Annual Research Day

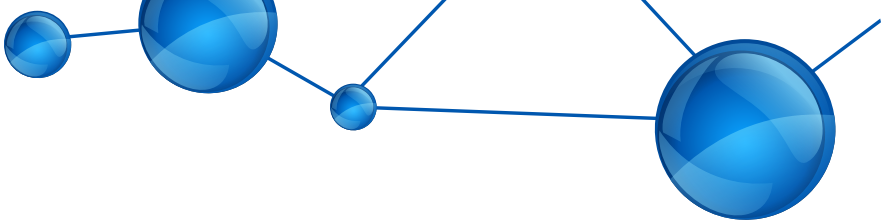
2017

St. Elizabeth's Medical Center

A STEWARD FAMILY HOSPITAL

Steward

Tufts UNIVERSITY | School of Medicine



Welcome Message

Dear Friends and Colleagues:

On behalf of the Planning Committee for Research Day, welcome to the Steward St. Elizabeth's Annual Research Day event, celebrating the academic mission of our Medical Center and the research efforts of our residents and fellows. We and the Accreditation Council for Graduate Medical Education consider research to be an important element of graduate medical training, and this event celebrates the efforts of our trainees who have been active in these endeavors. Research enables us to improve our care of patients and advance our medical knowledge and in this annual event, we judge the products of our trainees' efforts for their quality, methodology, significance, and originality. We applaud these efforts that are often pursued on top of and in addition to the full clinical responsibilities of our residents and fellows and are sympathetic to their families and friends who were deprived of their time during the conduct of their scholarly activities. We firmly believe that research is vital in carrying out the mission of an academic medical center and can result in significant advances in medicine. To that end, we are honored to host and welcome a good friend and our keynote speaker, Dr. Christoph Westphal, whose entrepreneurial, managerial and research efforts have resulted in eight publicly traded companies with a combined value of nearly $12 Billion, in fields as diverse as anticoagulation, RNA interference, metabolic disorders, drug formulation, aging, diabetes, infertility, oncology, and sports medicine. Dr. Westphal's talk highlights the enormous value research can produce and that we celebrate here today.

This year, the Planning Committee received a total of 48 abstract submissions in the categories of original investigations, quality improvement projects, and case reports. Highlights of these abstracts and a selection of the finest are displayed on poster boards in the auditorium today. Our honorable mention submissions have ribbons attached to the poster boards and the highest rated efforts will be presented orally in our program and receive awards.

I would very much like to thank our judges who reviewed the submissions, ranked them, and selected those that they felt were of the highest merit and worthy of honorable mention. I also would like to thank the planning committee, the efforts of Dr. Rabotnikov, our Anesthesiology Resident lead and de-facto organizer for this event, and the generous support of the SEMC GME Office, the Medical Executive Committee, and the Hospital Administration, without whom today's event would not be possible.

We very much hope that you will enjoy this showcase of our residents' and fellows', research efforts and that it will stimulate additional research efforts within our medical center and the hospital network. Ultimately it's all about providing the best patient care that we can and we believe that research is an integral part of our efforts. We hope you enjoy today's program and thank you so much for your participation.

Sincerely,

Andrew L. Sternlicht, MD
Chair, Annual Research Day Planning Committee

Program

March 30, 2017

7:00 - 7:30 **Continental Breakfast**

7:30 - 7:45 **Welcome & Introduction**
Andrew L. Sternlicht, MD
Chair, Research Day Planning Committee

7:45 - 8:10 **Keynote Speaker**
Christoph Westphal, MD, PhD
Turning Discoveries into Businesses

8:10 - 9:25 **Oral Presentations**

1st Place Original Investigation: Maheswara S. Golla, MD
The Patency of Stent Graft Treatment for Femoro-Popliteal Arterial Diseasemight be Positively Influenced by the number of Patent Tibial Vessels.

2nd Place Original Investigation: Justin Yang, MD
Pushups as a Predictor of Future Cardiovascular Events and Functional Status: A Retrospective Cohort Study.

3rd Place Original Investigation: Hussam Tallab, MD
A Comparative Study for Two Drug Eluting Technologies for the Treatment of Chronic Sinusitis with Nasal Polyposis.

Best Quality Improvement Project: Justin Yang, MD
Nonselective Versus Random Screening of Sleep Apnea in Primary Care Clinics.

Best Case Report: Katherine Adams, DPM
Comminuted Calcaneal Fracture Secondary to Opioid-Induced Osteoporosis and Hypogonadism.

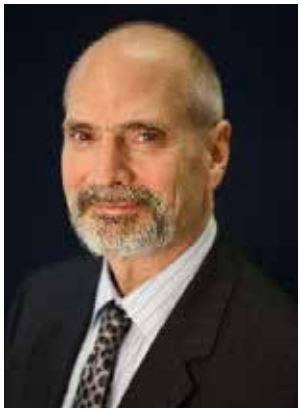
9:25 - 9:40 **Presentation of Awards**

9:40 - 10:40 **Poster Displays with Author Present**

Judges Panel

Original Investigation and Quality Improvement Report

Patrick Horn, MD, PhD

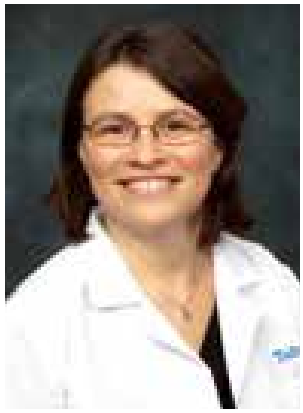


Dr. Patrick Horn is Chief Medical Officer at Tetraphase Pharmaceuticals, Inc., a Watertown MA based biotechnology firm that is actively developing antibiotics to treat infections caused by multidrug-resistant Gram-negative pathogens. Dr. Horn received his MD and PhD in Pharmacology and Physiology from the University of Chicago. He completed an internship and residency in Pediatrics at Boston Children's' Hospital and a fellowship in Clinical Pharmacology at the University of Minnesota. Prior to transitioning to industry, Dr. Horn was a faculty member in the Department of Pediatrics at the University of Chicago where he also served as Director of the Pediatric Residency program. Areas of research interest include cardiovascular pharmacology and physiology as well as strategies to improve clinical trial design. He has published over 30 manuscripts in peer-reviewed journals and numerous abstract presentations.

Chris Stevens, MD

Dr. Anthony Christopher Stevens is the Chief Medical Officer at Arsanis, Inc, a biotechnology firm with offices in Waltham, MA, and Vienna, Austria, that focuses on the development of monoclonal antibodies for targeted immunotherapy for infections. Prior to joining Arsanis, Dr. Stevens served as a senior manager and consultant to the biotechnology industry for over 17 years. Through his biotechnology consulting and management work, he has guided over 30 companies through all stages of drug development in both the U.S. and Europe. Dr. Stevens received his B.A. from the University of North Carolina, Chapel Hill, and his M.D. from the University of Miami School of Medicine. He completed his medicine residency at George Washington University and his gastroenterology fellowship at Beth Israel Deaconess Medical Center. He has authored over 30 peer-reviewed publications.

Geneve M. Allison, MD, MSc, FACP



Dr. Allison attended the University of Massachusetts Medical School and completed her Internal Medicine Residency at Alameda County Medical Center in Oakland, CA. She pursued her fellowship training in Infectious Diseases at Tufts Medical Center and joined the faculty in 2007. Additionally, Dr. Allison successfully completed additional research training through an NIH-funded KM1 fellowship at Tufts-CTSI culminating in a Masters Degree in Clinical Translational Science. Dr. Allison is a Lead Navigator for Tufts CTSI, connecting researchers to resources in order to facilitate translational research.
Dr. Allison treats patients on the inpatient ID consult and ID ward services at Tufts Medical Center, as well as in the multidisciplinary Center for Wound Healing and Hyperbaric Medicine at Tufts Medical Center. Her clinical interests include general infectious diseases, prosthetic joint infections, diabetic foot infections and complex wound healing. . As the Director of the OutPatient IV Antibiotic Therapy Program (OPAT Program), her research interests include the evaluation of care coordination programs and patient outcomes with home intravenous therapy. She is a member of the Infectious Diseases Society of America (IDSA) OPAT Guidelines Committee.

Judges Panel

Case Reports

Bertrand L. Jaber, MD, MS

Dr. Bertrand L. Jaber is Vice Chair for Quality Affairs in the Department of Medicine at St. Elizabeth's Medical Center, and Professor of Medicine at Tufts University School of Medicine. Dr. Jaber has extensive expertise in dialysis device-related research, translational research in cytokine and leukocyte biology in acute and chronic kidney disease, and hospital-based outcomes research in kidney disease. He received his medical degree from St. Joseph University School of Medicine, Beirut, Lebanon, and completed a residency in Internal Medicine at Carney Hospital, Boston, MA, and a clinical and research fellowship in nephrology at Tufts Medical Center, Boston, MA. He has served as co-editor for the American Journal of Kidney Diseases and as Chair for the Acute Kidney Injury Advisory Group of the American Society of Nephrology. He is a former member of the Renal Disease and Detoxification Committee of the Association for the Advancement of Medical Instrumentation, the Kidney Disease Outcomes Quality Initiative (K/DOQI) Advisory Board of the National Kidney Foundation, and the Quality and Patient Safety Task Force and Board of Advisors of the American Society of Nephrology. Dr. Jaber has previously served on the Scientific Program Committee of the Annual Clinical Meetings of the National Kidney Foundation, and has directed its annual Hemodialysis Course. He is the recipient of numerous awards and has authored more than 170 original publications, reviews and editorials in peer-reviewed scientific journals, as well as several textbook chapters.

Mark S. Shulman, MD

Dr. Mark S. Shulman is an Associate Clinical Professor of Anesthesiology at Tufts University School of Medicine and an Adjunct Clinical Associate Professor in the Department of Anesthesiology at the University of Massachusetts Medical School. Since 2004, he has served as the Program Director of the anesthesiology residency program at St. Elizabeth's Medical Center. Dr. Shulman received his B.S. from Union College and his M.D. from SUNY Upstate Medical Center in Syracuse. He completed his anesthesiology residency at Stanford and his fellowship in thoracic anesthesia at Toronto General Hospital. He has published numerous abstracts, journal articles, editorials, and book chapters. His research interests include spinal narcotics, the use of double lumen endobronchial tubes, the use of a lighted stylet for routine intubation, anesthesia for lung reduction surgery, and the use of P6 acupressure bands to prevent perioperative nausea and vomiting. Dr. Shulman is currently a member of the Human Subjects Committee of the Institutional Review Board at St. Elizabeth's Medical Center and is a member of the Graduate Medical Education Committee at St. Elizabeth's Medical Center.

Anthony L. McCluney, MD

Dr. McCluney is a faculty member of the Department of Surgery at Steward St. Elizabeth's Medical Center, and an Assistant Professor of Surgery at Tufts University School of Medicine. Dr. McCluney's clinical practice and interests focus on bariatric surgery and general surgery. He is member of several professional organizations.

Keynote Speaker

Christoph Westphal, MD, PhD

Dr. Westphal is a biomedical entrepreneur, co-founder and Partner of Longwood Fund, and Chair, CEO and co-founder of the Longwood portfolio company Flex Pharma. Dr. Westphal also co-founded Longwood portfolio companies Alnara Pharmaceuticals, OvaScience and Verastem. Dr. Westphal previously served as co-founder/CEO of Alnylam Pharmaceuticals, Acceleron Pharmaceuticals, Concert Pharmaceuticals, Momenta Pharmaceuticals and Sirtris. Companies founded by Dr. Westphal have developed and received FDA approval for important drugs, including the largest-selling heparin in the US, and a therapy for multiple sclerosis; and several experimental medicines for cystic fibrosis, currently incurable cancers, and serious inflammatory disorders. In addition, these companies have created substantial shareholder value and aggregate market capitalizations (sustained) of over $12 billion. Companies co-founded by Dr. Westphal have created approximately 1,000 good jobs in the Boston area.

Dr. Westphal was appointed to the BIO Emerging Companies Section Governing Board and serves on the Board of Fellows of Harvard Medical School, the Board of Overseers of the Boston Symphony Orchestra, and is a member of the Boston Commercial Club. He earned his M.D. from Harvard Medical School and Ph.D. in genetics from Harvard University and he graduated with a B.A. summa cum laude and Phi Beta Kappa from Columbia University. Dr. Westphal has been the lead or senior author on several patent applications and scientific papers in leading journals such as Cell, Nature and Nature Genetics. Dr. Westphal has been featured in the media, including on '60 Minutes', CNN, an ABC News Special hosted by Barbara Walters, and as the subject of a Fortune cover article. Dr. Westphal was listed as one of the top innovators in the annual MIT Annual technology review in 2002, and was the recipient of the Ernst & Young's New England Entrepreneur of the Year Award in the Biopharmaceutical category in 2006, the Stevie Award for Executive of the Year from The 2009 American Business Awards in 2009, and he was named as one of Fortune's Fortune Visionaries.

Original Investigation

Original Investigation 1st Place

The Patency of Stent Graft Treatment for Femoro-Popliteal Arterial Disease might be Positively Influenced by the Number of Patent Tibial Vessels

Maheswara S. Golla[1], Praveena Madapathi[1], Lawrence A. Garcia[1]

[1]SEMC-Division of Cardiovascular Medicine, Department of Medicine

Background: The ACC/AHA recommends endovascular stent placement for femoro-popliteal atherosclerotic disease. Theoretically, good distal tibial run-off to the foot increases flow across the stent, which prevents failure. However, less clinical data is available.

Design: This was a single center, retrospective cohort study where we collected the data from the St. Elizabeth's Medical Center's McKesson cardiology dataset.

Setting and Participants: We reviewed charts of the patients who had elective peripheral vascular intervention after failing outpatient medical and exercise therapy.

Methods: Between 2007 and 2014 we identified 734 patients underwent 1573 endovascular interventions at St. Elizabeth's Medical Center for femoro-popliteal revascularization. Among these, 143 Viabahn covered stent grafts were placed in 48 patients. Angiogram films were reviewed by two vascular interventionists. Stent graft failure followed up with Doppler and repeat peripheral angiograms.

Results: The patients were older (mean 72 years) and more likely to have hypertension (96%), hyperlipidemia (96%). Stents were placed predominantly in Trans-Atlantic Inter-Society consensus (TASC) C (32%) and D (68%) femoral arterial (88%) atherosclerotic lesions with mean length of 21.5cm. After stent graft placement, no distal tibial runoff noted in 4%, one vessel runoff in 20%, two vessel runoff in 60% and three vessel runoff to foot seen in 17%. We followed them for 12.5 months. During follow-up Major Adverse Limb Events (MALE) occurred 100% in no distal runoff group, 66% in one vessel runoff, 69% in two vessel runoff and 45% in three vessel runoff group. We noticed significantly higher MALE events in no distal runoff group and one or two vessel distal runoff group than three vessels distal runoff group (84% vs. 45%; $p \leq 0.05$).

Limitations: It is a small, single center, retrospective, cohort study. Only 70% of the study population had more than one year of follow-up. Functional status after intervention is not clear irrespective of distal vessel runoff.

