2017 Scientific Evening

21 - Hypothesis Based Abstracts
## ORAL PRESENTATIONS

<table>
<thead>
<tr>
<th></th>
<th>Resident / Fellow</th>
<th>PGY</th>
<th>Presentation Type</th>
<th>Faculty Mentor</th>
<th>Study Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lou Saddic</td>
<td>CT Fellow</td>
<td>Hypothesis-based</td>
<td>K. Howard-Quijano, A. Mahajan</td>
<td>Myocardial Injury Leads to Remote Transcriptome Remodeling of the Central Nervous System in a Large Animal Model</td>
</tr>
<tr>
<td>2</td>
<td>Alex Cheng</td>
<td>CT Fellow</td>
<td>Hypothesis-based</td>
<td>P. Neelankavil</td>
<td>Intraoperative Right Ventricular Strain Changes Following Single and Double Lung Transplantation</td>
</tr>
<tr>
<td>3</td>
<td>Matt Fischer</td>
<td>CR Fellow</td>
<td>Hypothesis-based</td>
<td>T. Vondriska, A. Mahajan</td>
<td>Network Analysis Reveals DNA Methylation Modules that Function as Biomarkers for Post-Operative Atrial Fibrillation</td>
</tr>
<tr>
<td>4</td>
<td>Chonghua Wang</td>
<td>PM Fellow</td>
<td>Hypothesis-based</td>
<td>M. Ferrante</td>
<td>Intra-articular Facet Injections Show Non-Inferiority vs Medical Branch Blocks in Diagnostic Value and Longer Duration of Pain Relief Proceeding Radiofrequency Ablation for Lumbar Facet Arthropathy</td>
</tr>
<tr>
<td>5</td>
<td>Alex Edwards</td>
<td>CT Fellow</td>
<td>Hypothesis-based</td>
<td>E. Methangkool</td>
<td>Acute Kidney Injury after Lung Transplantation</td>
</tr>
<tr>
<td>6</td>
<td>Marvin Chang</td>
<td>CA-3</td>
<td>Hypothesis-based</td>
<td>R. Olcese</td>
<td>A Novel Paradigm for a New Class of Anti-Arrhythmic Drug on Targeting Ca Channel Gating Properties</td>
</tr>
<tr>
<td>7</td>
<td>Marsha Bernardo</td>
<td>CA-2</td>
<td>Hypothesis-based</td>
<td>S. Umar</td>
<td>Investigating the Cardiotoxicity of Liposomal Bupivacaine Exparel in Rats: The Role of Intralipid Rescue</td>
</tr>
<tr>
<td>Resident / Fellow</td>
<td>PGY</td>
<td>Presentation Type</td>
<td>Faculty Mentor</td>
<td>Study Name</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>------</td>
<td>------------------------</td>
<td>----------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Kate Lee</td>
<td>CA-2</td>
<td>Hypothesis-based</td>
<td>V. Duval</td>
<td>Implementing a Novel Triage Questionnaire to Improve Preoperative Efficiency</td>
<td></td>
</tr>
<tr>
<td>Caitlin Sherman</td>
<td>CA-1</td>
<td>Hypothesis-based</td>
<td>S. Umar</td>
<td>Investigating Bupivacaine-Induced Cardiotoxicity and Intralipid Rescue in Pregnant Rats</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resident / Fellow</td>
<td>PGY</td>
<td>Presentation Type</td>
<td>Faculty Mentor</td>
<td>Study Name</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------</td>
<td>--------</td>
<td>-------------------</td>
<td>----------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Tiffany Williams</td>
<td>CT Fellow</td>
<td>Hypothesis-based</td>
