grant. Statistically significant factors found to affect amount of R01 grant monies awarded were limited to type of professorship and magnitude of h ' index.

Title: Outpatient antibiotic prescribing for acute otitis media in pediatric patients

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Abstract/Case Study: Current treatment guidelines for acute otitis media (AOM) in pediatric patients provide differing recommendations for initial management. Antimicrobial therapy and watchful waiting are outlined as appropriate options. Core Elements of Outpatient Antibiotic Stewardship, developed by Centers for Disease Control and Prevention, recognizes delayed antimicrobial prescribing and watchful waiting for conditions including mild AOM. These strategies are evidence-based approaches that can safely decrease antimicrobial use, adverse events, and development of resistance. The purpose of this evaluation is to characterize the appropriateness of antimicrobial prescribing for AOM in pediatric patients aged 2 months to 18 years old at pediatric outpatient facilities. This evaluation is a retrospective, observational, cross-sectional design of pediatric patients who were diagnosed with AOM between July 2018 and July 2019 at a pediatric outpatient facility. Patients were excluded if they had recurrent AOM and/or receipt of non-systemic antimicrobials. Data collection endpoints include demographics (e.g., age, sex, weight, beta-lactam allergy), clinical symptoms (e.g., otalgia, otorrhea, temperature), infection history (e.g., previous antimicrobial use, prior AOM episode), and AOM management (e.g., antimicrobial prescribed, watchful waiting, antimicrobial appropriateness). Descriptive statistics were used to describe all variables collected. This project has been reviewed by the Institutional Review Board and determined not to be human subject research. Results include the characterization of the outpatient prescribing practices and patient population receiving antimicrobials for AOM, the appropriateness of antimicrobials for AOM according to current pediatric guideline

recommendations, and the rates of treatment failure for patients receiving antimicrobials for AOM. Institutional guidelines will be updated utilizing the results of this evaluation and additional education to providers will be given in order to minimize treatment failure, antimicrobial resistance, and adverse events.

Title: Patient compliance with postpartum long-acting reversible contraception (LARC) placement

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Abstract/Case Study: The purpose of this study is was to evaluate patient compliance with delayed versus immediate postpartum long-acting reversible contraception (LARC) placement. A secondary outcome was the pregnancy rate at one year. This was a quality improvement assessment with retrospective chart review of patients who delivered 12 months prior to and 12 months after implementation of immediate postpartum LARC. Patients included in the study group were insured by Medicaid and desired LARC immediately postpartum. The control group included those insured by Medicaid and desired a delayed LARC. The patients excluded were those that received delayed postpartum LARC at greater than 8 weeks, desired alternative form of contraception, or had contraindications for placement. 369 patients were assigned to the delayed postpartum LARC group; of which 40% had it placed. 189 patients were assigned to the immediate postpartum LARC group; of which 87% had it placed. Of the intrauterine devices (IUD) placed immediately postpartum, 27% were expulsed, which was more likely after a vaginal delivery (p=0.00013). The delayed LARC group had 31 pregnancies at one year, including those who did not get it placed because of lack of compliance. The immediate LARC group had eleven pregnancies at one year. Seven of these pregnancies were in patient whose IUD was expulsed and four were in patients that had the LARC removed. Patients that did not have the LARC placed at their postpartum visit were three times more likely to be pregnant at one year. This is consistent with the argument that immediate LARC placement will increase patient compliance and decrease short interval and undesired pregnancy rates. Implementation of a policy for access to immediate postpartum LARC placement improves patient access and compliance to effective contraception.

Title: Dermatitis artefacta presenting in the setting of severe iron-deficiency anemia

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Abstract/Case Study: Dermatitis artefacta (factitial dermatitis) is a rare factitious disorder characterized by self-inflicted skin lesions wherein the patient refuses to acknowledge his or her role in the injuries in order to assume a sick role. Self-injury can be conscious or unconscious. We present a case of a 66-year-old female referred to dermatology for evaluation and treatment of progressive leg ulcerations. She had previously been evaluated and treated by her primary doctor, wound care, and acute care services with multiple rounds of systemic antibiotics for a presumed infectious cause of her severe ulcerations. At the dermatology office, her skin exam revealed angulated, geometric erosions and ulcerations with

thickened, lichenified, scarred borders diffusely on the lower extremities and less severely on the face and upper extremities. Diagnosis of dermatitis artefacta was suspected and further confirmed with a biopsy. Chronic ulcerations improved rapidly with weekly application of occlusive unna boots to the most severely affected leg, which prevented her from inducing further wounds. Interestingly, her factitial dermatitis initially started just before she was hospitalized for severe iron deficiency anemia. At that time, her hemoglobin was 2.3 g/dL and iron and ferritin were nearly undetectable. Dermatology evaluation and improvement of her ulcerations also corresponded with hematology follow-up and improvement in her iron-deficiency anemia, prompting the question of whether or not the severe anemia was partially causative for her aberrant behavior. Iron deficiency anemia is commonly associated with behavioral disturbances, most notably pagophagia, but it has also rarely been associated with neurotic excoriations, a condition distinct from dermatitis artefacta in which patients admit to compulsively inducing skin lesions. This is the first known case of dermatitis artefacta occuring in the setting of severe iron deficiency anemia.