Conclusion: The number of patent tibial vessels after stent placement for femoral and popliteal arterial atherosclerotic disease might positively influence the Major Adverse Limb Events (MALE). Three vessel tibial runoff showed 55% stent patency and freedom from revascularization during 12.5 months of mean follow-up.

Original Investigation

Original Investigation 2nd Place

Pushups as a Predictor of Future Cardiovascular Events and Functional Status: A Retrospective Cohort Study

Justin Yang[1], Steven Moffatt[2], Costas Christophi[2], Andrea Farioli[2], Stefanos Kales[2]

[1] *SEMC-Department of Medicine;* [2] *Other Institutional Affiliation*

Background: Cardiovascular disease (CVD) is the leading cause of morbidity and mortality in the U.S. Robust evidence exists to correlate measured physical fitness (e.g. treadmill tests) and CVD outcomes and longevity, however, few have studied simple, low-cost measures of fitness. This study assessed the association between pushup capacity and subsequent outcomes including incident CVD, retirement and death in a cohort of firefighters.

Study Design: Retrospective cohort study.

Setting and Participants: Participants were occupationally active career firefighters from Indianapolis and neighboring fire departments who underwent periodic medical surveillance between 2000 and 2010.

Methods: Participants were included if they were career firefighters >18 years old, with no restriction on duty at the index exam, who underwent baseline and periodic physical exams, including tests of pushup capacity and maximal or submaximal exercise tolerance tests, between 2000 - 2007. Data included complete physical exams, anthropometric measures, laboratory results, and clinical data. CVD-related outcomes included incident diagnoses of coronary artery disease (CAD) or other major CVD event. A composite outcome further included fire department exit (disability, retirement, resignation, termination) and death. Incidence rate ratios were computed and Cox proportional hazard regression models were used to model the time to each outcome from baseline, adjusting for age and BMI.

Results: During the ten-year period, 53 CVD-related outcomes were reported in 1632 participants (11,846 person-years). We noted a negative association between CVD events and pushup capacity. Furthermore, participants able to complete >40 pushups had an 86% reduction in the composite outcome incidence rate compared to those completing <10 pushups (95% CI: 0.08-0.26). For each 1 additional pushup completed, after adjusting for age and BMI, the hazard ratio (HR) for the composite outcome was 0.98 (95% CI: 0.97-0.99).

Limitations: Further investigation is warranted to evaluate utilizing pushups as a predictor of CVD events in a more heterogeneous, general population.

Conclusion: Being able to perform a greater number of pushups predicted a lower incidence of CVD events and a greater likelihood of remaining occupationally active and free of CVD at the end of follow-up among career firefighters. Each additional pushup completed was associated with a 2% reduced risk of the composite outcome.

Original Investigation

Original Investigation 3rd Place

A Comparative Study for Two Drug Eluting Technologies for the Treatment of Chronic Sinusitis with Nasal Polyposis

Hussam Tallab[1], Peter J. Catalano[1]
[1] *SEMC-Division of Otolaryngology, Department of Surgery*

Background: Inflammation/polyp recurrence, adhesions, and middle turbinate lateralization are causes of suboptimal outcome following sinus surgery and lead to increase rates of revision. Drug eluting nasal dressings and implants are now widely used to help medialization of the middle turbinate, decreased scaring and mucosal adhesion, reduced polyps' regrowth, and reduced mucosal inflammation. Herein, we compare the outcomes of 2 resorbable drug eluting technologies: a Chitosan-based polymer nasal dressing (PosiSep) combined with Kenalog to a Poly-ethylene Glycol cage stent coated with mometasone proprionate (Propel implant) following endoscopic sinus surgery for patient with chronic rhinosinusitis with nasal polyps (CRSwNP).

Design: Prospective, multicenter, randomized study, enrolling 23 patients with CRSwNP in 2 groups who failed medical therapy and elected endoscopic sinus surgery. Patients were randomized into either the PosiSep implant with Kenalog 20mg/ml, or Propel implant groups. Outcome was evaluated at 3-weeks and 3-months postoperatively. Primary outcome was a validated Post Operative Sinus Endoscopy score (POSE). Secondary outcomes included the validated quality of life outcomes survey (Sino-Nasal Outcome Test/SNOT-22). Baseline Lund-McKay CT scoring was used to determine the extent of sinus disease in all patients.

Setting and Participants: Prospective, multicenter, randomized study, enrolling 23 patients with CRSwNP in 2 groups who failed medical therapy and elected endoscopic sinus surgery.

Methods: Patients were randomized into either the PosiSep implant with Kenalog 20mg/ml, or Propel implant groups. Outcome was evaluated at 3-weeks and 3-months postoperatively. Primary outcome was a validated Post Operative Sinus Endoscopy score (POSE). Secondary outcomes included the validated quality of life outcomes survey (Sino-Nasal Outcome Test/SNOT-22). Baseline Lund-McKay CT scoring was used to determine the extent of sinus disease.

Results: Implants were successfully deployed in all 46 middle meati. Compared to Propel, PosiSep with Kenalog provided significant reduction in the recurrence of nasal polyps in the ethmoid area at 3 weeks ($p < 0.0012$), and 3-months ($p < 0.002$). Also, improvement in the quality of life was seen by significant reduction in SNOT-22 survey at 3-weeks ($p = 0.000$) and 3-months ($p = 0.002$).

Limitations: Limited sample size.

Conclusion: This study demonstrates the safety and efficacy of an inexpensive bioresorbable, steroid-eluting dressing (PosiSep) for use in patients with CRSwNP. This steroid-eluting implant is effective in improving wound healing and polyp recurrence by preserving sinus ostial patency, reducing inflammation, and minimizes adhesions via controlled local steroid delivery without measurable systemic exposure

Quality Improvement Report

Best Quality Improvement Report

Nonselective versus Random Screening of Sleep Apnea in Primary Care Clinics

Justin Yang[1], Blanca Lizaola[1], Larry Chin[1], Stephen Vandor[1], Javeryah Safi[1], Bertrand L. Jaber[1], Katherine Hendra[2]

[1]*SEMC-Department of Medicine;* [2]*SEMC-Division of Pulmonary, Critical Care, and Sleep Medicine, Department of Medicine*

Background: Obstructive sleep apnea (OSA) has been linked to significant morbidity, including an increased risk for diabetes, hypertension, metabolic syndrome, cardiovascular disease and stroke. Despite the increased attention OSA has received, the majority (70-80%) of those affected remain undiagnosed. Furthermore, up to 90% of primary care physicians (PCPs) do not routinely screen their patients for OSA.

Purpose, Setting and Participants: The aim of this quality improvement project was to increase OSA screening awareness among PCPs affiliated with St. Elizabeth's Medical Center (SEMC), by introducing a paper-based screening tool into the patient intake workflow and compare sleep medicine clinic referral results between these nonselective (mandatory) and random screening.

QI Plan: Two PCP offices with SEMC residents served as pilot sites for this project over a 6-week period. In the first two weeks, medical assistants were instructed to screen every patient during intake exam (nonselective period). Screening criteria was age > 18 years old with no literacy difficulties. Patients were asked to complete the validated STOP-BANG questionnaire. The score was calculated by the provider and a score of 5 or greater was considered positive, warranting further testing and referral. For the next 4 weeks, the medical assistants were not reminded to screen every patient (random screening period) and screening was based on provider's discretion.

Results: A total of 92 patients were screened. During the 2 nonselective screening weeks, of the 57 patients screened for OSA, 5 (8.8%) had a STOP-BANG score of 5 or greater, warranting a referral. During the 4 random screening weeks, only 35 patients were screened for OSA and none (0%) had a positive screening test (P=0.07). During the nonselective weeks, our screening positive rate of 8.8% is consistent with the OSA prevalence of 5-10%, whereas the screening positive rate of 0% during the random weeks suggests potential under-diagnosis of OSA.

Conclusion: Our project showed a significant increase in the detection of potential OSA in PCP offices using a nonselective screening process compared to random screening. This quality improvement project piloting OSA screening in two PCP offices calls for further system-wide implementation of the screening tool across all ambulatory care settings.

Case Report

Best Case Report

Comminuted Calcaneal Fracture Secondary to Opioid-Induced Osteoporosis and Hypogonadism

Katherine Adams[1], Julie Riley[1], Jordan Deliman[1], Alfred Phillips[1]
[1] *SEMC-Division of Podiatry, Department of Surgery*

Introduction: This case report aims to illuminate a less known side effect of opioids. Opioids can impair bone metabolism leading to decreased bone mineral density and an increased risk of fracture.

Description of Case(s): A 48 year-old male with pertinent history of methadone use since 2004 presented with right foot pain after stepping off a six inch curb. Subsequent imaging revealed a comminuted, non-displaced calcaneal fracture. Endocrinology consult was placed due to the peculiarity of the comminuted fracture from such a low energy mechanism. This consult led to the diagnosis of osteoporosis and hypogonadism secondary to chronic methadone use. The mechanism by which opioids affect bone health is twofold. There is a direct path via the presence of opioid receptors on the surface of osteoblasts, and an indirect path via the interference of opioids with the hypothalamus-pituitary axis. Direct interference with osteoblast activity causes an imbalance between osteoclast and osteoblast favoring bone resorption. Low testosterone and subsequent hypogonadism result from indirect inhibitory action on receptors within the hypothalamus-pituitary axis as well as testosterone production. Testosterone is an important component of bone health. This phenomenon is referred to as “Opioid Endocrinopathy” by the Endocrine Society. Many studies have revealed the correlation between opioid use which leads to low serum testosterone and low bone mineral density. Recent research has looked at post-operative implications and found that opioids inhibited callus strength at 8 weeks after open reduction internal fixation on rat femurs.

Discussion (Learning Value): Opioid-induced osteoporosis is an emerging health epidemic. This is an important issue for Physicians treating non-unions, elective surgeries, and unusual fracture patterns in patients that take opioids.

Honorable Mention

Original Investigation

Lifelong Limb Preservation: A Patient-Centered Description of Lower Extremity Arterial Reconstruction Outcomes

Katie Shean[1], Frank Pomposelli[1]

[1] *SEMC-Division of Vascular Surgery, Department of Surgery*

Background: Life expectancy is short for patients with critical limb ischemia (CLI), many of whom may fear amputation more than death. In light of the reduced life expectancy of these patients, the traditional 5-year freedom-from-amputation (FFA) statistic may not accurately address their concern. To better answer the question "Will I ever lose my leg", we developed a more relevant patient-centered calculation of major amputation risk over a patient's remaining lifetime.

Study Design: Retrospective-cohort

Setting and Participants: We identified all limbs undergoing first-time intervention for CLI in a large institutional database from 2005-2013.

Methods: We calculated the traditional metrics of amputation-free survival (AFS, where failure is death or amputation) and freedom-from-amputation (FFA, where failure is amputation but deaths are censored and removed from further analysis). Additionally, we propose a new term: lifelong limb preservation (LLP). LLP defines amputation as failure, but deaths are not censored, therefore reflecting LLP has been achieved. All deaths prior to 30-days were considered a failure in all three metrics, reflecting the risk of surgery.

Results: 1,006 limbs were identified as having first time intervention for CLI (22% rest pain, 45% ulcer, 27% gangrene; 46% treated by angioplasty +/- stenting, 54% bypass). Using life table analysis, seven- year AFS was 14% (561 events), FFA was 78% (123 events) and LLP was 86% (123 events). LLP was similar between patients undergoing angioplasty/stenting and bypass (seven- year: 86% and 85% respectively). For patients undergoing intervention for rest pain, seven-year rates were: AFS 14%, FFA 84% and LLP 92%. For those undergoing treatment for ulcer, seven- year rates were: AFS 14%, FFA 77% and LLP 86%. Finally, in those with gangrene, rates were: AFS 10%, FFA 67% and LLP 79%. Using LLP, a patient presenting with an ulcer can be told that while we cannot guarantee how long they will live, with revascularization there is approximately an 86% chance they will not lose their leg.

Limitations: Single-institution

Conclusion: The results above show that the durability of our limb preservation efforts often exceeds the life expectancy of our patients. Using lifelong limb preservation (LLP) as an outcomes assessment provides a more accurate and patient-centered answer to the question, "If I have this procedure, will I ever lose my leg?"

Honorable Mention

Original Investigation

Progress towards Liver Xenotransplantation Serving as a Bridge to Allotransplantation

Jigesh Shah[1], Parsia Vagefi[2]
[1]*SEMC-Department of Surgery;* [2]*Other Institutional Affiliation*

Background: Since the first attempt in 1968, survival following pig-to-baboon liver xenotransplantation (LXT) has been limited to <9-days due to a lethal coagulopathy. To improve survival, we developed a pre-clinical model utilizing human coagulation factor administration and co-stimulatory blockade.

Study Design: Shortages in available donor organs remains a critical barrier to organ transplantation. Xenotransplantation may help overcome this barrier by providing an unlimited supply of organs. Since the first attempt in 1968, survival following pig-to-baboon liver xenotransplantation (LXT) has been limited to less than 9-days due to dysregulated coagulation, thrombocytopenia, and thrombotic microangiopathy (TMA). To improve survival, we developed a pre-clinical model utilizing human coagulation factor administration combined with co-stimulatory blockade.

Setting and Participants: not applicable.

Methods: Four consecutive orthotopic pig-to-baboon LXT were performed using α1, 3-galactosyltransferase knockout donors. Post-LXT, baboons received a continuous infusion of human prothrombin concentrate complex. Immunosuppression consisted of anti-thymocyte globulin, FK-506, methylprednisone and belatacept (n=3) or anti-CD40 mAb (n=1).

Results: Belatacept Recipients: Baboon #1 survived until postoperaitve day (POD)-25 when euthanasia was performed due to worsening cholestasis and plantar ulcers. Baboon anti-pig cytotoxic IgM (but no IgG) was detected on POD7 with resolution by POD-14 after steroid pulse. Final pathology was C4d negative and without evidence of rejection, inflammation, and TMA. Baboon #2 suffered a seizure requiring euthanasia on POD-5 but at that time had normal LFT's and normal pathology. Baboon #3- the only recipient of CMV positive donor xenograft- necessitated euthanasia by POD-8 due to worsening liver function tests (LFTs). Post-mortem liver pathology was C4d positive, with hemorrhagic necrosis and CMV inclusions. Circulating baboon anti-pig cytotoxic IgM (but no IgG) was detected on POD-8. Anti-CD40 Recipient: Baboon #4 maintained stable hepatic function until euthanasia on POD-29 due to plantar ulcers and rising LFT's. No circulating antibody was detected, and final pathology was C4d negative and without evidence of rejection, inflammation, and TMA.

Limitations: Small sample size, use of human coagulation factors in a non-human primate model and need for consistent reproducibility.

Conclusion: We report nearly one-month survival in two recipients following pig-to-baboon LXT- the longest reported to date. The benefit of anti-CD40 mAb in preventing the development of baboon anti-pig cytotoxic IgM warrants further investigation. These results are encouraging for potential clinical application of LXT as a bridge to allotransplantation for patients with acute hepatic failure.