<td>K. Howard-Quijano</td>
<td>Isoflurane Increases Myocardial Sympathoexcitation In A Porcine Model Of Chronic Ischemia</td>
</tr>
<tr>
<td>2</td>
<td>Christine Nguyen-Buckley</td>
<td>LT Fellow</td>
<td>Hypothesis-based</td>
<td>C. Wray</td>
<td>Prevalence of Coronary Artery Disease in Liver Transplant Recipients Aged 65 and Older</td>
</tr>
<tr>
<td>3</td>
<td>Andrew Young</td>
<td>CC Fellow</td>
<td>Hypothesis-based</td>
<td>V. Gudzenko</td>
<td>Validation of Preoperative Assessment Scores in Critically Ill Patients</td>
</tr>
<tr>
<td>4</td>
<td>Benjamin Maslin</td>
<td>PM Fellow</td>
<td>Hypothesis-based</td>
<td>M. Ferrante</td>
<td>Lumbosacral Transitional Anatomy and Low Back Pain: A Pilot Prospective Epidemiologic Analysis</td>
</tr>
<tr>
<td>5</td>
<td>Goonjan Shah</td>
<td>PM Fellow</td>
<td>Hypothesis-based</td>
<td>M. Ferrante</td>
<td>Tracking Outcomes in Pain Patients Using Personal Fitness Devices</td>
</tr>
<tr>
<td>6</td>
<td>Chester Chan</td>
<td>CA-3</td>
<td>Hypothesis-based</td>
<td>J. Turner</td>
<td>Improving the Accuracy of Anesthesiology Resident Case Logs using an Anesthesia Information Management System Database</td>
</tr>
<tr>
<td>7</td>
<td>Samantha Wong</td>
<td>CA-3</td>
<td>Hypothesis-based</td>
<td>K. Sibert</td>
<td>Outcomes and Opportunities for Quality Improvement in Patients with Malignant Pleural Mesothelioma Undergoing Pleurectomy/Decortication</td>
</tr>
<tr>
<td></td>
<td>Christina Nguyen</td>
<td>CA-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resident / Fellow</td>
<td>PGY</td>
<td>Presentation Type</td>
<td>Faculty Mentor</td>
<td>Study Name</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>------</td>
<td>-------------------</td>
<td>----------------</td>
<td>-------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Shanxi Jiang</td>
<td>Lab</td>
<td>Hypothesis-based</td>
<td>T. Vondriska</td>
<td>Novel Epigenetic Regulators of Cardiac Hypertrophy</td>
<td></td>
</tr>
<tr>
<td>Douglas Chapski</td>
<td>Lab</td>
<td>Hypothesis-based</td>
<td>T. Vondriska</td>
<td>Epigenetic Regulation of the Heart: Therapeutic Insights from Two Disease Models</td>
<td></td>
</tr>
<tr>
<td>Dana Russell</td>
<td>MS2</td>
<td>Hypothesis-based</td>
<td>J. Meltzer</td>
<td>Risk of CLABSI with Internal Jugular Vein Cannulation in the Presence of Tracheostomy</td>
<td></td>
</tr>
<tr>
<td>Sara Mottahedan</td>
<td>MS4</td>
<td>Hypothesis-based</td>
<td>S. Umar</td>
<td>Presence of Atherosclerotic Lesions in Lungs of Patients with Pulmonary Hypertension</td>
<td></td>
</tr>
</tbody>
</table>
Hypothesis-Based Oral Presentations
Abstract #1
Myocardial Injury Leads to Remote Transcriptome Remodeling of the Cardiac Nervous System in a Large Animal Model
Louis Saddic, MD, PhD; Kimberly Howard-Quijano, MD, MS; Chen Gao, PhD; Tatsuo Takamiya, MD; Christoph Rau, PhD; Yibin Wang, PhD; Aman Mahajan MD, PhD