Title: Infantile Botulism: Early Diagnosis, Proper Reporting, Treatment, and Prevention.

Authors: Scott Keel, MD, VTCSOM Pediatrics Residency, University of Kentucky Preventative Medicine, Pediatrics, dr.rodneyscottkeel@gmail.com;

Abstract/Case Study: Infantile botulism still exists in Virginia. Because it is rare, medical providers may not recognize the disease or know how to acquire treatment. In addition, most of the public is unfamiliar with ways to protect babies from the potentially fatal disease. We present two previously healthy infants from Southwestern Virginia with poor feeding. They were weak, somnolent, and had reduced output. A thorough workup ruled out metabolic, infectious or traumatic causes. Their symptoms continued to progress to a weak suck and difficulty breathing which required intensive medical care. With assistance from the health department and the Infant Botulism Prevention and Treatment Center, Botulism Immune Globulin (BIG-IV) was started within 48 hours of admission. Both patients had excellent outcomes with proper supportive care and timely treatment. Their stools eventually returned positive for botulinum toxin B. Both families had a caregiver in construction as the probable source. When caring for a weak infant with poor feeding, botulism must be considered. Once other emergent diagnoses are ruled out, treatment with BIG-IV becomes crucial. Early treatment significantly decreases disease-associated morbidity by neutralizing circulating toxins. These two cases illustrate the typical presentation of infantile botulism, an approach to management, the possible clinical course, and opportunities for prevention. We created two handouts to emphasize this important public health message. The first is a step-by-step guide for the medical team who suspects a case of infantile botulism. It stresses early clinical diagnosis, proper reporting, and access to treatment. The second handout targets caregivers and educates on the importance of a clean formula preparation area and reminds those in high-risk occupations to remove soiled clothes and wash their hands before contact with infants. As always, effective treatment is not necessary with effective disease prevention.

Title: Hemolytic Anemia and Kidney Injury in patient with Rubinstein-Taybi Syndrome

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Abstract/Case Study: ADAMTS13 is a protein synthesized in the liver that functions to cleave von Willenbrand factor (vWF). vWF is anchored on the endothelial cells throughout the vasculature which

acts as a bridging molecule at the site of vascular injury. When there is a defect or deficiency in ADAMTS13, this results thrombosis due to impaired homeostasis which is referred to thrombotic thrombocytopenic purpura (TTP) a type of microangiopathic hemolytic anemia. A 56-year-old female with history of Rubinstein-Taybi Syndrome presents with 4 day history of diarrhea and progressive somnolence. She had no urine output and creatinine of 2.82mg/dL. Stool culture was positive for E. coli 0157. Laboratory studies revealed hemoglobin 6.9g/dL, reticulocyte count 4.6%, haptoglobin <20mg/dL and peripheral smear significant for schistocytes. She developed seizure activity. Patient started on plasma exchange for suspected HUS/TTP. ADAMTS13 level was found to be in normal rage at 73% (normal greater than 68%). She regained urine output without need for dialysis. At her two month follow-up, labs had near normalized with a hemoglobin 10.2g/dL, haptoglobin 155mg/dL and reticulocyte count 1.4% and creatinine back to baseline at 1mg/dL. Hemolytic uremic syndrome (HUS) is a rare cause of thrombotic microangiopathy (TMA). HUS typically presents with microangiopathic hemolytic anemia, thrombocytopenia, and small blood vessel thrombi resulting in end organ damage. TMA can be precipitated by Shiga toxin (STx) producing organism, most commonly O157H7. TTP is distinguished from HUS by an abnormally low ADAMTS13 activity. In our patient, ADAMTS13 was within the normal limits suggesting that our patient had Shiga toxin-mediated TMA. Stx stimulates wWF release from the endothelial cells and affects ADAMTS13 by impairing its ability to facilitate vWF proteolysis. This case illustrates the overlap of the thrombotic microangiopathic syndromes.

Title: Antibiotic prescriptions influence risk of mental illness in adults

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Abstract/Case Study: Growing evidence suggests that gut microbiome dysbiosis may contribute to an individual's risk of mental illness. Antibiotics are widely prescribed in the United States; however, the potential for these drugs to disrupt a healthy gut microbiome is largely overlooked. Several case reports have linked antibiotic use to psychiatric risk, but there is a lack of large, case-control studies. Here we used a collection of patient electronic medical records using the TriNetX database (https://www.trinetx.com/), which included more than 30 million patients in 26 healthcare organizations across the globe, to assess the risk of mental illness in patients that were prescribed antibiotics (versus patients without antibiotics) during a one-year window by determining the risk ratio 1.5-5 years following the end of this one-year timeframe. We found that a) adults between the ages of 18-50 years old were more likely to be diagnosed with new psychiatric disorders and comorbid substance use disorders following antibiotic prescription, and b) that individuals that received multiple antibiotic prescriptions within a one-year timeframe were at particularly high risk. Notably, these effects were specific to antibiotic prescriptions, with no significant impact on psychiatric risk with patients receiving one or more prescriptions for other drug classes known to affect the gut microbiome. Our data are the first to indicate that antibiotic prescriptions increase the risk of various mental illnesses and comorbid substance use disorders in an age- and sex-dependent manner. The current study provides further evidence that disruption of the gut microbiome may play a key role in the etiology of neuropsychiatric disorders.