Honorable Mention

Quality Improvement Report

Impact of Pharmacist-Enhanced Antimicrobial Stewardship on the Utilization of Two Unrestricted Antimicrobials and the Incidence of Clostridium Difficile Infection in a Community Teaching Hospital

Ahmad Mahrous[1], Salwa Elarabi[1], Jorge Fleisher[2]

[1]*SEMC-Department of Pharmacy;* [2]*SEMC-Division of Infectious Diseases, Department of Medicine*

Background: The Antibiotic Stewardship Program (ASP) is a multidisciplinary collaboration that requires coordinated interventions to improve patient outcomes and reduce adverse events including Clostridium difficile infection (CDI). Studies have linked CDI with the utilization of certain cephalosporin and fluoroquinolone antibiotics.

Purpose, Setting and Participants: The objective of this study is to evaluate interventions by the pharmacists on the reduction of the utilization of two unrestricted antimicrobials (levofloxacin, ceftriaxone) and the effect on the incidence of CDIs.

QI Plan: After Institutional Review Board approval, data was collected on all hospitalized patients who received levofloxacin and ceftriaxone for a period of 45 days retrospectively followed by 45 days prospectively. A pharmacy resident evaluated antimicrobial therapy and intervened when therapy was not aligned with treatment guidelines. Interventions included de-escalation, renal dosing, intravenous (IV) to oral (PO) conversion and adherence to duration of therapy. Outcome measures evaluated were, 30-day readmission rate, and incidence of hospital acquired CDI.

Results: The cohort analysis consisted of 320 patients retrospectively and 154 patients prospectively. Post intervention, total number of doses was reduced by 62% in the levofloxacin group, and by 18% in the ceftriaxone group. Distribution of patients by indications for ceftriaxone and levofloxacin was as follows: abdominal infection 23% and 18%; bacteremia 10% and 0%; urinary tract infections (UTI) 38% and 21%; and pneumonia 30% and 64%, respectively. Ceftriaxone interventions consisted of 5.2% discontinuation; 2.6% IV to PO switch; 1.3% de-escalation; and 3.5% streamlined. Levofloxacin interventions were 13% IV to PO switch; 10.3% discontinuation; and 13% renal dosed. Prospective results showed a reduction in mean duration of therapy from 2.90 to 1.54 days, 30-day readmission reduction from 38% to 28%, and hospital acquired CDI from 2.8% to 1.9% with a relative risk reduction of 68% (confidence interval -1.97% to 3.70%).

Conclusion: Interventions by pharmacists targeting two unrestricted antimicrobials resulted in significant reduction in the number of doses for ceftriaxone, and levofloxacin. The incidence of CDI reduction was not statistically significant, but a larger sample size may influence the results. Based on this study, a UTI clinical pathway will be incorporated in our electronic system, to guide the use of these two antimicrobials and to enhance our ASP.

Honorable Mention

Quality Improvement Report

Improvement of In-Training Exam Scores after Implementation of an Academic Enrichment Program by the Internal Medicine Residency Program

Meredith Halpin[v], Hyun Kim[1], Bertrand L. Jaber[1], Claudia Nader[1]

[1] *SEMC-Department of Medicine*

Background: Medical education during residency training faces many challenges, including burden of administrative tasks and time devoted to medical record completion. This allows limited time to balance clinical and educational activities within the 80-hour work week. Our Internal Medicine Residency Program witnessed a decline in the In-Training Exam (ITE) scores between 2011 and 2014.

Purpose, Setting and Participants: Improve medical knowledge among residents as measured by an improvement in the ITE score, through implementation of an Academic Enrichment Program (AEP).

QI Plan: In academic year 2014-2015, we first designed an AEP using the Access Medicine tool. Residents performing at <25th percentile on the 2014 ITE in any given content area were required to complete modules with pre- and post-tests, and score >75% in each content area. In academic year 2015-2016, the ITE performance threshold was raised to <30th percentile and the NEJM Knowledge Plus was adopted, an individualized and adaptive ABIM-focused question bank. PGY1s, 2s, and 3s were required to correctly complete 30%, 50% and 100%, respectively of the content, based on 2015 ITE performance. Monthly medical Jeopardy was conducted to review and reinforce key learning points.

Results: The mean (±SEM) percentile for the ITE 12-content areas increased significantly over 4 years (P=0.037). The mean percentile in 2013, 2014, 2015, and 2016 was 16±2, 19±3, 39±3, and 46±3, respectively, the last 2 years reflecting implementation of the AEP.

The mean ITE percentile for the graduating classes of 2016-2018 (post-AEP implementation) increased compared to that of the graduating classes of 2013-2015 (pre- AEP implementation). This was observed for PGY2s (27±7 vs. 9±2; P=0.046) and PGY3s (30±4 vs. 13±5; P=0.083). The final data point for the PGY3 class graduating in 2018 will not be available until the 2017 ITE. PGY1s scores were excluded as they were not exposed to the AEP prior to taking their first ITE exam.

Conclusion: We designed and implemented an AEP focused on self-directed learning based on individualized needs for enrichment among the subspecialties of Internal Medicine. This program resulted in significant improvement in the performance of our residents on the ITE.

Honorable Mention

Case Report

B. Cereus Bacteremia: Be Serious

Tamara Nawar[1], Joe Aoun[1], Mansour Almnajam[1], Jorge Fleisher[1]
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Introduction: Bacillus cereus is a widespread spore-forming microorganism usually triggering an acute self-limiting emetic or diarrheal illness associated with contaminated rice outbreaks. Extra-intestinal manifestations of the infection are being encountered more frequently in clinical practice. Intravenous (IV) drug users are at increased risk of acquiring the infection from the injection paraphernalia and from the heroin itself.

We describe three cases of Bacillus cereus bacteremia encountered at Saint Elizabeth's Medical Center.

Description of Case(s): Case 1: A 40-year-old male with a history of IV drug use presented with altered mental status and fever. He has been using heroin and cocaine IV after sharpening his needles on the wall and rinsing them with tap water. Initial blood cultures grew methicillin sensitive Staphylococcus aureus. Subsequent blood cultures grew Bacillus cereus. A trans-esophageal echocardiogram revealed a localized abscess of the aortic valve. The patient was started on nafcillin and vancomycin with improvement in his condition.

Case 2: A 22-year-old female with a history IV drug use presented with worsening dry cough and shortness of breath. A chest x-ray revealed a left lower lobe infiltrate with a small left pleural effusion. Her blood cultures grew Bacillus cereus. Both transthoracic and transesophageal echocardiograms were performed and did not show significant vegetations. The patient was successfully treated with a prolonged course of vancomycin.

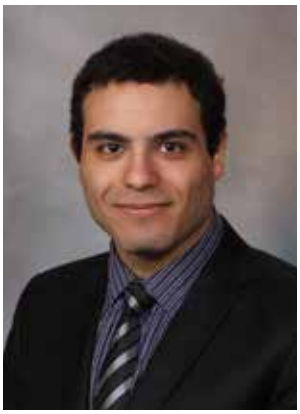
Case 3: A 24-year-old female with a history of IV drug use presented with severe left flank pain and fever. A CT-scan of the abdomen and pelvis with contrast revealed a 5 x 5 cm perinephric abscess involving the inferior aspect of the left kidney and extending retroperitoneally. Blood cultures grew Bacillus cereus repeatedly along with other microorganisms. She was treated with linezolid and piperacillin-tazobactam.

Discussion (Learning Value): IV drug users are susceptible to Bacillus cereus bacteremia. Injections paraphernalia may be the source of these infections. It is yet to be determined whether the heroin itself or the utensils used to inject are contaminated.

Appropriate therapy is important to achieve early clinical resolution and improve clinical outcomes.

Honorable Mention

Case Report



A Case of Retroperitoneal Fibrosis due to of IgG4-Related Disease

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Introduction: The use of bioprosthetic valves for aortic valve Introduction: Retroperitoneal fibrosis (RPF) is a rare entity characterized by inflammation and fibrosis in the retroperitoneal vasculature region extending to involve other structures. We report a case of RPF due to IgG4 related disease (IgG4-RD).

Description of Case(s): A 64 year-old woman with hypertension and right hemicolectomy for colonic adenomas presented to an outside hospital with a 3-month history of dry heaves and malaise, and was found to have kidney failure with a serum creatinine of 21 mg/dL (baseline of 1.3 mg/dL), requiring emergent hemodialysis. A CT scan revealed bilateral hydronephrosis with no evidence of masses or stones. She underwent insertion of bilateral ureteral stents. Serum creatinine dropped to 2.7 mg/dL. Four weeks later, she presented to the hospital after ureteral stent migration. Serum creatinine was 3.1 mg/dL. A repeat CT scan revealed bilateral hydronephrosis. The right ureteral stent was absent. There was extensive presacral and retroperitoneal fat stranding. She underwent cystoscopy with retrograde pyelography, revealing mucosal irregularity in the middle third of the right ureter. A right ureteral stent was inserted. Serum creatinine dropped to 2.2 mg/dL. An MRI revealed increased soft tissue in the retroperitoneum inferior to the aortic bifurcation. An extensive workup for RPF was unrevealing, including negative urine cytology, nonreactive ANA and ANCA, and absence of monoclonal proteins. However, ESR (73 mm/hour) and serum IgG4 (259 mg/dL) were elevated. She underwent a surgical biopsy of the retroperitoneal soft tissue density, which revealed fibrous proliferation with hyalinized collagen, dense lymphoplasmacytic infiltrate, and focal obliterative phlebitis. Immuno-histo-chemistry revealed IgG4positive plasma cells (60-70/high-power field) and the IgG4/IgG plasma cell ratio was >40%, supporting the diagnosis of IgG4-RD.

Discussion (Learning Value): Two thirds of RPF cases are idiopathic, while secondary forms occur in the setting of prior abdominal surgery, drugs, infections, autoimmune disorders, malignancies, and radiotherapy. IgG4-related disease is a fibro-inflammatory disorder that can affect any organ, and has been linked to cases of RPF previously termed as idiopathic. Our patient had an elevated serum IgG4 level and the histopathology confirmed the diagnosis of IgG4-RD. Corticosteroids and B-cell depletion with rituximab are being planned to prevent sclerosis and permanent organ damage.

Original Investigations

Clinical Characteristics of Patients Diagnosed with Strongyloidiasis in a United States Urban Outpatient Dermatology Department

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Background: Although considered a tropical disease, strongyloidiasis may be encountered in non-endemic regions, primarily amongst immigrants and travelers from endemic areas. Chronic strongyloides infection may be under-detected owing to its non-specific cutaneous presentation and the low sensitivity of commonly used screening tools.

Design: To describe the clinical characteristics of 18 patients with positive serologic tests for strongyloides stercoralis.

Setting and Participants: A single urban, academic dermatology clinic in Somerville, Massachusetts. 18 patients all with positive serologic tests for strongyloides stercoralis. The population was 44.4% female (8/10) and 55.6% male (10/18) with a mean age of 47.1 (range 28-62).

Methods: After IRB approval, 18 consecutive patients with serologic evidence of strongyloides infestation who presented to a single urban, academic dermatology clinic between September 2013 and October 2016 were retrospectively included in this case series. Patient age, sex, country of origin, strongyloides serology titer, absolute eosinophil count, presenting cutaneous manifestations and patient reported subjective outcome of pruritus after treatment were obtained via chart review.

Results: Of the 18 patients with positive serologies for strongyloides all had non-specific pruritic dermatosis, 36% had documented eosinophila and none were originally from the United States.

Limitations: Serologic studies for strongyloides are limited by cross reactivity to other parasitic infections and an inability to distinguish between past and current infections.

Conclusion: Although typically considered a tropical pathogen, strongyloides infection should be considered in patients living in non-endemic regions presenting with pruritic dermatosis and with a history of exposure to an endemic area.

Regional Variation in Patient Selection and Treatment for Carotid Artery Disease in the Vascular Quality Initiative (VQI)

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Background: Previous studies involving large administrative datasets have revealed regional variation in the demographics of patients selected for carotid endarterectomy (CEA) and carotid artery stenting (CAS), but lacked clinical granularity. This study aims to evaluate regional variation in patient selection and operative technique for carotid artery revascularization using a detailed clinical registry.

Design: Retrospective-cohort

Setting and Participants: All patients who underwent CEA or CAS from 2009 to 2015 were identified in the Vascular Quality Initiative (VQI).

Methods: De-identified regional groups were used to evaluate variation in patient selection, operative technique and perioperative management. Chi-square analysis was used to identify significant variation across regions.

Results: A total of 57,555 carotid artery revascularization procedures were identified. Of these, 49,179 underwent CEA (asymptomatic: median 56%; range 46-69%, $P < 0.01$) and 8,376 underwent CAS (asymptomatic: median 36%; range 29-51%, $P < 0.01$). There was significant regional variation in the proportion of asymptomatic patients being treated for carotid stenosis < 70% in CEA (3-9%, $P < 0.01$) versus CAS (3-22%, $P < 0.01$). There was also significant variation in the rates of intervention for asymptomatic patients over the age of 80 (CEA: 12-27%, $P < 0.01$; CAS: 8-26%, $P < 0.01$). Pre-operative CTA/MRA in the CAS cohort also varied widely (31-83%, $P < 0.01$), as did pre-operative medical management with combined aspirin/statin (CEA: 53-77%, $P < 0.01$; CAS: 62-80%, $P < 0.01$). In the CEA group, the use of shunt (36-83%, $P < 0.01$), protamine (32-89%, $P < 0.01$) and patch varied widely (87-99%, $P < 0.01$). Similarly, there was regional variation in frequency of CAS done without a protection device (1-8%, $P < 0.01$).

Limitations: VQI is a large, multicenter database.

Conclusion: Despite clinical benchmarks aimed at guiding management of carotid disease, wide variation in clinical practice exists, including the proportion of asymptomatic patients being treated using CAS and pre-operative medical management. Additional intra-operative variables including the use of a patch and protamine during CEA and use of a protection device during CAS displayed similar variation, in spite of clear guidelines. Quality improvement projects could be directed towards improved adherence to benchmarks in these areas.

Original Investigations

Therapy with Angiotensin Receptor Neprilysin Inhibitor is Superior to Enalapril in the Rodent Model of Dilated Cardiomyopathy but not Hypertrophic Cardiomyopathy

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[1]SEMC-Department of Anesthesiology, Critical Care, and Pain Medicine

Background: An angiotensin receptor neprilysin inhibitor (ARNI) is a salt complex of a neprilysin inhibitor prodrug which increases vasoactive peptides, and an angiotensin II type 1 receptor blocker, and is indicated as heart failure therapy. While treatment with ARNI resulted in 16% reduction in all-cause mortality in patients with heart failure and reduced ejection fraction over angiotensin-converting-enzyme (ACE) inhibition, the mechanisms of action leading to this benefit are not well understood and need to be studied in relevant animal models.

Study Design: Not applicable

Setting and Participants: We used rat models of dilated cardiomyopathy (DCM), and hypertrophic cardiomyopathy

(HCM). The length of the experiments was 8 weeks. The studied therapies were ARNI vs. Enalapril. The therapeutic strategy was the treatment of the preexisting cardiomyopathy. The evaluations consisted of hemodynamic assessments and exercise tolerance studies.