Background:
Myocardial ischemic injury leads to activation of the autonomic nervous system (ANS) with an increase in sympathoexcitation and cardiac arrhythmias. Although the physiologic responses to cardiac stress from myocardial injury are documented, the molecular basis of these changes in the cardiac neural system remain unexplored. The goal of this study was to use transcriptome profiling to determine the effect of acute and chronic ischemia on the cardiac nervous system. We hypothesize that myocardial ischemia, through alterations in afferent signaling, will lead to remote remodeling in the cardiac neuraxis at the level of the spinal cord and dorsal root ganglion through specific changes in gene expression. 1-5

Methods:
RNA analysis was performed on tissue harvested from porcine models of healthy control (n=3), acute ischemia (n=3), and chronic infarct (n=3). Acute ischemia consisted of 15 minutes of left anterior descending artery ligation and reperfusion for 3 hours whereas chronic infarcts were 8 weeks post myocardial infarction. Tissue was harvested from the thoracic and lumbar dorsal horn and dorsal root ganglion. RNA extracted from these tissues was subjected to next generation sequencing. Reads were aligned and counted using the Tophat 2 and HTSeq algorithm. Differential expression was conducted through the R package DESeq2. Functional predictions of differentially expressed genes was performed using Gene Ontology and Kyoto Encyclopedia of Genes and Genomes pathway analysis.

Results:
Principal component analysis of all samples cluster by location in the ANS. Differential expression analysis comparing acute ischemic to healthy controls demonstrated enrichment of inflammatory pathways in the dorsal root ganglion. Interestingly, in the dorsal horn there was over-representation of neurotransmitter secretion, vesicle trafficking, and gabaergic pathways in the thoracic segments but no significant changes in gene expression in the lumbar area. Chronic ischemia showed enrichment in interactions with the extracellular matrix (Figure 1).

Conclusion:
This is the first study to demonstrate remote remodeling of the cardiac nervous system at the level of spinal cord and dorsal root ganglia through specific changes in gene expression after acute and chronic myocardial ischemia in a large animal model. Future studies will validate candidate genes and define the cardiac neural pathways involved in increased sympathoexcitation and arrhythmogenesis seen after myocardial injury.
Abstract #2

Intraoperative Right Ventricular Strain Changes Following Single and Double Lung Transplantation

Alexander Cheng, MD; Kimberly Howard-Quijano, MD, MS; Jennifer Scovotti, MA; Einat Mazor, RDCS; Tristan Grogan, MS; Prince Neelankavil, MD

Background:
Over 4,000 lung transplants are performed annually worldwide. Many lung transplant recipients have underlying pulmonary hypertension and susceptibility to right ventricular (RV) failure in the perioperative period. Though evidence suggests that reverse cardiac remodeling leads to improved RV function weeks to months following transplantation, the assessment of RV function perioperatively after lung transplantation has not been well characterized. Myocardial strain imaging is a novel modality able to quantify RV function. We hypothesize that global and regional RV strain will be improved in patients immediately following both single and double lung transplantation.

Methods:
17 patients who underwent lung transplantation (8 single lungs and 9 double lungs) between September 2015 and June 2016 were prospectively enrolled. Patients had transesophageal echocardiographic (TEE) images obtained intraoperatively prior to surgical incision and after transplantation during periods of stable hemodynamics, oxygenation and ventilation. Hemodynamic values and vasoactive medications were recorded at the time of each exam. Systolic and diastolic strain measures were performed offline using GE’s EchoPAC software. Pre- and post-transplant myocardial strain values were then compared within and between single and double lung transplant groups using paired T-tests and mixed effects models, respectively.

Results:
Following double lung transplantation, RV global longitudinal strain (RV GLS) was decreased (-16.59 vs. -12.28, p=0.026, Table 1) while RV global longitudinal strain rate (RV GLSR) remained unchanged (-1.14 vs. -0.96, p=0.272). Regionally, RV septal peak systolic longitudinal strain (PSLS) decreased after transplantation (-19.54 vs. -14.17, p=0.028), while RV lateral PSLS was not significantly changed (-14.12 vs. -12.11, p=0.265). However, after single lung transplantation, RV GLS was unchanged (-18.33 vs. -17.40, p=0.695) while RV GLSR improved (-1.04 vs. -1.50, p=0.005), and no regional changes were seen in RV septal or lateral PSLS. Left ventricular global longitudinal strain was not significantly affected in either population. Post-transplant pulmonary arterial pressures were decreased in patients undergoing double but not single lung transplantation.