Title: Evaluation of sotalol-dosing in patients at a multi-center health system

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Abstract/Case Study: Sotalol, a class III antiarrhythmic with FDA approved indications for atrial fibrillation/flutter (AFF) and ventricular arrhythmias, is renally eliminated. Corrected QT interval (QTc) prolongation, hypotension, and bradyarrhythmia are common dose related adverse effects of sotalol. For patients with AFF, sotalol is dosed twice daily in patients with creatinine clearance (CrCl) > 60 mL/min, once daily in patients with CrCl between 40 and 60 mL/min and it is contraindicated in patients with CrCl < 40 mL/min. The purpose of this study was to evaluate the percentage of time sotalol was dosed appropriately for renal function and to determine if adverse effects are associated with improper dosing. This multi-center, retrospective chart review involved patients who received sotalol during their hospital stay at all Carilion Clinic facilities. The electronic medical record was utilized to identify patients eighteen years of age and older that had been ordered oral sotalol during their hospital stay from July 2018 to June 2019. The first 150 patients were selected from a generated report containing every patient who received sotalol during the specified time period. The following data was collected: age, gender, height, weight, presence of bradycardia, presence of hypotension, presence of device, indication, dose appropriateness, non-cardiac adverse drug effects, baseline QTc, presence of prolonged QTc, drug interactions, prior to admission dose, and presence of pharmacy interventions on renal recommendations. The primary outcome was the percentage of time sotalol was dosed appropriately for renal function. Sotalol was dosed appropriately for renal function in 73% of the patients. Most common adverse effects included bradycardia and hypotension due to drug interactions. All patients had a baseline serum creatinine upon initiation of sotalol. Non-cardiac adverse effects were not seen in the population studied. All pharmacy interventions were related to either dose change or prolonged QTc monitoring.

Title: Sports Medicine Specialists for Retired and Current Professional Soccer Players

Authors: Rahul Nadendla, MD, Virginia Tech - Carilion Clinic, Department of Emergency Medicine, rnadendla@carilionclinic.org; Tom Swaffield, MD, Penn State Milton S. Hershey Medical Center, Department of Pediatrics; Robert Russell, MD, UVA Medical Center, Department of Emergency Medicine; Ram Seeni, MD, George Washington University, School of Medicine

Abstract/Case Study: Professional athletes lose access to their team sports medicine specialists at time of retirement. We conducted a survey study of current and retired Major League Soccer (MLS) players to assess the interest and necessity for better access to sports medicine physicians during retirement. Survey questions were sent to members of the MLS Players Association, which included current and retired MLS players. Survey data was collected for approximately 3 months. All responses were de-identified. There were 233 completed surveys and 4 incomplete surveys for a total of 237 respondents. Of all respondents, 128 identified as retired and 104 identified as current players. 47% of all players stated they have lingering injuries that require medical therapy. 55% of retired respondents stated they have searched for sports medicine specialists since retirement. Of retired athletes, 72% would have been willing to pay a monthly fee for access to concierge sports medicine at retirement. Additionally, 63% of retired players and 49% of current players stated they would be willing to pay a monthly fee now for access to concierge sports medicine providers. 89% of retired athletes stated at time of retirement, they would have been interested in being referred to a sports medicine clinic with a focus on caring for

retired athletes. At retirement 52% of respondents stated their PCP handled all sports-related medical care. Only 17% stated their team physician continued to be their care provider. Our survey results suggest that there is a continued need for access to operative and non-operative Sports Medicine specialists beyond an athletes' playing days. With a slight majority of retired players seeking Sports Medicine specialists since retirement and half stating they have lingering injuries as a result of playing professionally, the need for Sports Medicine trained physicians is essential.

Title: Evidence-Based Management of BRUEs: A Quality Improvement Study

Authors: Margaret E. Nelson, MD, Pediatrics Resident, PGY-2, Pediatrics, menelson@carilionclinic.org; Lisa A. Uherick, MD, Medical Director, Pediatric Emergency Department, Emergency Medicine

Abstract/Case Study: A BRUE, or Brief Resolved Unexplained Event, is an episode experienced by an infant that lasts less than one minute, has at least one defining characteristic such as change in tone or color, and is otherwise unexplained. These episodes, due to their uncertain nature in a vulnerable population, have been inconsistently treated, leading to unnecessary labs, imaging, and admissions. In 2016, the American Academy of Pediatrics released guidelines for low-risk BRUEs which include minimal testing, shared-decision making, and CPR training. High-risk BRUEs, which are defined by certain criteria, have a more serious differential and require more comprehensive testing. Carilion Clinic is currently part of a multi-center quality improvement project which aims to determine whether institutions are adhering to these guidelines. Initial retrospective data was obtained by reviewing the charts of patients who presented to our hospital with a BRUE over the past 3 years (Carilion's n=20, total multi-center study n=1113). These charts were compared to non-BRUE patients, high-risk BRUE patients, and BRUE patients at outside hospitals. We found that Carilion physicians correctly classified BRUEs approximately 85% of the time (as compared to the overall average of 52%), but documented 3 of the 4 required criteria less frequently (70% compared to 64% nationally), and rarely classified risk category (15% compared to 18%). CPR training was seldom offered. Multiple quality improvement interventions were implemented in the fall of 2019 to improve performance in these areas, and we will review more charts in the coming weeks to determine whether adherence to guidelines has improved. In summary, a more evidence-based approach to infants with BRUEs should help to limit unnecessary testing and identify higher risk patients who require further workup. Our project aims to enhance our institution's performance in delivering appropriate care to pediatric patients with BRUEs.