Male Sprague Dawley rats were treated daily for 4 weeks with either ARNI (68 mg/kg, N=8), or Enalapril (30 mg/kg, N=8) 4 weeks after cardiomyopathy induction.

Methods: All studies were approved by the Institutional Animal Care and Use Committee at CBSET Inc, a Contract Research Organization (Lexington, MA). The DCM model was induced by partial disruption of the aortic valve (N=8). The HCM model was initiated via partial ligation of the abdominal aorta (N=8). Drugs were administered via daily oral gavaging. Treadmill exercise tolerance and hemodynamic assessments were conducted after four weeks of treatment.

Results: In DCM, therapy with ARNI but not Enalapril improved LV contractility, relaxation, and exercise tolerance and was superior to therapy with Enalapril in terms of LV relaxation and exercise tolerance. Neither therapy improved LV ejection fraction, cardiac output and LV morphology. In the model of HCM, therapy with ARNI and Enalapril significantly reduced mean arterial pressure, end systolic pressure, LV hypertrophy, and improved exercise tolerance (running distance), but did not improve ejection fraction, reduce systemic vascular resistance, or attenuated of LV dilatation.

Limitations: Animal experiments do not represent heterogeneity of disease and drug metabolism in patients.

Conclusion: Therapy with ARNI is superior to Enalapril in the rat model of DCM in terms of improved left ventricular relaxation and exercise tolerance. ARNI and Enalapril had comparable beneficial therapeutic effects in the model of HCM.

Correlation of Ventilatory Limitation and Exercise capacity with Baseline Spirometry Parameters

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[1]SEMC-Division of Pulmonary, Critical Care, and Sleep Medicine, Department of Medicine

Background: Patients with advanced pulmonary disease usually have multiple co-morbidities which can decrease exercise capacity. We evaluated whether spirometry measurements could predict ventilatory limitation (as measured by decreased Breathing reserve) resulting in reduced exercise capacity.

Study Design: Retrospective chart review on patients performing Cardiopulmonary Exercise Tests (CPETs) in the Pulmonary Physiology laboratory at St. Elizabeth's Medical Center.

Setting and Participants: We retrospectively reviewed CPETs and paired spirometry tests performed on all adult patients (>18 years of age) in the Pulmonary Physiology laboratory at St. Elizabeth's Medical Center between April, 2006 and April, 2016.

Methods: We defined severely reduced exercise capacity as peak oxygen consumption VO(2) of < 15 mL/kg/min and used the conventional definition of ventilatory limitation as breathing reserve (BR) less than 15% at peak exercise.

Results: Out of the 304 patients included in the analysis, 22 patients had evidence of both ventilatory limitation and severely reduced exercise capacity. Only 5 (2%) of 246 patients with FEV1>60% predicted had concomitant ventilatory limitation and severe reduction in exercise capacity compared with 13 (34%) out of 34 patients with FEV1<50% predicted (p<0.0001). Approximately 70% of patients with FEV1<50% had ventilatory limitation at peak exercise. In patients with FEV1<50%, the mean FVC was lower in the group with ventilatory limitation (62% predicted; SD-15%) compared to the group with BR>15% (71% predicted; SD-19%); although the difference was not statistically significant (p=0.16) likely due to small sample size.

Limitations: Study limitations include single center study and small sample size.

Conclusion: Reductions in FEV1 are associated with ventilatory limitation at peak exercise. This association is less apparent in those with severe exercise limitations suggesting a more prominent role of co-morbidities in this population.

Original Investigations

Association of Omentopexy at the Time of Laparoscopic Sleeve Gastrectomy and Prevention of Long-term Postoperative Nausea-related Complications

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[1]SEMC-Department of Surgery; [2]SEMC-Division of Bariatric Surgery, Department of Surgery

Background: Nausea and vomiting is a common complication after laparoscopic sleeve gastrectomy (LSG). Performing omentopexy to the greater curvature of the stomach has been described as a method of reducing these symptoms postoperatively.

Design: Retrospective cohort study of patients that underwent LSG with and without omentopexy between 10/2014-8/2015 and had follow up visits up to one year postoperatively were included in the final analysis (n=130).

Setting and Participants: 57 patients underwent omentopexy (Group 1) and 73 did not (Group 2). T-test and chi-square were used. $p<0.05$ was considered statistically significant.

Methods: The patients included in the study were obtained through the Bariatric Surgery database. Chart review of their electronic medical records was performed by accessing Athena and Meditech. Postoperative nausea requiring medical attention and other nausea-related outcomes (anti-nausea medication doses, emergency room visits and hospital readmissions) were the outcomes of the study.

Results: 57 patients underwent omentopexy (Group 1) and 73 did not (Group 2). T-test and chi-square were used. $p<0.05$ was considered statistically significant.

Limitations: Omentopexy at the time of LSG doesn't significantly reduce postoperative nausea and nausea-related complications. However, no hospital readmissions after 30 days from surgery were noted in patients that had undergone omentopexy at the time of LSG when compared to those who didn't. Further studies may elucidate the potential long-term benefit omentopexy during LSG on postoperative GI symptoms.

Conclusion: All patients were comparable in age, pre- and post-operative BMI, intra-operative and major postoperative complications. Groups 1 and 2 did not differ in postoperative nausea rates (21.05% vs. 19.18%, respectively p=0.83). The groups required similar total amounts of ondasetron (21.71±17.40mg vs. 17.86±16.58mg, respectively; p=0.20) and promethazine (9.87±12.49mg vs. 10.00±14.00mg, respectively; p=0.96) during their immediate postoperative hospitalization. Postoperative nausea-related ER visits (17.54% vs. 12.33%, respectively; p=0.46) and hospital re-admissions (7.02% vs. 6.85%, respectively; p=1.00) within one year of the procedure were also similar. Further sub-analysis of only the patients with postoperative nausea requiring medical attention was performed. Groups 1a (12 patients with omentopexy) and 2a (14 patient without omentopexy) had similar postoperative nausea-related ER visits and hospital readmissions after stratifying for the following postoperative follow-up time periods: <30 days, 30 days-6 months and 6 months-1 year from surgery. No hospital readmissions >30 days from surgery were identified in patients who had undergone omentopexy, although this wasn't statistically significant when compared to those who hadn't undergone omentopexy (p=0.10).

Original Investigations

Accuracy of Bedside Ultrasound by Internal Medicine Residents to Evaluate Central Venous Catheter Placement

Christian Ghattas[1], Mandeep Hundal[1], Fahad Farooq[1], Frederic Celestin[1], Peter LaCamera[1], Samaan Rafeq[1]
[1]SEMC- Division of Pulmonary, Critical Care, and Sleep Medicine, Department of Medicine

Background: Proper central venous catheter (CVC) placement involves positioning of the catheter tip in the distal Superior Vena Cava. A chest X-ray (CXR) is the gold standard for diagnosing CVC misplacement. Fast and accurate confirmation of proper CVC tip position allows immediate use of CVC. Ultrasound (US) assessment of CVC position by direct visualization has been studied by operators with US expertise. US confirmation of proper CVC placement has not however been evaluated in trainees in an academic setting. Our study investigated whether IM interns and residents (IMIR) can effectively perform US confirmation of CVC using a well described saline flush technique after receiving ultrasound training.

Design: Prospective non randomized observational study.

Setting and Participants: Internal medicine interns and residents rotating in the intensive care unit

Methods: The first CVC placement attempts from 36 IMIR were included. There were 14 PGY1 (38.9%), 15 PGY2 (41.7%) and 7 PGY3 (19.4%). In 33/36 (91.7%) attempts, the IMIR were successful acquiring the cardiac window (95% CI, 77.5%-98.2%). This success rate was significantly greater than the pre-specified threshold of 75% (two-sided p=0.02). All IMIR (100%) did a proper pre and post procedure pleural exam. The RAT was properly interpreted every time a cardiac window was obtained. CXR reveal proper CVC tip position in all studies except in one patient, in which the RAT was absent and the CXR confirmed misplacement of the tip into the contralateral subclavian vein.

Results: The first CVC placement attempts from 36 IMIR were included. There were 14 PGY1 (38.9%), 15 PGY2 (41.7%) and 7 PGY3 (19.4%). In 33/36 (91.7%) attempts, the IMIR were successful acquiring the cardiac window (95% CI, 77.5%-98.2%). This success rate was significantly greater than the pre-specified threshold of 75% (two-sided p=0.02). All IMIR (100%) did a proper pre and post procedure pleural exam. The RAT was properly interpreted every time a cardiac window was obtained. CXR reveal proper CVC tip position in all studies except in one patient, in which the RAT was absent and the CXR confirmed misplacement of the tip into the contralateral subclavian vein.

Limitations: small sample size

Conclusion: With proper training, ultrasound examination performed by IMIR is concordant with the chest x-ray to identify proper CVC tip position.

Steatotic Human Livers Show Inferior Function Compared to Non-steatotic Livers during Ex-Situ Viability Assessment by Oxygenated Machine Perfusion

Fermin M. Fontan[1], James Markmann[2]
[1]SEMC-Department of Surgery; [2]Other Institutional Affiliation

Background: Fatty livers are frequently declined for transplantation due to high risk of primary non-function. We assessed the function of fatty-livers compared to lean-livers during ex-situ subnormothermic machine perfusion (SNMP) and normothermic machine perfusion (NMP).

Study Design: This is an exploratory study comparing different Ex-Vivo organ perfusion temperatures as well as steatoic and lean liver grafts outcomes.

Setting and Participants: This is an exploratory study comparing different ex-vivo organ perfusion temperatures as well as steatoic and lean liver grafts outcomes.

Methods: Twenty human-livers declined for transplantation were included. Fatty livers were defined as >30% macrovesicular steatosis by histology. 3 hours oxygenated SNMP (n=4 lean, n=10 fatty) or NMP (n=3 lean, n=3 fatty) with Williams-E based perfusate were performed. The NMP perfusate included an artificial oxygen carrier based on bovine hemoglobin.

Results: Portal venous resistance was relatively constant throughout the study period in all 4 groups after the first 15 minutes and was fairly similar in all 4 groups. Hepatic arterial resistance decreased gradually over time in all groups, and while fairly close in all groups, resistance tended to be higher in NMP than SNMP and in fatty than lean livers. Lactate levels in the perfusate decreased over time, but much more rapidly during NMP than during SNMP. NMP fatty livers cleared lactate much more slowly than NMP lean livers, resulting in > 7-fold higher lactate levels by the end of 3 hours. Similarly, both fatty and lean livers produced low amounts of bile on SNMP, although fatty livers produced markedly less bile at NMP than lean livers.

Limitations: Ex-vivo perfusion is not associated with hormonal support, which could negatively impact longer perfusion periods; increased costs; the sample power and the heterogeneity between the donors.

Conclusion: Functional differences were quite pronounced between fatty and lean livers at NMP that were not evident during SNMP. This suggests that the low metabolic activity of SNMP may not be sufficient to distinguish impaired function in fatty livers; either longer perfusion times or additional therapeutics will likely be necessary to restore transplantability in steatoic livers.

Original Investigations

Ex vivo Normothermic Machine Perfusion of Discarded Human Kidneys

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Background: Hypothermic non-oxygenated machine perfusion (HMP) and static cold storage preservation offer little opportunity to assess/improve organ quality. Through oxygenated normothermic machine perfusion-NMP we investigated the possibility of rescuing discarded kidneys.

Design: Study designed to explore the benefits of oxygenated NMP as a preservative method for kidneys declined for transplantation.

Setting and Participants: Not applicable.

Methods: n=5 human kidneys (A-E), from extended criteria donors declined for transplantation, were perfused with oxygenated NMP. Perfusions lasted for a total of 3 hours. Different parameters were measured throughout the perfusion period in order to assess metabolic function and markers that could suggest which organs could be recovered for transplantation.

Results: The average cold ischemia time was 21h. A was declined for poor flush, B, D, and E for a percent glomerulosclerosis of 15, 24, and 30% in combination with flow (ml/min/100g)/resistance (ml/min/100g) on HMP of 80/0.45, 110/0.26, and 76/0.46 respectively; while C had a hilum hematoma. Renal artery flow, resistance, pH, bicarbonate, creatinine, lactate and arterio-venous oxygen difference showed overall improvement throughout NMP, except for the lactate which showed an uptrend (literature suggests that synthetic oxygen carriers could make lactate unreliable as an injury marker). All kidneys were able to sustain a physiologic pH/bicarbonate. Resistance measurements in kidneys showed a significant improvement with normothermic perfusion allowing for more physiologic flows. Perfusate creatinine trends showed evidence of a modest clearance function. Kidneys A, B and E made a total of 18.5, 7.8, and 80 ml of urine, respectively.

Limitations: Sample power and heterogeneity between donors. Ex-vivo perfusion lacks hormonal support of the grafts, which could negatively impact longer perfusion periods. NMP is currently associated with increased costs.

Conclusion: Flow and resistance showed marked improvement with NMP. The oxygen consumption trend correlates with a sustained metabolic activity and we are testing tissue samples for ATP content to confirm this finding. Although our results are promising, extended NMP periods might be necessary to determine the need for short versus prolonged perfusions to more accurately assess organs in the pre-transplant period.

Split Liver Ex-situ Oxygenated Machine Perfusion: A Novel Approach to Organ Preservation and Treatment

Fermin M. Fontan[1], James Markmann[2]
[1]SEMC-Department of Surgery; [2]Other Institutional Affiliation

Background: The heterogeneity of deceased liver donors can affect the interpretation of perfusion outcomes. Therefore we developed a split liver ex-situ machine perfusion technique to provide matched controls for each liver.

Study Design: This is an exploratory study where we compared split liver single lobes outcomes while on subnormothermic machine perfusion (SNMP).

Setting and Participants: Not applicable.

Methods: n=11 discarded human livers were included after obtaining informed consent for research from the donor's family. Livers were split anatomically into right and left lobes. Each lobe was perfused at a subnormothermic temperature, separately for 3 hours. Hemodynamic parameters and biochemical profiles of each lobe were monitored at regular time intervals.

Results: We adapted our previously designed SNMP (21°C) protocol for whole liver grafts, to test whether two lobes of the same liver would be comparable to each other and to a whole graft during perfusion. As with whole livers, each lobe exhibited decreasing portal venous and hepatic arterial resistance and lactate levels during the perfusion period, which were not significantly different between the right and left lobe within each liver. Overall bile and ATP production was low in the split livers compared to whole liver perfusions; suggesting that the splitting act might cause some extra degree of injury to the grafts. ALT release per gram of liver weight was slightly higher in left lobes compared to right lobes.

Limitations: Ex vivo perfusion has no hormonal support of the grafts, which could negatively impact longer perfusion periods. NMP is currently associated with increased costs.

Conclusion: Single liver lobes behave similarly to whole livers, and more importantly, to each other. Split liver perfusion is a novel approach that may allow direct comparison of different preservation techniques and treatments on the same liver, circumventing the need for extremely large numbers of experimental and control livers necessary, with the wide variability of discarded human livers.