Conclusion:
RV strain decreases after double but not single lung transplantation, and reductions in strain predominantly involve the RV septal wall. RV strain rate increases after single but not double lung transplantation. Patients undergoing double lung transplant may have worsened RV function in the immediate post-transplant period. These preliminary findings highlight differences between single and double lung transplants that may be clinically significant, and further studies are needed to examine the long-term effects of single versus double lung transplant on RV function.
Abstract #3
Network Analysis Reveals DNA Methylation Modules that Function as Biomarkers for Post-Operative Atrial Fibrillation
Matthew Fischer, MD; Emma Monte, PhD; Todd Kimball, BS; Maximilian Cabaj, BS; Jennifer Scovotti, MA; Kimberly Howard-Quijano, MD, MS; Aman Mahajan, MD, PhD; Thomas Vondriska, PhD

Background:
Post-operative atrial fibrillation (POAF) is a major cause of morbidity and mortality after cardiac surgery. Although clinical risk factors for POAF are known, predictive models have thus far been inadequate for widespread clinical use. Single nucleotide polymorphisms have been examined to better identify patients at risk for POAF, but their addition failed to improve POAF prediction. In the realm of epigenomics, DNA methylation has emerged as an important regulator of disease due to its integration of genetic and environmental cues. However, the ability of epigenomic marks to serve as biomarkers for perioperative complications is unknown. Building on previous work investigating individual CpGs, we examined whether networks of methylated CpGs could serve as biomarkers to predict POAF.

Methods:
98 adult patients scheduled for cardiac surgery were prospectively enrolled. Clinical risk factors for POAF were assessed from a patient database. Occurrence of POAF was defined as any instance of confirmed AF from post-op ICU admission until discharge. After induction of anesthesia but prior to incision, whole blood samples were collected. DNA was extracted and analyzed by reduced representation bisulfite sequencing, providing single-base resolution of DNA methylation on cytosines contiguous with guanine (CpG). We restricted our analysis to CpGs that had 10x sequencing coverage per patient and were variable within the population. Using the Weighted Gene Co-expression Network Analysis (WGCNA) package in R, we constructed modules of interrelated CpGs and compared their association with POAF using Pearson correlation. We then performed gene ontology analysis on the modules associated with POAF using the program David.

Results:
This prospective cohort of 98 patients had a median age of 65 and ranged from 18 to 88 years of age. There was a 35.7% incidence of POAF. We obtained an average of 916,347 CpGs with 10X coverage per patient. Using WGCNA, we obtained 55 modules, each of which contained at least 30 interrelated CpGs. 7 of these modules were significantly correlated with POAF (p-value < 0.05) and had between 55 and 328 CpGs. Importantly, 5 of these 7 modules are not associated with any known clinical risk factors or clinical risk scores for POAF indicating they may provide independent predictive value. Bioinformatic analyses revealed that the genes containing the CpGs in these POAF risk modules were enriched (after Benjamini-Hochberg correction) for involvement in cell adhesion, alternative splicing, calcium and cell signaling.

Conclusion:
This use of network analysis reveals DNA methylation modules in preoperative blood that are associated with POAF and are independent of traditional clinical risk factors, suggesting they may serve as biomarkers of this complication. This novel use of epigenomics and informatics could help individualize preventative measures for POAF to decrease its incidence and the associated adverse outcomes.
Abstract #4
Intra-articular Facet Injections Show Non-Inferiority vs Medical Branch Blocks in Diagnostic Value and Longer Duration of Pain Relief Proceeding Radiofrequency Ablation for Lumbar Facet Arthropathy
Chonghua Wang, MD; Tristan Grogan, MS; Michael Ferrante, MD

Background:
Fluoroscopy-guided medial branch blocks have become one of the most popular procedures in pain medicine for the treatment of facet arthropathy. Diagnostic block with local anesthetics to the medial branch of the dorsal rami (MBB) can lead to short term relief of patient’s lower back pain, which can direct the pain physician to proceed with radiofrequency ablation (RFA) of the medial branch nerves to provide prolonged relief. Diagnostic blocks can also be achieved with intra-articular facet injections (IA), which direct the local anesthetic into the joint capsule. The objective of this retrospective study is to compare the diagnostic value and length of efficacy of medial branch block versus intra-articular facet injections. We hypothesize that non-superiority of medial branch blocks over intra-articular facet injections in the lumbar vertebrae with intra-articular facet injections having a longer duration of action.