Title: Healing environment in the fertility clinic

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Abstract/Case Study: With an increasing focus on the influence of the physical environment on health outcomes, the ideal healthcare ambience for the well-being of this patient population has not been investigated. The purpose of our study was to determine if alterations in the ambient environment have an impact on the anxiety level and/or satisfaction of patients undergoing fertility treatment. We conducted a cross-sectional survey study. The healing environment intervention included: a cooperative coloring activity in the waiting room, lowering and warming lights in exam and waiting rooms, maintaining a low noise level and using sound machines in exam rooms, utilizing a mild calming natural aroma, and maintaining a comfortable temperature for equipment. The primary outcome was

psychological well-being as measured by the validated State-Trait Anxiety Inventory (STAI) 6-Y survey which was self-administered at the time of the patient visit. The secondary outcome of patient satisfaction was evaluated using the Press-Ganey Survey in follow up to the patient visit as per institutional protocol. T-test and fisher exact tests were used for statistical analyses. Power analysis demonstrated a need for 35 surveys from each phase of the study to achieve 80% power to detect an effect size of .40 in STAI scores. A total of 37 and 48 surveys were conducted pre and post intervention, respectively. The average scores during the pre and post 'healing environment' were 35 and 32, respectively (p = .26). Only the component assessing 'feeling upset' demonstrated a statistically significant difference between the groups (21.62% versus 6.25% for a score of 2 and 0% versus 6.25% for a score of 3, p = .0396). There was no significant difference in overall STAI scores pre and post intervention. Differences in patient satisfaction scores are yet to be determined.

Title: Chronic Cough - A Rocky Road to a Rare Diagnosis

Authors: Eric C. Noh, DO, Carilion Clinic, Family Medicine, ecnoh@carilionclinic.org; Priscilla Tu, DO, Carilion Clinic, Family Medicine; Amy Doolan, DO, Carilion Clinic, Family Medicine; Eric Chen, MD, Carilion Clinic, Family Medicine

Abstract/Case Study: Tracheobronchopathia Osteochondroplastic (TO) is a benign condition characterized by cartilaginous and osseous nodules protruding into the distal trachea and bronchi. Majority of patients with TO are asymptomatic but may also have nonspecific symptoms, including a productive cough or dyspnea upon exertion. Diagnosis of TO can be made by a computed tomography (CT) scan, bronchoscopy, or histopathology. This case illustrates an uncommon disease that was overlooked on initial CT scans and diagnostic bronchoscopy. This 73-year-old caucasian male was referred to the pulmonologist for his refractory cough. He was presumed to have chronic obstructive pulmonary disease given his 50 pack-year smoking history and prescribed three different inhalers. A bronchoscopy was performed due to a persistent tree-in-bud opacification of the right lower lung noted on previous CT scans. The bronchoscopy revealed uneven ridges in the trachea and right bronchus, but these findings were overlooked due to the diffuse purulent secretions and mucosal fibrous stranding consistent with chronic bronchitis. Therefore, in addition to the inhalers, the patient was started on daily prophylactic azithromycin. After one year of frequent office visits and hospitalizations, the patient had another bronchoscopy during a hospitalization for recurrent pneumonia. The final impression specifically noted prominent TO nodules found in the trachea and right main bronchus. His treatment regimen was subsequently changed to hypertonic saline with an albuterol nebulizer and an inhaled corticosteroid inhaler. TO was first described by Wilks in 1867, however, only approximately 400 cases have been documented. Due to the rarity of TO, the etiology and treatment guidelines remain unclear. A 2014 clinical study in China investigated the role of inhaled corticosteroids in the management of TO given the presence of inflammatory cells. The results are promising, with overall improvement of symptom scores and quality of life.

Title: Treatment of subacute/chronic extremity pain with FDM in the ED

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Abstract/Case Study: STUDY PURPOSE: To identify whether a low-cost, minimally invasive, one-time manual medicine intervention (fascial distortion model, FDM) is effective for the management of subacute and chronic extremity pain in the emergency department (ED). Demonstration of benefit may have far-reaching implications including reduction of pain medication use in the ED, shortened ED visit times, and future use of this intervention in the outpatient setting for chronic pain management. METHODS: We plan to conduct a randomized, unblinded clinical trial of FDM for the management of subacute and chronic extremity pain. Approximately 300 patients ages 18 and older seeking care in the ER for extremity pain that has been present for more than one week and less than three months will be recruited from four rural emergency departments within the Carilion Clinic hospital network over a 1.5-year time period. Patients are recruited into the study by treating clinicians in the ER and must describe their pain according to a pattern amenable to treatment with FDM. POPULATION: Adult patients presenting to Carilion Franklin Memorial Hospital, Carilion Giles Community Hospital, Carilion New River Valley Hospital, and Carilion Stonewall Jackson Hospital. Prisoners and patients with known serious psychiatric comorbidities are specifically excluded. SPECIFIC AIMS: The primary objective is to determine whether FDM yields significant improvement in function compared with standard care alone. The secondary objective is to determine whether FDM yields significant improvement in pain compared with standard care alone. Our exploratory objective is to determine whether FDM yields clinically significant improvements in pain and function that endure over time. HYPOTHESIS: Patients treated with FDM will demonstrate statistically and clinically significant improvement in function and pain compared with those treated with standard care alone. SIGNIFICANCE: This is the first clinical trial of FDM in the United States and the first in an ED.