Original Investigations

Photochemical Tissue Bonding Optimizes Outcomes of Large Gap Peripheral Nerve Defects Repaired with Acellular Nerve Grafts in a Porcine Model

Rachel L. Goldstein[1], William G. Austen, Jr.[2], Gem Runyan[2], Mark A. Randolph[2], Jeena Easow[2], Robert W. Redmond[2]
[1]SEMC-Department of Surgery; 2Other Institutional Affiliation

Background: Standard reconstruction for large gap peripheral nerve defects utilizes nerve autograft harvested from a donor limb, which is not always present after battlefield amputating traumas. The alternative, acellular nerve graft, results in suboptimal functionality. Photochemical tissue bonding (PTB) creates a functional seal of cross-linked collagen, improving nerve repair outcomes in our recent small animal studies. PTB may also optimize large gap nerve repair with acellular nerve grafts.

Design: Large gap peripheral nerve defects in pigs were repaired with either standard sutured autograft, or acellular nerve graft using PTB.

Setting and Participants: Six Yucatan pigs were used, housed in standard MGH animal facilities.

Methods: All protocols were approved by MGH IACUC. Each pig received 5cm resection of bilateral ulnar nerves, repaired with sutured saphenous nerve autograft in the control limb, and acellular human nerve graft with PTB in the experimental limb. For PTB, coaptation sites wrapped with chemically cross-linked human amniotic membrane (HAM), painted with photosensitizing dye, were exposed to LED light promoting collagen cross-linking. Tacrolimus prevented xenograft rejection. Electromyography (EMG) was performed on native nerve on Day 0 and then 150 days after injury/repair to obtain the compound muscle action potential (CMAP) of the flexor carpi ulnaris after stimulation of the nerve proximal to the graft. Animals were then euthanized and nerves collected for histology.

Results: Five pigs survived. No signs of xenograft rejection were observed. On Day 150, control and experimental grafts displayed similar CMAP amplitudes (28.46±5.41 vs. 21.28±6.26 mV, p=0.09) and conduction velocities (59.69±3.93 vs. 62.04±5.89 m/s, p=0.48). Conduction velocities were similar on Day 0 and 150 in the control limb (48.16±12.35 vs. 59.68±3.93 m/s, p=0.106), but increased in the experimental limb (44.34±7.61 vs. 62.04±5.89 m/s, p=0.004). Histology results are pending.

Limitations: Only 2 experimental groups were compared in this study. Also, functional assessment depended on EMG as gait and sensation could not be evaluated with this model.

Conclusion: Repair of large gap ulnar nerve defects with acellular nerve grafts using PTB demonstrates comparable electrophysiological outcomes to the standard repair in a large animal model. Thus, PTB may optimize functionality for patients with reconstructed large gap peripheral nerve defects in whom auto-grafting was not an option.

Original Investigations

Poloxamer 188 Improves Cryopreserved Fat Graft Take in a Nude Mouse Model

Rachel L. Goldstein[1], William G. Austen, Jr.[2], Gem Runyan[2], Michael C. McCormack[2], Robert N. Goldstone[2], Mark A. Randolph[2]
[1]SEMC-Department of Surgery; [2]Other Institutional Affiliation

Background: Autologous fat grafting is widely used in reconstructive surgery. Variable, unpredictable graft retention often necessitates secondary grafting procedures, each requiring another donor-site-morbid harvest procedure. With cryopreservation, one harvest procedure could provide for multiple future grafting procedures. But since few adipocytes survive cryopreservation, graft retention is poor. Poloaxmer 188 (p188) increases fat graft retention and viability by stabilizing cell membranes. In this way, p188 may protect adipocytes through the cryopreservation process.

Study Design: Fat was cryopreserved with NS or p188 for freezing and thawing and grafted in nude mice.

Setting and Participants: Nude mice were housed in MGH animal care facilities.

Methods: All protocols were approved by MGH IACUC. Liposaspirate was washed with either normal saline (NS) or p188 solution. Fat was stored at -80oC for 2-3 weeks and thawed at 37oC in either NS or p188. Groups were: 1) Freshly collected fat (Control), 2) Frozen in NS, thawed in NS (NS/NS; Cryopreservation Control), 3) Frozen in p188, thawed in NS (p188/NS), 4) Frozen in NS, thawed in p188 (NS/p188), and 5) Frozen in p188, thawed in p188 (p188/p188). A metabolic assay measured viability. 1g globules were then injected subcutaneously through a 14 gauge angiocatheter in the bilateral dorsa of nude mice. Animals were euthanized after four weeks. Grafts were then harvested, weighed for retention, and processed for histology.

Results: The NS/p188 group had the highest retention, 74±11.7%, which was similar to the control group, 73±8.6% ($p=0.56$), and significantly higher than the cryopreservation control group (NS/NS), 66±10.5% ($p=0.009$) and all other cryopreservation groups ($p<0.05$). After thawing, all cryopreservation groups had significantly lower viability than the control. But after harvest, histological health scores were similar for all groups, except p188/p188 scoring significantly lower than the control ($p=0.034$).

Limitations: This study did not investigate the mechanism of p188 protection during cryopreservation. It also did not compare p188 to other cryoprotective agents.

Conclusion: Grafted cryopreserved fat thawed in p188 has similar retention to freshly harvested fat, and appears just as healthy histologically. Thawing with p188 improves cryopreserved graft take by >10%. A safe, effective method of cryopreservation will allow surgeons to achieve desired fat grafting results without the morbidities of multiple harvesting procedures.

Original Investigations

A Multidisciplinary Approach to Atrial Fibrillation: The Convergent Experience at St. Elizabeth's Medical Center

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Background: The convergent procedure is a minimally invasive procedure, developed as an option for the management of refractory atrial fibrillation (AF). It involves epicardial ablation of the posterior wall of the left atrium via a transdiaphragmatic approach followed by catheter based endocardial pulmonary vein isolation.

Design: Retrospective cohort study to assess recurrence of arrhythmias within one year in patients who underwent the convergent procedure for AF at a tertiary healthcare facility.

Setting and Participants: We reviewed electronic medical records at St. Elizabeth's Medical Center to identify patients who underwent the convergent procedure. Demographic characteristics, medical history, type of AF (paroxysmal or persistent) and procedural data including complications were obtained.

Methods: Our primary outcome was the recurrence of AF or atrial flutter within one year of the intervention using Cox proportional survival analyses. We used Kaplan-Meier non-parametric analyses to depict the event-free probability for this outcome. Secondary outcomes were the need for repeat catheter ablations, antiarrhythmics and anticoagulants.

Results: 17 patients were included in the study. The mean age was 65.4 ± 7.4 with a male predominance (77%). More patients presented with persistent (76.5%) than paroxysmal (23.5%) AF. The average CHA2DS2VASc was 2.56 ± 1.6. No patient suffered cardiac tamponade, major bleeding, phrenic nerve injury, or death. Complications were liver laceration (1/17, 5.9%), and acute kidney injury (2/17, 11.76%). Hospital length of stay was 4.9 ± 1.9 days. Compared to pre-procedural paroxysmal AF, persistent AF was not associated with recurrence of atrial flutter [hazard ratio (HR) 0.60; 95% CI 0.05, 6.66; p = 0.680], AF (HR 0.42; 95% CI 0.07, 2.53; p = 0.344), or either (HR 0.54; 95% CI 0.10, 2.96; p = 0.479). After excluding events during the typical 3 month post-ablation blanking period, AF recurrence at one year was 0% and all patients were in sinus rhythm.

Limitations: Retrospective, observational study; underpowered for any clinically significant estimate.

Conclusion: The convergent procedure is safe and effective. Success rates are higher than reported success rates in catheter ablation studies including a high percentage of patients with persistent AF. Randomized controlled trials are necessary to validate this treatment.

Original Investigations

Trends in Avoidable Hospitalizations for Diabetes-Related Complications: Experience of a Large Integrated Health Care System

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Background: The Agency for Healthcare Quality and Research (AHRQ) has developed Prevention Quality Indicators (PQIs) to measure potentially avoidable hospitalizations for Ambulatory Care Sensitive Conditions (ACSCs). Timely and effective ambulatory care for these conditions can prevent complications and reduce hospitalizations. Steward Health Care System participates in alternative payment models that reward high-quality care by focusing on population health management. We examined the impact of these clinical integration efforts on diabetes-related potentially avoidable hospitalizations.

Study Design: Retrospective cohort and ecological study.

Setting and Participants: Inpatient and observation hospitalizations (2012-2016) at 9 acute care hospitals in 6 counties. IRB approval with waiver of consent was obtained.

Methods: Using the hospital administrative claims data set and the AHRQ technical specifications, monthly hospitalizations rates (per 1,000, aggregated annually) were calculated for the following 4 diabetes-related PQIs: short-term complications (PQI-01), long-term complications (PQI-03), uncontrolled diabetes (PQI-14), and lower extremity amputation (PQI-16). Stratified analyses were performed by payer. County income-per-capita (from 2015) was correlated with hospitalization rates. Results are displayed as mean (±SD).

Results: Over 5 years, the monthly hospitalization rate for diabetes short-term complications gradually increased from 3.2 (±0.9) to 7.1 (±1.0) per 1,000 discharges ($p<0.001$). A similar trend was observed for the monthly hospitalization rate for uncontrolled diabetes, doubling from 1.3 (±0.4) to 2.4 (±0.6) per 1,000 discharges ($p<0.001$). By contrast, the monthly hospitalization rate for diabetes long-term complications gradually decreased from 12.6 (±3.9) to 6.5 (±2.3) per 1,000 discharges over 5 years ($p=0.004$); a similar trend was observed for the monthly hospitalization rate for lower extremity amputations, gradually decreasing from 88.6 (±3.6) to 82.2 (±3.4) per 1,000 discharges ($p<0.001$). These trends persisted for across payers for both short-term and long-term diabetes complications. There was an inverse correlation between county income-per-capita and monthly hospitalization rate for diabetes short-term complications ($r=-0.250$, $p=0.034$), long-term complications ($r=-0.259$, $p=0.028$), and lower extremity amputation ($r=-0.785$, $p<0.001$).

Limitations: Ecological fallacy; evolving hospital-based coding practices; reliance on administrative dataset.

Conclusion: Diabetes is a serious, highly prevalent, costly, yet manageable chronic disease. Clinical integration efforts aimed at optimizing diabetes care in ambulatory settings can prevent long-term complications and reduce avoidable hospitalizations.

Original Investigations

Hospital Mortality Rates on Medical Services: An Analysis of Transfers vs. Non-transfers from Acute Care Facilities

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Background: St. Elizabeth's Medical Center (SEMC) serves as the tertiary care hospital for the Steward Health Care System. In the past 2 years, the number of patients transferred to SEMC from outside acute facilities to medical services has steadily risen. We investigated the difference in mortality rates of patients hospitalized on medicine services who were transferred from acute care facilities (transfer group) compared to those hospitalized through our Emergency Department (non-transfer group).

Design: Retrospective cohort study spanning two years (June 2014-June 2016).

Setting and Participants: Hospitalized adults who died on medicine services (excluding cardiology) between June 2014 and June 2016, identified in the Department of Medicine's mortality database.

Methods: We calculated monthly in-hospital mortality rates using number of deaths, number of transfers, and total number of patients hospitalized on medicine services. The test of significance was performed using nonparametric t-test and chi-square test.

Results: 273 deaths were identified in our study period, of which 85 (31%) were in the transfer group and 188 (69%) in the non-transfer group. The in-hospital mortality rate of the transfer group was significantly higher than the non-transfer group (5.19% vs. 2.74%, P=0.006). The hospital mortality rate within the first 24 hours of admission appeared higher in the transfer group (0.89% vs. 0.53%, P=0.46); the hospital mortality rate among weekend transfers also appeared higher (5.38% vs. 4.64%, P=0.18) with a relative risk of 1.21 (95% CI 0.79, 1.84). Both findings however, did not meet statistical significance due to small sample size. The transfer group was younger (mean age 67.6 vs. 76.1 years old, P<0.05) and predominantly male (58.5% vs. 47.6%, P=0.079). Hospital LOS was similar (6.8 vs. 5.8 days, P=0.24). Leading causes of death in the transfer group were cancer (21.3%) and cardiac arrest (21.3%), and in the non-transfer group, cancer (19.5%) and pneumonia (16.7%).

Limitations: Lack of adjustment for comorbidities.

Conclusion: For patients hospitalized on medical services, there is almost a two-fold increase in hospital mortality among those transferred from acute care facilities. Moreover, there was a non-significant trend toward higher mortality for patients transferred on weekends rather than weekdays.

Competitive Atrial Pacing Can Trigger Atrial Tachyarrythmias: Results of the RATE Registry

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Background: An unsuspected high incidence of asymptomatic atrial tachyarrhythmias (AT/AF) has been recognized in patients with implantable cardiac devices (CIED). In some of these instances, the "device detected AT/AF" was shown to be associated with competitive atrial pacing (CAP). Relationship of CAP to AT/AF remains speculative, but causality has previously been suggested. The clinical significance of potentially CAP triggered AT/AF episodes is undergoing investigation.

Study Design: To investigate a potential causation between CAP and AT/AF in the largest observation to date.

Setting and Participants: The registry enrolled patients >=18 years of age within 45 days of implantation of a St. Jude Medical pacemaker or defibrillator (ICD) that included an atrial lead and Advanced AT/AF Diagnostic capabilities. Patients were excluded if they had documented permanent atrial fibrillation or documented atrial fibrillation within 3 months before enrollment.

Methods: The RATE registry was a multicenter study that included 5,379 pts with CIED followed for approximately two years. Over 30,000 electrograms (EGMs) from a subset of all detected AT/AF were analyzed by a group of experienced adjudicators, and categorized according to the presence of AT/AF, different forms of CAP, and the causal relationship between AT/AF and CAP.

Results: There was a strong association between CAP and AT/AF (72-78% of all competitive pacing episodes, p<0.04). There was a causal relationship between CAP and AT/AF in 26 % of all episodes identified by expert adjudication.

Limitations: The study is limited in evaluation of AT/AF episodes detected by CIEDs. The device's memory limits its ability to store full duration of AT/AF episodes. Consequently, we may not have examined all episodes of AT/AF or their full duration.

Conclusion: This is probably the largest description of CAP and AF to date. CAP triggered AT/AF accounts for a large portion of CIEDs detected AT/AF. CAP may be in part responsible for the higher than expected incidence of CIED detected AT/AF.

Original Investigations

Feasibility and Reproducibility of Robotic Retro-Muscular Ventral Hernia Repair

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Background: There is limited data on the value of a robotic approach for complex abdominal wall reconstruction as well as the ability to reproduce these results among surgeons. Here, we describe our initial experience and present a foundation for further research in regards to the reproducibility of such approach including perioperative outcomes.

Design: A single-center, retrospective review of prospectively collected data between 2015 and 2016 was performed on robotic retromuscular ventral hernia (RRVH) repair with approval from the institutional review board.

Setting and Participants: All cases of RRVHR with or without component separation via Transversus abdominis release (TAR) between 2015 and 2016 were reviewed.