Methods:
Retrospective data from the EMR of UCLA was obtained using algorithmic extraction for “Facet/Medial Branch Block” or “Radiofrequency Ablation Nerve” by the Pain Management service from 3/1/2013 to 9/30/2015. Altogether, 1584 individual procedures constituting 731 patients were isolated with additional information including the patient’s MRN, age, weight, practitioner performed, date performed, procedure performed. After excluding incomplete progression to RFA, lack of notation of degree of pain improvement post-procedure, raw data was paired down to 46 intra-articular participants and 161 MBB participants. Average pain relief post-procedure as well as duration of time until RFA was analyzed.

Results:
The diagnostic pain relief for the IA group (77.2% relief) was higher than the MBB group (69.9% relief) on average although this difference was not statistically significant (p=0.078, 95% CI (-0.84 – 15.4). The IA patients tended to go about 10 days longer on average (57.2 vs. 47.0 days) before coming back for their RFA as compared to the MBB patients (p=0.021)

Conclusions:
Degree of pain relief from intra-articular facet injections was not inferior to standard medial branch blocks for patients with facet arthropathy. In addition, interval between diagnostic block and RFA was statistically longer for intra-articular blocks. Intra-articular facet blocks should remain of diagnostic value in evaluation of chronic back pain, capable of distinguishing facet arthropathy, in workup to medial branch radiofrequency ablation.
Abstract #5
Acute Kidney Injury After Lung Transplantation
Alex Edwards, MD; Eilon Gabel, MD; Tristan Grogan, MS; Vadim Gudzenko, MD; Emily Methangkool, MD

Background:
Acute kidney injury (AKI) after cardiothoracic surgery is associated with increased morbidity, mortality, and cost. Patients receiving lung transplantation have a particularly high risk of these complications which exceeds that of the general cardiothoracic surgical population. The aim of this study was to examine the incidence and specific preoperative and intraoperative risk factors associated with AKI in adult lung transplant recipients.

Methods:
Retrospective data from lung transplantation cases from 2013-2016 were examined using a departmental data warehouse sourced from Epic’s Clarity relational database. Data was validated using selected patients for manual review. We defined AKI using the creatinine definition of the RIFLE criteria, or an increase of greater than 1.5 times baseline creatinine within 7 days of surgery. Comparisons between groups were assessed using t-tests for continuous variables and chi-square tests for categorical variables. Patients were divided into those with and without AKI, and patient characteristics were compared between these groups. We controlled for confounders by defining selection criteria and factors that could contribute to AKI a priori.

Results:
Of 306 transplant cases (48% single lung, 52% bilateral lung), we found an AKI rate of 37.9% (n=116). Creatinine was significantly higher in both the early (0 to 72 hours) and late (72 hours to 7 days) postoperative period (Table 1). AKI rates were increased among those patients with a lower preoperative hemoglobin (p<0.001), and those with a higher pre induction mean arterial pressure (MAP) (p=0.037). Patients with AKI had more ICU hours (p=0.008), a longer hospital stay (p=0.005), and higher inpatient mortality (p=0.024); they were also more likely to need tracheostomy (p=0.044), ICU readmission (p=0.014), reintubation (p=0.006), or hemodialysis (p=0.013). There were no statistically significant associations between age, body mass index, preoperative creatinine, sleep apnea, hypertension, diabetes, or preoperative NSAID, diuretic, or antihypertensive medication use and AKI. There were also no statistically significant associations with intraoperative hypotension, vasopressor use, anemia, transfusions, intravenous fluid, urine output, or cardiopulmonary bypass duration and AKI. Patients with AKI did not have increased ventilator hours. The development of AKI was similar between single and double lung transplant recipients (p=0.272).