Title: Impact of Education on Resident Utilization of Epic ACP Navigator

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Abstract/Case Study: Objective: Sample resident utilization of the advance care planner (ACP) navigator before and after educational intervention Evidence suggests lack of resident education is one barrier to discussion of advance care planning with patients. Epic has an ACP Navigator to aid in finding AMD documents. Residents have not been properly educated on how to access this information or understand what materials were available in the navigator. This QI project consisted of a pre-intervention survey, an educational session with handout, followed by a post intervention survey. Survey questions included use of viewing the ACP navigator and documentation review, as well as comfort with discussion of ACP, and options on documentation of patient's wishes. Data collected showed small sample size of matched data available for residents. A total of 40 residents participated in the pre/post and educational intervention, which included 9 surgical, 5 internal medicine, 12 emergency medicine, 8 family medicine, and 6 obstetrics & gynecology residents. There were not statistically significant changes in use of EPIC navigator utilization after educational intervention. Analysis used paired t-test between pre and post survey. Over 1/3 of the residents noted the EPIC navigator was confusing to use once they had received training. Discussion and proper documentation of ACP is vital

to clinical practice to align treatment to patients' preferences, yet residents are unaware of their patients' AMDs. Part of the difficulty in obtaining this information is ability to access information within the EMR. This QI project showed an onetime PowerPoint education session is insufficient resident education for improved utilization of EPIC ACP navigator. Ongoing education training is needed to improve use of the ACP navigator.

Title: Evaluation of collagenase clostridium histolyticum (XIAFLEX) use

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Abstract/Case Study: Collagenase clostridium histolyticum (Xiaflex') is a high cost, proteinase, FDA approved for Dupuytren's disease (DD) and Peyronie's disease (PD). For DD, collagenase showed a contracture reduction to 0 to 5 degrees of full extension at 30 days (64.0% vs. 6.8%) after one cycle compared to placebo. Recurrence rates are reported in 9% of the patients at 24 months. The Pharmacy and Therapeutics committee added Xiaflex' to its formulary in November 2012 for FDA approved indications but restricted to outpatient urology and orthopedic clinic. As part of the formulary evaluation, the purpose of this medication use evaluation was to examine the appropriateness of collagenase use, recurrence rates, cost-evaluation, and assess any adverse reactions. This MUE is an IRB exempted quality assurance, quality improvement, retrospective chart review. Baseline demographic characteristics, efficacy data, safety data, and cost data were collected for all adults' patients treated with collagenase for either DD or PD from October 1, 2017 to June 30, 2019 at Carilion Clinic. Fifty-six patients were administered collagenase at an orthopedic clinic for the treatment of DD, while only 4 patients were treated with collagenase for PD. Successful outcomes (contracture reduction > 20 degrees) was noted in 81% of the patients. Sixty-eight percent of the patients reported a reduction in their contracture to <5o and 13% reported contracture reduction to 5-20o. Recurrence was reported in 3 patients at 12 months. Four patients were treated for PD and reported an average contracture reduction of 58o (30o-90o) after an average for 3 cycles (2-4). The average contracture reduction was 64.4%. Commercial and Medicare insurances are main insurance carriers with an average reimbursement rate at 72% and 63% respectively of the total charges. The most common ADR reported was bruising (20%), swelling (14%), and injection site reaction (5%), which is lower than reported in previous studies.

Title: The Impact of Metabolic Disorders in Young-Onset Non-Hereditary Colorectal Cancer

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Abstract/Case Study: Metabolic disorders play a substantial role in colorectal cancer (CRC) carcinogenesis. Further understanding of the impact of metabolic disorders on survival in early-onset

non-hereditary colorectal cancer is needed. To assess the frequency of metabolic disorders in young patients with CRC and its impact on survival. In this retrospective observational study, we randomly selected young patients (<50 years old) with non-hereditary CRC at Carilion Clinic, Roanoke, Virginia from 2002 to 2017. Patients with inflammatory bowel disease, Lynch Syndrome and Familial Adenomatous Polyposis Syndrome were excluded. The cumulative risk of mortality among patients with metabolic diseases was estimated using Kaplan Meier curves. We identified 139 patients (Mean age, 41.6±6.9 years; 53.2% males) with non-hereditary colorectal cancer. 48% were obese (BMI > 30). 17.3% of patients had Diabetes Mellitus (A1c > 6.5%), 72% controlled (A1c < 8%), and 48% had the disease for > 5 years. 43 (30.9%) had hypertension (two or more elevated BP > 130/90), 88.6% controlled, and 6.8% had the disease for > 5 years. 40 (29.0%) had hyperlipidemia (LDL > 190), 34.1% had controlled LDL< 100 with statin monotherapy, and 41.3% had the disease for >5 years. The diagnosis of any metabolic disorder nor tight control impacted patients' survival. The chronicity of hyperlipidemia impacted patients' survival and the median time of survival decreased in patients with chronic hyperlipidemia for >5 years compared to patients with hyperlipidemia for <5 years (13.7 vs 3.11, P=0.04). Females with multiple metabolic disorders had worse survival compared to females with one metabolic disease (p=0.04). There was no difference in the survival of males with multiple metabolic diseases compared to males with one metabolic disease. Half of the patients with non-hereditary early-onset CRC are obese and chronic hyperlipidemia decreased survival in all patients. Females with multiple metabolic diseases had decreased survival.