Methods: Surgeon utilized social media platforms (international hernia collaboration and robotic surgery collaboration) for continuous mentorship and feedback. Data collected included patient demographics, details related to the surgical procedure (including defect size, mesh size and fixation), the ability and technique used to close the midline anterior and posterior fascia (including the need for component separation), conversion rate to an open procedure, perioperative outcomes and postoperative complications (surgical site occurrence, surgical site infection, hospital readmission, and early hernia recurrence due to technical error). Routine postoperative follow-up was at 1 month, 3 months.

Results: A total of 26 consecutive RRVH were performed utilizing the Intuitive Si daVinci™ robotic platform, including 9 TAR component separation repairs. All cases were considered elective with ASA scores ranging from 2-3. Demographics included: average BMI 33.7 (range 28-42), sex (male n=16, female n=10) and average age 61.3 years (range 42-82 years). All cases were classified as clean, with the exception of 1, where an iatrogenic colostomy was encountered and repaired primarily without spillage. Operative times averaged168 (range 72-242) for RRVH without TAR and 295 minutes (range 234-335) for RRVH with TAR (average operative time for all cases was 212 minutes (range 72-335 minutes). The average hernia defect was 89 cm2 (range 24-300 cm2), whereas the average size of synthetic mesh used was 550 cm2 (range 192-1400 cm2). Conversion to an open procedure was required in 1 case (3.8%) due to an inability to close the anterior fascia. Average blood loss was only 10 mL (range 5-50 mL) and average hospital length of stay was 1.08 days (range 0-5 days). Complications consisted of one symptomatic seroma requiring aspiration in the office. No surgical site infection, early hernia recurrence, or hospital readmission was encountered.

Limitations: This is a report of our early single center experience of RRVHR performed by a single surgeon.

Conclusion: Our early experience has demonstrated that RRVH repair with or without component separation is a safe, feasible and reproducible approach, which allows the surgeon to perform complex abdominal wall reconstruction via a minimally invasive approach.

Original Investigations

Heparin Requirement during Atrial Fibrillation Ablation in Patients on NOACs

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Background: Atrial fibrillation (AF) is the most common arrhythmia accounting for 15% of strokes worldwide. Radiofrequency ablation is a frequently used therapy for treatment of AF during which heparin infusion is given and it has been observed that patients on Novel Oral Anti-Coagulants (NOACs) require larger doses of heparin and take longer time to reach therapeutic ACT. It is unknown whether this represents sub therapeutic anticoagulation or insensitivity of ACT to NOACs.

Study Design: To retrospectively analyze the effect of oral anticoagulant on intra-procedural heparin requirements in patients undergoing AF ablation and to prospectively elucidate the mechanism of this phenomenon.

Setting and Participants: Patients undergoing AF ablation between Jan 2016 to Dec 2016 at St. Elizabeth's Medical Center.

Methods: We performed a retrospective analysis of consecutive patients undergoing AF ablation between January 2016 and December 2016 at St. Elizabeth's Medical Center. The patient population was divided into 4 groups based on the type of anticoagulation prior to the procedure. Heparin was given as a bolus and continuous infusion during AF ablation. ACT testing was performed to assess the degree of anticoagulation and total dose of heparin to achieve therapeutic ACT was calculated.

Results: A total of 85 patients were included: 20 pts on Coumadin (23%); 27 on Rivaroxaban (32%); 28 on Apixaban (33%) and 7 on Dabigatran (8%). In the Coumadin group, mean INR was 2.2 with a baseline ACT of 168 while the baseline ACT in patients on Rivaroxaban, Apixaban and Dabigatran were 152, 143 and 165 respectively. The time to reach therapeutic ACT was significantly lower in Coumadin group compared to Rivaroxaban (36 vs. 53 min, p 0.02), Apixaban (36 vs. 61 min, p 0.01) and Dabigatran (36 vs. 52 min p 0.02). Similarly, total amount of heparin administered to achieve therapeutic anticoagulation was significantly lower in the Coumadin group (8138 +/- 2221 Units) as compared to Rivaroxaban (12924 +/- 2919 units, P<0.001) Apixaban (12308 +/- 3716 units, P<0.001) and Dabigatran (12889 +/- 3274 units, p<0.001).

Limitations: Our study has the limitations of a retrospective analysis including lack of randomization and presence of selection bias. Additionally, the results can be influenced by confounders which were not accounted for during the analysis.

Conclusion: Patients on NOACs undergoing AF ablation require higher doses of intra-procedural heparin as compared to Coumadin. The reason for such an effect is unclear. A prospective study to investigate possible mechanisms is underway.

Quality Improvement Reports

Acid suppressive Agents for Stress Ulcer Prophylaxis: Impact of a Pharmacy Monitor

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Background: Risk factors such as mechanical ventilation and coagulopathy have been associated with stress ulceration. Current stress ulcer prophylaxis (SUP) guidelines are outdated and are due to be updated imminently. Use of Acid suppressive Agents (ASAs) for SUP is recommended and proton pump inhibitors (PPI) are widely prescribed. Meanwhile, there are controversies: incidence of stress ulcers, choice of agent and PPI-related adverse events.

Purpose, Setting and Participants: The objective of this project is to evaluate prescribing patterns for ASAs at our institution and to identify the impact of a pharmacy monitor on their use.

QI Plan: The study was submitted to Institutional Review Board for approval. A retrospective phase was followed by a prospective phase until at least 500 patients was reached in each phase. The following data were collected using electronic medical records for hospitalized patients receiving ASAs for SUP: patient demographics, indication, medication, route, class, dose and duration. During the prospective phase the pharmacy resident printed a daily report of all hospitalized patients receiving ASAs. Recommendations were made based on indication, duration etc. according to literature guidelines. Data from the prospective phase were compared to that of the retrospective phase. Primary outcomes were based on the net effect of the pharmacist's interventions: 1) appropriate indication for SUP and 2) timely discontinuation of the prophylactic agent. The results will be presented to the Pharmacy and Therapeutics Committee.

Results: ASAs were prescribed for SUP in 90 retrospective and 84 prospective hospitalized patients. Excluding patients on the cardiac thoracic surgery service, there were 40 and 54 in each phase respectively. For the primary outcome, appropriate indication for use, the compliance was 42% (n=38) and 60% (n=50) of patients in the retrospective and prospective phases respectively. For the second primary outcome, timely discontinuation, 28% (n=25) of patients were discontinued in a timely fashion in the retrospective phase and 49% (n= 41) of patients in the prospective phase after pharmacist intervention in the latter.

Conclusion: Employing a pharmacy monitor resulted in timelier discontinuation, and thus may decrease the duration, of ASA regimens prescribed for stress ulcer prophylaxis in hospitalized patients.

A Focus on Rapid Retriage of Critically Injured Trauma Patients

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Background: Critically injured patients presenting to non-trauma hospitals require timely transfer to a trauma center (TC). Purpose, Setting and Participants: Purpose: To evaluate regional trauma outcomes following local EMS agencies implementation of policies allowing for rapid retriage, the expedited transfer of critically injured trauma patients from non-trauma hospitals to a trauma center. ED physicians at non-trauma hospitals, upon recognizing a critically injured trauma patient, were given the ability to call 9-1-1 to retriage the patient to the associated trauma center with an unconditional acceptance. QI Plan: This retrospective, observational study used a quality improvement database compiled from all 12 trauma registries within the San Francisco Bay Area (2013-2015). Patients were categorized as: 1) critical ED transfers; 2) non-critical ED transfers; and 3) critical trauma patients presenting directly to a TC. Critical trauma patients were predefined as patients meeting CDC tier 1 field triage criteria. Within the critical transfer group, patients with blunt vs. penetrating injuries were compared. Primary outcomes were total transfer time and mortality rate. Results: Of 49,438 patient records, 10,289 (20.8%) met inclusion criteria; of these 586/10,289 (5.7%) met criteria for critical ED transfers. Mortality rate was similar among critically injured patients who were transferred and those that presented directly to a TC (16.6% and 19.0%). The mortality rate for non-critical ED transfers was substantially different, 1.5%. Critical ED transfer patients with blunt compared to penetrating injuries (51.4% and 48.6%) had a higher median ISS (17 vs. 9), higher mortality rate (23.5% vs. 9.6%) and longer median time at the initial non-trauma hospital (160 vs. 64 min). Critical ED transfer patients who died also spent longer times (143 vs. 125 min) at non-trauma hospitals than those who survived (all p-values <0.001).

Conclusion: Our retriage protocol accurately identified critically injured patients who would benefit from 911 emergency transports. Critical trauma transfer patients with blunt compared to penetrating trauma spent a significantly longer time at non-trauma hospitals prior to transfer. This potentially avoidable delay could have contributed to the group's higher mortality rates. We are using this information to create a regional consensus-based trauma registry page to record data needed to improve our care of this vulnerable population.

Quality Improvement Reports

Stop the CRAsH (Congestive Heart Failure Readmissions to the Hospital)

Christopher Blomberg[1], Shruti Hegde[2], Mansour Almnajam[2], Gemini Yesodharan[2], Joe Aoun[2], Lana Tsao[1]
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Background: A subgroup of the Heart Failure (HF) Task force at St. Elizabeth's Medical Center (SEMC) maintains The American Heart Association's Get With The Guidelines (AHA GWTG) database for HF and promotes the program's recommendations as an ongoing QI project. Historically, patients discharged to home or VNA have the highest readmission rates. One of four measures required for recognition of program compliance is scheduling of follow-up appointments or VNA visits within 7 days of discharge.

Purpose, Setting and Participants: This study aims to determine if these appointments impact readmission rates. SEMC patients in the AHA GWTG's database between 2014 -2016 discharged to home were included. An intention-to-treat (ITT) analysis (patients with scheduled appointments versus those without), and per protocol (PP) analysis (patients who showed for their scheduled follow-up appointments vs. those who did not) was performed.

QI Plan: SEMC patients in the AHA GWTG's database from 2014 to 2016 discharged to home were included. An intention-to-treat (ITT) analysis (patients with scheduled appointments versus those without), and per protocol (PP) analysis (patients who showed for their scheduled follow-up appointments versus those who did not) was performed.
Results: A total of 314 patients met the criteria for inclusion in this study. In both the ITT and PP analysis, no difference in readmission rates at 30, 60, or 90 days was seen. However, subgroup analysis of the ITT group demonstrated that patients scheduled to follow-up with a cardiologist were less likely to be readmitted ($p = 0.02$), with an absolute risk reduction (ARR) of 9-17% at 30 days. In the PP group, this benefit was again seen at 30 days ($p < 0.01$, ARR = 15-24%), but persisted to 60 days ($p < 0.01$, ARR 3-20%) and 90 days ($p = 0.04$, ARR 7-19%). Patients who followed-up with their PCPs or were visited by VNA consistently had readmission rates equivalent to, or slightly worse, than those having no follow-up appointment scheduled.

Conclusion: HF hospitalizations are associated with increased morbidity and mortality. At SEMC, HF discharge follow-up within 7 days with a cardiologist reduces readmissions while with VNA and PCPs are associated with a higher rate of readmission. Efforts should be made towards establishing a discharge clinic to ensure that all patients are seen within 7 days of discharge by their cardiologists. Homecare and PCP visits are vital to patient care and cardiologists need to work more closely with them to improve patient outcomes.

Gold-Level Compliance with Guideline Directed Medical Therapy for Patients Treated with Congestive Heart Failure at St. Elizabeth's Medical Center

Christopher Blomberg[1], Shruti Hegde[1], Mansour Almnajam[1], Gemini Yesodharan[1], Joe Aoun[1], Lana Tsao[2]
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Background: Since the Joint Commission stopped tracking quality measures, the Heart Failure Task Force (HFTF) decided to enroll SEMC in The American Heart Association's Get With The Guidelines (AHA GWTG) Program for heart failure (HF) to continue these efforts.

Purpose, Setting and Participants: This data collection allows for the monitoring of hospital-wide compliance with guideline directed medical therapy (GDMT) and recommendations for CHF on a real-time basis at SEMC.

QI Plan: A subgroup of the HFTF (medical interns and residents, and a cardiology fellow) has been entering data into the database for all patients treated with HF since 2014, currently totaling 655 entries.
This data, as well as summaries of all readmissions, are presented at the monthly HFTF meeting; the team gives at least monthly educational sessions for interns and residents; and continual feedback is given to various providers on how to improve compliance with these national guidelines.

Results: The GWTG program has four primary measures with a target compliance rate of 80%: documenting the ejection fraction, prescribing ACE inhibitors/ARBs/ARNIs and/or beta blockers at discharge when indicated, and scheduling a follow-up appointment soon after discharge. By maintaining this level of compliance for two years SEMC is anticipated to achieve the Gold Medal from the AHA. Maintaining at least 75% compliance with anticoagulation for AF/AFL, DVT prophylaxis, ICD counseling or placement, and influenza vaccination will achieve further recognition with a "Plus" designation. In addition, we will qualify for the Target:HF Honor Roll for at least 50% compliance with aldosterone antagonists, follow-up appointments within 7 days of discharge, and HF teaching. Our efforts have led to our second publication in Circulation and in the "Best Hospitals" issue of the U.S. News & World Report. We continue to be one of only 8 hospitals in the state to achieve these prestigious recognitions; however, we are the only program that is successfully co-managed by trainees.

Conclusion: As a group comprised predominantly of trainees, we are learning how to translate a nationwide quality improvement program to the local level. Participation in this program helps to continue the hospital-wide focus on GDMT for patients treated for heart failure.

Quality Improvement Reports

Evaluation of the Use of Unfractionated Heparin versus Bivalirudin for Adjunctive Antithrombotic Therapy in Patients Undergoing Percutaneous Coronary Intervention

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Background: Patients undergoing percutaneous coronary intervention (PCI) require anticoagulant therapy to reduce the risk of thrombotic complications. According to the 2011 ACCF/AHA/SCAI PCI guidelines, unfractionated heparin (UFH) or bivalirudin are indicated for adjunctive antithrombotic use during PCI.

Purpose, Setting and Participants: We conducted a retrospective cohort study to evaluate anticoagulant use in this patient population. Our objective was to identify ways to help guide the choice of therapy in order to maximize efficacy, safety, and resource utilization.

QI Plan: We identified patients who underwent PCI with stent placement between June 1st and September 30th, 2016. Data collected included PCI indications, demographics, anticoagulant dosing, co-morbidities and concomitant medications. The following clinical outcomes were evaluated: bleeding, reinfarctions and other ischemic events including unplanned target lesion revascularization. The chi-square test and the t-test were used to compare categorical and continuous variables, respectively.

Results: We reviewed 101 procedures. The antithrombotic agent of choice was bivalirudin in 39 procedures and UFH in 62 procedures. Baseline characteristics and risk factors for ischemic events and bleeding were comparable between the two groups. In the bivalirudin group, 2 patients (5.13%) had a history of prior bleeds compared to 11 patients (17.74%) in UFH group (p= 0.065). Thirty-seven (94.87%) procedures were performed via femoral approach in the bivalirudin group and 55 (88.71%) in the UFH group (p=0.289).
There were no ischemic events leading to revascularization in either group within 30 days. Re-infarctions occurred in 2 (5.13%) patients in the bivalirudin group and none in the UFH group (p=0.072). Both incidences of reinfarction occurred within 7 days of PCI. Five patients (12.82%) treated with bivalirudin experienced mild bleeding versus 8 patients (12.90%) treated with UFH (p=0.990); all bleeds occurred within 1 week of stenting. The average length of hospital stay was 2.6 days with bivalirudin and 2.9 days with UFH (p=0.577). Estimated overall drug acquisition costs were $13.5 for UFH and $22,302.8 for bivalirudin.