Title: Alternative Agents vs Benzodiazepines For Alcohol Withdrawal in Trauma Patients

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Abstract/Case Study: Benzodiazepines (BZDs) are the standard of care to mange alcohol withdrawal symptoms (AWS) but they can increase the risk of over sedation and delirium. Other non-BZD agents may also be used to manage AWS. This was a retrospective review of BZD use pre and post implementation of a BZD sparing protocol in patients from March 2016 to March 2019. Patients were included if they were admitted as a trauma surgery patient >18 years old, had a positive alcohol level on admission, received treatment for AWS and had at least one CIWA-AR score. All BZDs were converted to lorazepam equivalents for the first seven days of hospital stay. Secondary objectives included: CIWA-Ar scores and if medications were ordered appropriately. Outcomes included hospital and ICU length of stay (LOS), duration of mechanical ventilation and adverse events. A total of 44 patients were included in the pre-protocol (PRE) and 44 in the post-protocol (POST) group. CIWA-Ar score reductions were appreciated in the POST group, but not statistically significant. There was no difference in the amount of BZDs used between the two groups on any of the seven days. Hospital and ICU LOS were five days and zero in the PRE and seven and three in the POST groups (p=0.43, p=0.15). Patients requiring transfer to ICU due to worsening withdrawal was 13.6% in the PRE vs 0% in the POST (p=0.01). Respiratory depression occurred in 9.1% of the PRE patients vs 0% in the POST (p=0.041) . Intubation rates were 11.4% vs 2.3% in PRE vs POST (p=0.2). Medications were ordered incorrectly on 47.7% of patients in the POST protocol group. This review found a clinical difference in the CIWA-Ar scores between the two protocol groups, but no difference in the total BZD equivalences. More adverse events were seen in the PRE group.

Title: Evaluation of naloxone prescribing compliance post best practice alert implementation

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Abstract/Case Study: In 2017, the Virginia Board of Medicine enacted regulations that require naloxone to be prescribed to patients at higher risk of opioid overdose. In 2017, a medication use evaluation (MUE) done at Carilion Clinic determined that only 22% of patients who were legally required to receive a prescription for naloxone were prescribed it, leading to implementation of a best practice alert (BPA). The primary purpose of this study was to determine if implementation of the BPA increased compliance with naloxone prescribing. A random sample of 150 patients for whom the BPA fired from November 2018 to July 2019 was generated from the electronic medical record. The primary objective was the percent change in naloxone prescribing after implementation of the BPA. Secondary objectives were action taken on the BPA by the provider, percentage of patients who received a prescription for naloxone of those legally required, and incidence of 30 day readmissions for overdose. Data collected was compared to data from the previous MUE to assess the impact of the BPA. Of 150 patients, 78.7% required a naloxone prescription. Of patients legally required to have a naloxone prescription, only 14.4% received a prescription. This is a decrease of 7.6% in naloxone prescribing compared to the previous MUE. Of 150 orders, the BPA was dismissed 117 times (78%). The BPA is occasionally miscalculating the MME and inappropriately firing for opioids co-prescribed with butalbital/acetaminophen/caffeine. In total, the BPA misfired on 25 (17%) patients. Implementation of the BPA was ineffective at increasing compliance with required naloxone prescribing. One potential factor is inappropriate firing of the BPA which could lead to alert fatigue and BPA dismissal. As a result of this MUE, the BPA will be optimized to prevent misfires. Additional solutions include education for providers with higher rates of non-compliance and pharmacy involvement.

Title: Evaluation of rescue pack prescribing on reducing admissions for COPD

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Abstract/Case Study: Patients'with Chronic Obstructive Pulmonary Disease (COPD) frequently experience exacerbations with symptoms including breathlessness, coughing, and chest tightness.'These exacerbations frequently lead to a hospital admission which impacts not only the patient experiencing them but the healthcare system in general. As a result, studies in recent years have focused on exploring ways to decrease the number and severity of COPD exacerbations. A focus has been on self-management programs; the patient is educated to recognize symptoms of an impending exacerbation and to take action to prevent or decrease the severity of the exacerbation. Within Carilion Clinic,'patients'with COPD'are being prescribed rescue packs (a steroid and antibiotic) as a part of a written action plan. This retrospective, pre-post study aimed to determine whether the prescribing of COPD rescue packs is associated with a reduction in hospital admissions for COPD exacerbations. Chart review was completed for patients who were prescribed a rescue pack at the Roanoke Salem Family Medicine'Clinic (RSFM)'or the Southeast Family Medicine clinic. Information collected included baseline characteristics, COPD controller medication, type of rescue pack prescribed and number of hospital admissions before and after the rescue pack prescription. The primary endpoint was the percent change in hospital admissions from pre and post rescue pack prescribing. Secondary endpoints included

the difference in length'of'hospitalizations pre/post prescription for a rescue pack and in a subgroup of patients with'30 day'readmissions, incidence of 30 day readmissions pre and post rescue pack prescribing. A total of 194 patient charts were reviewed. Of these, 99 patients were included in the study. No statistically significant difference was found in hospital admissions prior to rescue pack prescription compared to after rescue pack prescription (p=0.62). Secondary endpoint analysis is in process and will be completed prior to research day.

Title: Evaluating dextrose utilization within adult and newborn hypoglycemia treatment algorithms

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Abstract/Case Study: The implementation of hospital or system-wide hypoglycemia treatment protocols that include dextrose-containing rescue medications like IV dextrose and oral glucose is common in current practice. Treatment algorithms assist with selecting appropriate corrective measures based on patient factors like responsiveness and dietary status. The objective of this study was to evaluate the usage of dextrose-containing rescue medications according to current inpatient adult and newborn hypoglycemia treatment algorithms at Carilion Roanoke Memorial Hospital (CRMH). A retrospective review of patients from January 1, 2019 to April 1, 2019 who received dextrose-containing hypoglycemia rescue medications was completed. Adult and neonatal patients were identified through dispensing reports of IV dextrose or oral glucose. Data elements included demographics, baseline level of care, and blood glucose before and after correction. Additional elements included dietary status and whether changes to insulin regimens occurred in adult patients. Descriptive statistics were used to analyze data. A sample of 165 hypoglycemic episodes in 95 adults and 41 newborns requiring administration of at least one dextrose-containing rescue agent were evaluated. Newborn patients had a median time to first blood glucose check of 91 minutes from birth, 3 newborns were symptomatic prior to correction and 5 (12%) newborns required NICU admission for refractory hypoglycemia. The mean gel dextrose dose was 0.67 grams. All 9 adult patients reported as initially unresponsive were appropriately treated with IV dextrose. Of the patients documented as having a standard dietary status, 84% were inappropriately treated initially with IV dextrose. Based on these findings, dextrose-containing rescue medications are being overutilized in adult patients who can receive initial dietary correction of hypoglycemia. Further evaluation of the adult treatment algorithm is warranted to better define dysphagia risks and clarify algorithm-driven treatment decisions. Dextrose was administered appropriately according to the newborn hypoglycemia treatment algorithm and helps reduce escalations in care.

Title: Analysis on appropriate use of outpatient parenteral antimicrobial therapy

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Abstract/Case Study: To assess the use and outcomes of OPAT at Carilion New River Valley Medical Center (CNRV) and determine if there are opportunities for improved patient safety and cost savings through antimicrobial stewardship and the avoidance of inappropriate central line placement. This is a

single center, retrospective, chart review on adult patients with bacterial infections discharged from CNRV from January 2014 to January 2019 with central venous catheters and parenteral antibiotics. The electronic medical record was used to identify patients >/=18 years of age, admitted to CNRV and discharged to receive OPAT through a PICC line. The primary outcome is the number of inappropriate central line placements for OPAT. Secondary outcomes are appropriateness of antibiotic use, readmission rates (due to catheter-related complications and/or antibiotic-related adverse events) and estimate potential cost savings. Fifty-eight patients were included in the study with the following baseline characteristics: mean age of 63 years old, 74% male, mean line duration of 4.86 days prior to discharge, mean length of stay of 9.38 days, mean duration of therapy of 30 days, and a discharged destination of 68.9% (home) and 31% (long term care facility). For the primary outcome, 29% of the patients were inappropriately placed on a PICC upon discharge. For the secondary outcomes, 35% of the patients had inappropriate antibiotic selection, dose, and/or duration of therapy; 3.4% were readmitted for PICC-related and/or antibiotic adverse events; and the cost in the number of inappropriate PICC placement was $22,474 [17 inappropriate PICC placements x $1,322/occurrence] with midline placements costing $980/occurrence. These results indicate opportunities to improve patient safety, antibiotic use, cost savings and minimize multidrug-resistant organisms through antimicrobial stewardship. Recommendations for discussion of OPAT plans with ID physician/pharmacist prior to patient discharge and physician education on current OPAT guidelines will be utilized to improve antimicrobial stewardship.