Conclusion: Our study showed no statistically significant differences in bleeding or 30-day ischemic events between bivalirudin and UFH. The results of this study are limited by a small sample size and retrospective data collection.

Quality Improvement Reports

Enhancing the Accuracy of Medication Reconciliation on the Medicine Service: A Quality Improvement Project

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Background: The Joint Commission defines medication reconciliation as one of its National Patient Safety Goals. Obtaining a correct medication history ensures effective medication use and prevents patient harm. Based on review of records, several incidents of inaccurately reconciled medications have been identified on the medicine service at St. Elizabeth's Medical Center.

Purpose, Setting and Participants: The current practice at our institution is that medication reconciliation is performed by the admitting medical resident. This process has proven to be both cumbersome and time-consuming. According to data collected by the hospital administration, medication reconciliation is performed in merely 76% of all service admissions. Moreover, multiple errors are identified on a daily basis compromising patient safety. Hence, we decided to collaborate with the Pharmacy Department in order to ameliorate this process.

QI Plan: The medication lists for a total of 30 patients admitted to the medicine service in September2016 were reviewed retrospectively. The list documented by the admitting resident was compared to the patient's actual home list. This was achieved by calling the patients' pharmacies and primary care physicians and reviewing outpatient and inpatient records. This review revealed that only 57% of patients had an entirely accurate medication list; the remaining 43% had at least one inaccuracy in their medication list when compared to their home list. To intervene, pharmacy residents reconciled medication lists on admission for 30 patients in January 2017.

Results: Medication reconciliation performed by pharmacy residents was verified by medical residents. Errors such as drug omission, duplication, discrepancy in frequency, posology or route were tracked. Review revealed significant improvement in accuracy. 93% of those patients had accurate medication lists documented on admission compared to 57% in the pre-intervention period (P=0.002 by Fisher's Exact test).

Conclusion: Due to their relevant expertise and distinct knowledge of medications, Doctors of Pharmacy can significantly improve both accuracy and effectiveness of medication reconciliation, and reduce the incidence of adverse drug events. We hope that our data can be extrapolated in such a manner that pharmacy personnel can be directly involved with medication reconciliation.

Case Reports

Plasmapheresis for Treatment of Immune Complex-Mediated Glomerulonephritis in Infective Endocarditis: A Case Report

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Introduction: In patients with subacute bacterial endocarditis (SBE), circulating immune complexes deposit in the glomerulus and activate the complement system, leading to an immune complex-mediated glomerulonephritis (ICGN). Control of the infection generally leads to resolution and normalization of kidney function. The use of plasmapheresis as salvage therapy for SBE-associated ICGN is controversial.

Description of Case(s): We present the case of a 57 year-old man who was diagnosed with SBE secondary to Streptococcus mutans bacteremia with tricuspid and mitral valvular vegetations. He received intravenous ceftriaxone followed by rapid resolution of the bacteremia. On presentation, he had acute kidney injury. The urinalysis had 2+ protein and large blood, and the urine sediment revealed dysmorphic red blood cells, and red blood cellular casts. Complement factors C3 and C4 were low. On hospital day-4, he underwent a percutaneous kidney biopsy, which revealed diffuse endocapillary and mesangial proliferative glomerulonephritis. Immunofluorescence microscopy revealed heavy granular deposits of IgG, C3 and C1q, consistent with ICGN. Despite appropriate antibiotics and a short course of corticosteroids, the kidney function continued to decline. Given the presence of circulating immune complex, as detected by the C1q (binding assay) level of 63 EU/mL (<20 EU/mL) and rheumatoid factor level of >130 IU/mL (<14 IU/mL), as well as persistent hypocomplementemia, he was started on an empirical course of plasmapheresis. After 7 sessions, the kidney function improved, coinciding with a decline in the rheumatoid factor level to 39 IU/mL and an improvement in C3 and C4 levels. He was discharged on hospital day-27, and a year later his kidney function had fully normalized.

Discussion (Learning Value): We report on the successful use of plasmapheresis for the removal of circulating immune complexes in a patient who presented with SBE complicated by ICGN, and who had initially failed to respond to first- and second-line therapy with antibiotics and a short course of corticosteroids. While the use of plasmapheresis for ICGN is not currently endorsed by the American Society for Apheresis, the observed favorable renal outcome raises the hypothesis as to whether plasmapheresis has a potential role as third-line therapy for the treatment of this kidney-related complication of endocarditis.

Giant Coronary Sinus due to Persistent Left-sided Superior Vena Cava: The Importance of Multimodal Imaging

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Introduction: Giant coronary sinus (CS) is a rare finding on cardiac imaging. Persistent left sided superior vena cava (PLSVC), with a prevalence 0.3-0.5% in the general population, is the most common cause of enlarged CS. We demonstrate a case of a giant CS with a PLSVC with contrast echocardiography.

Description of Case(s): An 86-year-old female with severe aortic stenosis (AS) and recurrent admissions for heart failure was referred for the management of AS. Cardiovascular examination was pertinent for an irregularly irregular rhythm, late peaking, crescendo-decrescendo, systolic ejection murmur, elevated jugular venous pressure, decreased breath sounds bilaterally with associated rales and bilateral pedal edema. A transthoracic echocardiogram (TTE) showed severe AS (valve area 0.5 sq.cm, peak gradient 79 mmHg, mean gradient 44 mmHg), severe tricuspid regurgitation and a giant CS measuring 3.9 cm x 2.84 cm. When contrast was injected in the left antecubital vein, bubbles were seen entering the CS prior to the right atrium confirming the presence of PLSVC. This was further demonstrated on a computerized tomography. Based on the society of Thoracic Surgeons score of 8.1 and the comorbidities, she underwent an uneventful transcatheter aortic valve replacement.

Discussion (Learning Value): Dilatation of CS is rarely seen in healthy individuals. Its clinical significance is apparent during the placement of pacemakers, pulmonary artery catheters or cannulation of the left internal jugular or subclavian veins. The differential diagnoses of an enlarged CS include; PLSVC, right atrial hypertension, tricuspid valve disease, “unroofed” coronary sinus, partial anomalous pulmonary venous return and coronary arterio-venous fistula. Contrast echocardiography is used to diagnose PLSVC. The earlier opacification of the CS compared to the right atrium on injecting agitated saline into the left brachial vein confirmed PSLVC in our patient. PLSVC results from the failure of the left anterior cardinal vein to degenerate during fetal life. The terminal connection between the CS and the PLSVC is the vein of Marshall (ligament of Marshall in normal individuals), which could stimulate arrhythmogenesis in such patients. The presence of a PLSVC should be easily excluded in cases of enlarged CS with contrast echocardiography.

Case Reports

The Failure of Flumazenil and Physostigmine to Reverse a Demedetomidine Overdose.

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Introduction: The learning objectives of this case report are review the management of accidental dexmedetomidine overdose, and the failure of physostigmine and flumazenil to reverse effects of dexmedetomidine.

Description of Case(s): Case Description: A 15-year old boy weighing 54 kg underwent surgery for a testicular torsion. He received 2 mg of midazolam, 100 ug of fentanyl, 250 mg of propofol, and an accidental overdose of 200 ug of dexmedetomidine intravenously. The procedure lasted 30 minutes. Post procedure, the patient was unconscious and was not arousable with stimulation. He was given 5 mg of flumazenil to reverse the midazolam and 2 mg of physostigmine in an attempt to reverse the large dose of dexmedetomidine.

Physostigmine which has been shown to reverse somnolence from benzodiazepines, butyrophenones, anticholinergics, opioids, and phenothiazines, has not been tried for alpha-2 agonists. Unfortunately the flumazenil and physostigmine had no effect on the patient's obtundation. The patient was monitored closely for the next two hours in the recovery room until the effects of the dexmedetomidine wore off.

Discussion (Learning Value): The management of an accidental dexmedetomidine overdose should be supportive care until the effects of the drug are no longer apparent. It appears that physostigmine has no effect on reversing the somnolence caused by dexmedetomidine. To date there have been no reports on the management of a dexmedetomidine overdose.

Anesthesia for a patient with OSA on CPAP and Narcolepsy that Required Patient to Respond Verbally Intraoperatively

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Introduction: We describe the case of a patient with obstructive sleep apnea (OSA) and narcolepsy who posed an intra-operative challenge that was successfully managed.

Description of Case(s): The patient's narcolepsy history consisted of long-term use of medications, and during the spinal cord stimulator (SCS) trial performed prior to surgery that with a small amount stress/pain he exhibited hypersomnia which prolonged his wakeup. The patient's hypertension and OSA were well controlled. Upon admission to the pre-operative area, he reported having taken his scheduled medications including Modafinil that morning.

The neurosurgeon requested the patient to be prone and initially would need "deep sedation" for the laminectomy. Once the laminectomy was complete and the SCS was placed, the patient would need to be woken up to test the SCS. Once testing was complete he would need to be re-sedated.

The patient was positioned in the prone position, placed on hi-flow oxygen at 40L/min, given intravenous midazolam, dexmedetomidine, and ketamine, and was started on a Propofol infusion. Caution was taken not to induce apnea. The surgeon gave a 20 minute warning for wakeup. The Propofol infusion was turned off and the patient was given Narcan, Physostigmine and Ephedrine in an attempt to quickly wake him up. It took 10 minutes before the patient became responsive. He was able to give accurate feedback for testing. Once testing was complete the patient was re-sedated with propofol.

Discussion (Learning Value): A literature search did not reveal any documented cases for patients with OSA and narcolepsy requiring rapid emergence to test a SCS under general anesthesia. Our patient's history of OSA and narcolepsy posed a challenge to keep him breathing spontaneously, prone and without obstructing his airway or becoming hypoxic with adequate anesthesia, and be able to wake him up at a specific time. The use of dexmedetomidine, ketamine and propofol as well as hi-flow oxygen enabled us to be successful. Furthermore the use of Narcan, Physostigmine and Ephedrine hastened his emergence.

Case Reports

Atypical Lumbar Sympathetic Block Level in Complex Regional Pain Syndrome

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Introduction: Lumbar sympathetic block at L3 level is a therapy for patients with lower extremity Complex Regional Pain Syndrome (CRPS). Significant anatomical variations can exist, making blockade at a given level ineffective. We report a patient who failed to receive relief with L3 injection, but subsequently achieved relief with L4 injection.

Description of Case(s): A 35 year old female with a longstanding history of Complex Regional Pain Syndrome affecting the left lower extremity presented to the pain clinic for follow up after a lumbar sympathetic block at the L4 level using a left oblique approach 3 months prior.

She was first diagnosed 12 years ago without any preceding trauma. She has had lumbar sympathetic blocks by experienced pain management proceduralists in the past at the L3 level with minimal relief. After an injection of contrast under live fluoroscopy demonstrated a good spread of the contrast just immediately anterior to the edge of the vertebral body of L4, 8-cc of 0.25% Bupivacaine and 40-mg of Depomedrol were injected.

On follow up visit, the patient reported significant 60-70% relief in both the intensity and frequency of her symptoms which was still ongoing 3 months after the injection. She reported a change in quality from a constant burning sensation to an intermittent cramping which allowed her to significantly increase her daily activities and allowed her to rely less on her breakthrough medications such as Vicodin.

Discussion (Learning Value): Lumbar sympathetic block for CRPS of the lower extremity can be achieved using a known technique by a single needle at the L2 or L3 level. We report a patient who failed to obtain relief of symptoms with prior injections at the L3 level, but had good response to injection at the L4 level. The goal of this case report is to raise awareness regarding variability in patient response and anatomy, and that consideration should be given to a three level lumbar sympathetic block approach at L2, L3, and L4. This three level approach may be more likely to yield a definitive and possibly beneficial outcome, if a lumbar sympathetic block were to be diagnostic and therapeutic when compared to a single level approach.

The Use of an Atypical Antipsychotic in an Elderly Woman with Major Neurocognitive Disorder with Behavioral Disturbance and Stroke

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Introduction: The elderly population is at increased risk of developing strokes. This risk may be exacerbated by the use of antipsychotic agents, especially in those with major neurocognitive disorder (MND).

Description of Case(s): A naturalistic n=1 study allowed for the evaluation of the benefits and risks of the use of Risperidone in an 80 year old woman diagnosed with MND presented to geriatric psychiatric unit with anxiety, paranoia and disorganized thought process. The patient's symptoms intensified early in her hospitalization. A trial of risperidone 0.5 mg at bedtime was initiated. Severe behavioral disturbances improved greatly after 3 days of therapy. She became more coherent, paid greater attention to her hygiene, and was more socially appropriate and redirectable. Patient and her family were able to enjoy meaningful conversations, and delight in the relationships they had before. The patient's son reported that an outpatient neurologist noted left hemianopsia before hospitalization. An MRI showed an infarct in the right thalamus and a new infarct in the right medial occipital lobe. Risperidone carried an increased risk of stroke and was discontinued. The patient was transferred to a stroke service; later she deteriorated and began to exhibit paranoia and disorganization. She returned to the psychiatric unit where was restarted on Risperidone and improved dramatically again.

Discussion (Learning Value): Clinicians are constantly faced with the dilemma of trying to find the balance between achieving controls over a patient's psychiatric symptoms and reducing adverse effects associated with medications. In patients who are at increased risk for stroke, caution should be exercised. This case illustrates the fine balance that exists between managing a patient's psychiatric signs and symptoms to improve the quality of life, and avoiding the increased risk of side effects. Here, the benefits of treatment with risperidone included the markedly improved quality of life in this patient and her family. While more longitudinal data is needed, in some elderly patients with MND with behavioral disturbance and stroke, the benefits from an improved quality of life may outweigh the risks of using antipsychotic such as risperidone.

Case Reports

Isolated Hypotension in Anaphylactic Reaction to Vancomycin

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Introduction: One classic adverse reaction of vancomycin administration is histamine release and accompanying hypotension. This process is by IgE-mediated mast cell degranulation and subsequent vasodilation. Usually this is accompanied by pruritus and intense erythema (red man syndrome), wheezing and urticaria. In a study where vancomycin was infused over 30 minutes, 26% of patients developed adverse reactions (flushing and hypotension) compared with only 1 out of 40 patients who received the medication over 60 minutes. This suggests strongly that the incidence of adverse reactions to vancomycin directly correlates with the speed of infusion. This effect seemed to be decreased when an intravenous anti-histamine agent was administered prior to vancomycin. Interestingly enough, another small study of 16 patients showed no correlation between peak serum vancomycin level and incidence of clinical hypotension.

Description of Case(s): This was a 76 year old man who presented for femoral-popliteal bypass. He had a history of hypertension, diabetes mellitus, hyperlipidemia, coronary artery disease status post stenting and CABG, AAA status post endovascular repair, GERD, peripheral vascular disease status post lower extremity stenting, and an appendectomy. His home medications were metformin, amlodipine, lisinopril, isosorbide mononitrate, hydrochlorothiazide, atenolol, and aspirin.

After an uneventful induction of general anesthesia, a prophylactic 1-g dose of vancomycin was set to infuse over 60 minutes. 10-15 minutes after initiating the infusion, the patient experienced profound hypotension with a drop in the systolic blood pressure into the 40's with non-palpable carotid pulses. A code blue was initiated, and epinephrine, Benadryl and phenylephrine were administered with return of adequate blood pressure within less than 5 minutes. The hypotension was not accompanied by any other classic symptoms of anaphylaxis; there were no cutaneous changes in color and no edema, and airway peak pressures remained normal throughout. A serum tryptase was drawn and was positive, indicating that this was a true anaphylactic reaction.

Discussion (Learning Value): Our case points out that life-threatening hypotension can develop during a vancomycin infusion, even at a rate that is generally considered to be safe. This raises the question as to whether we should adopt routine prophylaxis with intravenous anti-histamines as part of our practice when administering this drug.

Vitamin D Toxicity (Hypervitaminosis D) – Clinical Presentation and Management

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Introduction: Vitamin D is a fat-soluble vitamin that plays an important role in calcium and phosphate homeostasis and metabolism; sources of vitamin D include supplementation, de novo production, and diet. Supplementation of vitamin D can be either as vitamin D3 or D2, which require activation in the liver and kidney to the physiologically active 1, 25 dihydroxy-vitamin D, also known as calcitriol. Vitamin D overdose is a rare event but has serious systemic side effects. Toxicity of vitamin D, also called hypervitaminosis D, typically occurs in the setting of excessive oral supplementation, which is common in the elderly. We describe the case of an elderly woman who developed hypervitaminosis D as a result of excessive exogenous vitamin D intake.

Description of Case(s): The patient was an 84 year old woman who presented with symptoms of fatigue, weakness, and polydipsia while taking an over-the-counter vitamin D supplement in excess of the daily recommended allowance. Instead of the recommended daily allowance of 1 drop daily, she took a full dropper daily (approximately 2 cc) of the vitamin D supplement, over two months. The serum calcium level was elevated to 10.2 mg/dL, and the 25-OH vitamin D level was markedly elevated at 152 ng/mL. In this case, we were able to trend the timing of excessive vitamin D oral supplement and its direct increase in the 25-OH vitamin D level with corresponding rise in serum calcium and phosphorus levels. Followed as an outpatient, we could appreciate a subsequent correlation between the readjustment of the vitamin D dosing and the improvement in her symptoms laboratory values.

Discussion (Learning Value): The Institute of Medicine recommends a vitamin D daily dietary allowance of 600-800 IU depending on age. Taken in excess, vitamin D toxicity can develop with symptoms of vomiting, irritability, fatigue, muscle weakness, and hypercalcemia with elevated calcifediol levels. Exogenous vitamin D-related toxicity occurs most commonly through dietary supplement, fortification of food, or iatrogenic administration. It is important for health care providers to be aware of this potential complication and educate patients about vitamin D supplements and the recommended optimal dose without adverse effect.

Case Reports

The Heart Team Approach: The Tale of a TAVR converted to SAVR in a Centenarian

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Introduction: A minimalist approach for Transcatheter Aortic Valve Replacement (TAVR) has recently been proposed, and entails the use of local anesthesia, minimal conscious sedation, fully percutaneous access site entry and closure, with transthoracic echocardiogram guidance. While this approach may suffice for low-risk patients, the ability to manage life-threatening complications in a timely manner may be compromised.

Description of Case(s): A 104 year-old-woman with critical aortic stenosis (AS) was referred for TAVR. Her Society of Thoracic Surgeons Predicted Risk of Mortality (STS-PROM) score was calculated as 18.4%, with a 41% morbidity and mortality risk. Transesophageal echocardiogram (TEE) confirmed critical aortic stenosis (EF 89%, valve area: 0.3cm2, mean gradient 76mmHg), and coronary angiogram showed non-obstructive coronary artery disease. CT angiography revealed heavy aortic valve calcification with an aortic annulus measuring 2.5 x2.2 cm. Immediately following balloon valvuloplasty with a 20-mm balloon, hematoma formation in the wall of the aorta was recognized by the echocardiographer, the patient rapidly became hypotensive and CPR was initiated. Cardiopulmonary peripheral bypass was initiated within 3 minutes. An emergency sternotomy was performed with surgical repair of the aortic perforation. The native valve was replaced with a 19-mm Edwards's valve. She was successfully discharged to rehabilitation without neurologic sequelae and with a preserved ejection fraction.

Discussion (Learning Value): The transition to minimalist TAVR may be feasible for lower risk patients. However, complications such as annular rupture, while uncommon, are associated with high mortality and require immediate recognition and treatment. In this case, the continuous TEE monitoring led to immediate recognition of this complication and rapid initiation of cardiopulmonary bypass allowed definitive treatment. While more resource intensive, the heart team approach ensures not only appropriate patient selection but also rapid recognition and management of major complications.

18F Fluorodeoxyglucose Positron Emission Tomography in Exogenous Lipoid Pneumonia Emulating Metastatic Pancreatic Cancer to Lungs

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Introduction: Although controversial, Positron Emission Tomography (PET)/CT imaging is often pursued as part of the metastatic workup of pancreatic cancer. Exogenous Lipoid Pneumonia (ELP) has been shown to be 18F-fluorodeoxyglucose (FDG) avid by positron emission tomography in multiple case reports. On occasion these false-positive findings in metastatic workups have led to biopsy procedures.

Description of Case(s): We present the case of a 66-year-old man with ELP likely due to initially misreported long-term mineral oil ingestion used for constipation. Patient had a remote tuberculosis exposure and remembers being treated with several months of multiple antibiotics. He presented due to minimal abdominal pain and jaundice in the context of recent antibiotic treatment for prostatitis. Right upper ultrasound revealed dilatation of his common bile duct and he was later diagnosed with pancreatic adenocarcinoma. During the course of his work-up bilateral lower lobe cavitating lesions with bilateral right upper lobe and lingula ground glass changes were identified on CT scan despite an unimpressive CXR. A diagnosis was established by left lung lesion biopsy with histology consistent with lipoid pneumonia. Upon further history taking patient recalled daily mineral oil ingestion over the course of the previous year. PET/CT imaging was later performed to complete metastatic work-up. It showed moderately FDG-avid bilateral lower lobe activity coinciding with areas of lipoid PNA. Patient went on to have a pancreaticoduodenectomy/ pancreaticojejunostomy.

Discussion (Learning Value): Though rare, ELP can present as a false positive metastatic finding. In this patient biopsy was performed based on incidental CT findings in the context of a pancreatic cancer workup. Subsequent PET/CT imaging revealed moderate FDG uptake. This stresses definite role for biopsy despite positive FDG avidity. This case offers a distinct retrospective look at FDG PET positive lesions mimicking metastatic cancer and/or infectious disease.

Case Reports

A Case of Acute Intradialytic Hemolysis

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Introduction: Acute hemolysis is a known but rare complication of hemodialysis. If not recognized early, it can be life-threatening through development of severe hyperkalemia and acute anemia. Serial blood samples that are hemolyzed in a patient on hemodialysis who is experiencing vomiting and abdominal pain should raise suspicion for intra-dialytic hemolysis.

Description of Case(s): We present the case of a 55-year-old woman with end stage renal disease secondary to diabetic nephropathy and hypertensive nephrosclerosis who developed acute nausea, vomiting and abdominal pain 2 hours after starting hemodialysis, leading to early treatment termination. She had been receiving dialysis through an arteriovenous fistula, using two 15-gauge needles at a blood flow rate of 390 mL/min. She presented to the hospital within 12 hours with symptoms of vomiting, diarrhea, and cola-colored urine. The work-up revealed an acute drop in hemoglobin (from 11 to 8.7 gm/dL), and elevated lactate dehydrogenase (4683 U/L), total bilirubin (1.9 mg/dL), and aspartate aminotransferase (343 U/L) levels. The initial serum potassium level could not be reported on 4 consecutive samples due to hemolysis, but was later found to be elevated (6.1 mEq/L). Urinalysis revealed large blood but few red blood cells on the urine sediment, suggestive of pigmenturia. The haptoglobin level was undetectable (<10 mg/dL) suggestive of hemolysis. The platelet count was normal ruling out thrombotic microangiopathies. She was hospitalized for further investigation of the hemolytic anemia and management of the hyperkalemia. The timeline of her symptoms and the laboratory data raised concerns for acute hemolysis associated with hemodialysis.

Discussion (Learning Value): Intra-dialytic hemolysis can be caused by a traumatic, chemical, thermal, or osmolar injury. In our case, a root cause analysis was conducted but a specific cause for the hemolysis could not be identified, although a traumatic injury related to kinked blood tubing, high blood pump flow rates, or malpositioning of the fistula needle was suspected.

Rare Case of Tachyphylaxis to Epidural Local Anesthetics during Labor

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Introduction: Very few cases of tachyphylaxis to epidural local anesthetics have been reported. However, the prevalence of tachyphylaxis is not known and its mechanism is still unclear. We present a rare case of tachyphylaxis in a pregnant patient in labor.

Description of Case(s): A 20-year-old primigravid pregnant female at 40 weeks requested epidural analgesia. Loss of resistance (LOR) was achieved at 6 cm. She was given a bolus of 10-cc of 0.25% bupivacaine and started on 0.1% bupivacaine and 2 mcg/cc of a fentanyl infusion at 10-cc/hour. A sensory level of T9 was obtained. After 2 hours, the patient was in 10/10 pain. She was given 6-cc of 0.25% bupivacaine bolus, and after 45 mins, 5-cc of 2% lidocaine was given. After another 45 mins, she received 10-cc of 0.125% bupivacaine. Throughout the entire period, her sensory level was T9. Thereafter, the epidural catheter was replaced, with LOR at 8 cm, and 18-cc of 0.25% bupivacaine given over 15 mins with no pain relief and her sensory level was still T9. The patient had developed bupivacaine tachyphylaxis. We finally gave her a mixture of 10-cc 3% chloroprocaine, 100-mcg of epinephrine and 1-cc of soda bicarbonate after which she had significant pain relief, and she delivered vaginally uneventfully after about 6 hours.

Discussion (Learning Value): Tachyphylaxis to local anesthetics is defined as decrease in duration, segmental spread, or intensity of a regional block after repeated doses of equal size, i.e. to maintain a given level of effect the dose has to be increased Decrease of perineural pH could result in decreased diffusion of the local anesthetics from the epidural space to their binding sites at the sodium channel. Antagonistic effects of nucleotides or increased sodium concentration, increase in afferent input have been implicated. Recently, nitric oxide has been implicated in the development of tachyphylaxis. Due to the cross reactivity within the same class, lidocaine was not used. We used 3% chloroprocaine, which is an ester local anesthetic and combined it with epinephrine which prolongs the duration of action as well has analgesic effects via action on presynaptic alpha 2 receptors.

Case Reports

Catecholamine-induced Cardiomyopathy: A Unique Presentation for a Rare Tumor

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Introduction: Takotsubo cardiomyopathy is a syndrome of transient cardiac dysfunction associated with sudden emotional or physical stress. Catecholamine surges have been implicated as one of the important mechanisms. Pheochromocytoma is a rare catecholamine secreting tumor that usually presents as a triad of headache, sweating, and palpitations. Life-threatening complications, such as Takotsubo-like cardiomyopathy, acute coronary syndrome, and cardiogenic shock can rarely occur. We describe a unique case of Takotsubo-like cardiomyopathy as the first manifestation of pheochromocytoma.

Description of Case(s): A 64-year-old woman presented with acute onset of dyspnea. On exam, she was diaphoretic with a BP 79/56 mmHg and heart rate of 110 bpm. She had elevated JVP and bibasilar crackles. EKG showed ST depression in the antero-lateral leads, and chest x-ray revealed pulmonary edema. Laboratory data were notable for a glucose of 425 mg/dl, a proBNP of 1864 pg/ml, and a troponin of 6.01 ng/ml with CKMB of 30 ng/ml. An urgent cardiac catheterization revealed non obstructive coronary artery disease, and elevated filling pressures with a low cardiac output and index. Ventriculography and echocardiography revealed reduced ejection fraction (EF) of 31% with apical ballooning and multiple regional wall motion abnormalities in a non-coronary distribution. She was treated with beta blockers and ACE inhibitors, which relieved her symptoms. However, she continued to have uncontrolled hypertension and palpitations. Further workup with catecholamine levels and abdominal MRI was suspicious for pheochromocytoma for which she underwent laparoscopic adrenalectomy. Pathology confirmed pheochromocytoma. At 1-month follow-up, she was normotensive, and her ventricular function had normalized with an EF of 70%.

Discussion (Learning Value): This case is an extremely atypical presentation of Takotsubo cardiomyopathy caused by pheochromocytoma, and illustrates the importance of considering catecholamine secreting tumors as a possible cause of cardiomyopathy. This patient was initially treated with a cardiac specific beta blocker, which could have been catastrophic in the presence of unopposed alpha stimulation as sudden cardiovascular collapse could have occurred. Catecholamine secreting tumors should be included in the differential diagnosis of unexplained cardiomyopathy. Recognition of pheochromocytoma induced cardiomyopathy is critical as it is potentially reversible.

A Case Of Chylothorax Resulting From Necrotizing Pancreatitis

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Introduction: Chylothorax is accumulation of lymphatic fluid in the pleural space characterized by a pleural fluid triglyceride concentration greater than 110mg/dl and the presence of chylomicrons. Malignant invasion and traumatic disruption (usually surgical) of the thoracic duct are the most common causes. Chylothorax can rarely occur following disruption of the cistern chili causing chylous ascites leakage into the pleural cavity. There are only a few case reports of chylothorax from pancreatitis- associated ascites. We present one such case.

Description of Case(s): A 75 year old woman presented with abdominal pain, lipase > 2500 U/L and an abdominal CT-scan consistent with acute pancreatitis. Despite conservative management she developed necrotizing pancreatitis, associated with retroperitoneal fluid collections requiring percutaneous drainage of turbid fluid (amylase >7500 U/L, chylomicrons were not tested). Imaging immediately prior to discharge showed clear lungs, without evidence of pleural fluid. Two months later, she was readmitted to the hospital with dyspnea and a large right pleural effusion. Thoracentesis drained 2L of turbid pleural fluid, with WBC 112 /uL (50% lymphocytes), LDH 50 U/L, amylase 11 U/L, protein 1.5 g/dl, Triglycerides 152 mg/dl, cholesterol 24 mg/dl, and positive chylomicrons confirming the diagnosis of chylothorax. There was rapid fluid re-accumulation requiring chest tube placement and drainage of > one liter/ 24 hours. She ultimately underwent Video Assisted Thoracoscopic Surgery (VATS) with repair of a diaphragmatic defect and talc pleurodesis. Subsequently the pleural drainage decreased to less than 250 cc per day.

Discussion (Learning Value): We present an unusual case of chylothorax being caused by pancreatitis with chylous ascites. The mechanism for pleural effusion accumulation appears likely to pancreatic inflammation and accumulation of ascitic fluid.

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