Title: Torsemide Induced PNGD: A Case Report and Review of Literature

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Abstract/Case Study: A 77-year-old man presented to the emergency department with an exacerbation of heart failure while on torsemide, On examination he had nontender, scaly pink papules coalescing into plaques on his arms, legs, and torso. Antinuclear antibody, anti-double-stranded DNA, and anti-histone antibody were positive resulting in a diagnosis of drug-induced lupus, presumably from Torsemide. Punch biopsies from his arms revealed a layered pattern of granulomas with focal central necrobiosis and neutrophils surrounded by multinucleated giant cells. Colloid iron with and without digestion showed increased dermal mucin in the granulomatous inflammation, especially the areas of necrobiosis. Acid-fast bacilli, Fite, and Gomori methenamine silver-stained tissue sections were negative for organisms. The histopathologic results supported a diagnosis of palisaded neutrophilic and granulomatous dermatitis (PNGD). PNGD is a very rare dermatological disorder. Case reports are sporadic, and few case series have been published. A literature review in 2008 identified only 97 reported cases. It is considered an immune complex disease found along a spectrum that includes Churg-Strauss granulomas, cutaneous extravascular necrotizing granuloma, rheumatoid papules, and superficial ulcerating rheumatoid necrobiosis. PNGD clinically presents with tender erythematous violaceous papules, plaques or nodules, usually affecting the extensor surfaces. The underlying pathogenesis remains poorly understood. It is thought that T-cell dysregulation and immune complex deposition play a key role in the formation of the skin lesions. Histologically, palisading granulomas with prominent neutrophils and collagen degeneration are usually evident. Treatment is usually tailored towards treating the underlying disease, in our case, stopping the offending torsemide. Steroids,

dapsone, cyclosporine, and methotrexate have been used with varying success. With appropriate treatment, recovery is usually favorable. To our knowledge, this is the first case of torsemide induced lupus resulting in PNGD.

Title: The Use of Contrast Echocardiography for Diagnosing Metastatic Cardiac Tumor

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Abstract/Case Study: Clinical presentation: A 57-year-old woman was admitted with left-sided numbness and confusion. Two months ago she was diagnosed with pulmonary adenocarcinoma with liver metastasis and receiving treatment with pembrolizumab, and also pulmonary embolism treated with apixaban. MRI brain revealed acute ischemic infarcts with bilateral hippocampal involvement in multiple vascular territories. Although vasculitis from pembrolizumab was considered, echocardiography was used to determine a cardiac source for her stroke. Imaging Findings: Transthoracic echocardiogram (TTE) revealed a large, long, finger-like mass in the right atrium, which was initially concerning for a thrombus. Transesophageal echocardiography (TEE) showed a 4.9 x 1.3 cm irregular, mobile mass in the right atrium attached to the interatrial septum, with multiple projections and extension into the right ventricle. The mass had central enhancement with contrast echocardiography. Role of Imaging in Patient Care: Differential diagnoses for the intracardiac mass included metastatic cancer, thrombus, vegetation, or primary cardiac tumor. TEE revealed an irregular mass which enhanced with contrast echocardiography, suggestive of a malignancy rather than thrombus. The mass was new compared to her TTE 2 months ago. Given her history of lung cancer, this suggested metastatic mass, rather than primary tumor. These findings were sufficient to make the diagnosis, and further cardiac MRI testing was forgone due to prognostic implications. The patient ultimately transitioned to hospice. Discussion: Cardiac tumors are very rare (<0.1%) and present a diagnostic conundrum that drastically influences management. TEE is often necessary to better characterize a tumor's size, morphology, attachment site, extension, and hemodynamic effects. In addition, contrast echocardiography serves as a complementary tool to narrow the differential diagnosis. Contrast enhancement is highly suggestive of vascularity. Vascular masses like malignant tumors demonstrate hyper-enhancement whereas, avascular masses like vegetations and thrombi do not. We highlight a rare finding of a metastatic cardiac tumor, and the importance of contrast echocardiography with TEE in its diagnosis.

Title: POSITIVE CDX2 CONFERS SIGNIFICANT RISK FOR ESOPHAGEAL ADENOCARCINOMA

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Abstract/Case Study: Esophageal adenocarcinoma (EAC) can develop from Barrett esophagus (BE). The American Gastroenterological Association (AGA) has defined BE as requiring the presence of goblet cells

(GC). CDX2 is a transcription factor that regulates cellular proliferation and differentiation of intestinal mucosa. All intestinal mucosa is strongly positive for CDX2 by immunohistochemical (IHC) staining. Our past studies have shown CDX2 IHC positivity in the absence of GC in suspected BE patients. Objective: Evaluate the natural history of BE patients that were initially GC positive but had subsequent biopsies negative for GC, determine if CDX2 IHC more accurately defines the presence of BE, and determine risk of dysplasia and EAC. Methods: This was a pilot retrospective study, between 2010 and 2017. For inclusion patients had at least two sets of biopsies, the first with the diagnosis of BE based on the presence of GC and the second pathology report read as not BE. Histology was based on hematoxylin and eosin (H&E) staining. CDX2 IHC staining was also performed on both sets of esophageal biopsies. Results: A total of 130 patients met inclusion criteria. Of these patients 47 gave informed consent to participate in the study. The initial set of biopsies by definition were all GC positive. Forty-four of the initial biopsies were positive for CDX2 IHC (94%) and three were negative (6%). On the second set of biopsies, one biopsy was both GC negative and CDX2 IHC negative, yet had high grade dysplasia (HGD). Thirty-four second esophageal biopsies were GC negative but CDX2 IHC positive. Two of these showed HGD (6%) and one had EAC (3%). Conclusions: CDX2 IHC positivity may be more accurate compared to GC for the diagnosis of BE. More importantly, patients that are GC negative and CDX2 IHC positive on followup biopsies have significant risk for HGD and EAC.