Conclusion:
In the high-volume academic medical center lung transplant patient population, we found patients with AKI to have a lower preoperative hemoglobin and higher preinduction MAP. Patients with AKI were more likely to have respiratory complications, need hemodialysis, a longer ICU and hospital stay, and had higher inpatient mortality. A better understanding of these associations will aid in identifying those patients at high risk for AKI, and may lead to the development of clinical care pathways that include interventions to decrease the risk of development of AKI.
Abstract #6
A Novel Paradigm for a New Class of Anti-Arrhythmic Drugs Based on Targeting Ca Channel Gating Properties

Marvin G. Chang, MD, PhD; Marina Angelini, PhD; Arash Pezhouman, MD; Hrayr Karagueuzian, PhD; Alan Garfinkel, PhD; Zhilin Qu, PhD; James Weiss, MD; Riccardo Olcese, PhD

Background:
Early after depolarizations (EADs) play a key role in the genesis of arrhythmias in cardiac diseases including congenital and acquired long QT syndrome and heart failure. It is the underlying mechanism of polymorphic ventricular arrhythmias such as Torsades de Pointes, and often underlies atrial fibrillation and VF, which are associated with significant morbidity and mortality. Most pharmacological anti-arrhythmic drug strategy is focused on “ion channel blocking” which has been shown to be ineffective and even pro-arrhythmic in some cases as seen in the CAST and SWORD trials. In this study, we propose a new paradigm for anti-arrhythmic drug development based on modulation of ion channel gating, ie. “ion channel gating modulation” rather than “ion channel blocking”, with a focus on targeting Ca channel gating properties without adversely impacting excitation-contraction (E-C) coupling.

Methods and Results:
Optical mapping of cultured neonatal rat ventricular myocyte (NRVMs) monolayer tissue exposed to BayK8644 and isoproterenol revealed robust bursts of EADs resembling those seen in neurons, and is thus an ideal in vitro model of EADs to test antiarrhythmic strategies. Modulation of the gating properties of the Ca channels with roscovitine, a chemotherapy agent with unique properties of accelerating inactivation of the Ca channel and reducing late Ca current without significantly impacting the peak Ca current, eliminated EAD bursts in 90% of NRVM monolayers (n=10). Roscovitine did not significantly affect APD (surrogate of QT interval), however, peak Ca fluorescence was slightly but significantly increased.

Conclusion:
Targeting Ca channel kinetics without adversely impacting E-C coupling may serve as a viable therapeutic strategy for the development of this new class of anti-arrhythmic drugs.
Abstract #7
Investigating the Cardiotoxicity of Liposomal Bupivacaine Exparel in Rats: The Role of Intralipid Rescue
Marsha Kristel L. Bernardo, MD; Siamak Rahman, MD; Mansoureh Eghbali, PhD; Soban Umar, MD, PhD

Background:
Liposomal bupivacaine has been studied and applied in clinical practice in order to provide long lasting pain relief after a single dose. Exparel is a formulation of bupivacaine encapsulated in multi-vesicular liposomes, developed for surgical wound infiltration for postsurgical anesthesia. The liposomes have been shown to increase the drug’s stability and extend its duration of action, with recent studies showing bimodal kinetics and rapid uptake during the first few hours and prolonged release over 96 hours. Exparel may prevent accumulation of bupivacaine in blood and/or tissues; thus, it may decrease the risk of central nervous or cardiovascular toxicities. Administration of Exparel has its risks. There is concern that non-bupivacaine based local anesthetics may cause immediate release of bupivacaine from Exparel when administered concomitantly. The cross-reactivity may potentially place the patient at risk for local anesthetic toxicity especially when total local anesthetic use is unclear. Because Exparel is a white solution, another concern is inadvertent intravenous injection of the local anesthetic if mistaken for propofol leading to systemic toxicity. The maximum dosage of Exparel for adults is ~266 mg; however, the maximum mg/kg dosing limit is not known. There have been no formal studies conducted on Exparel’s actual toxic dose in mg/kg and if use of Intralipid 20% can reverse its toxicity. The study’s aim is to determine Exparel’s toxic dose in mg/kg and if Intralipid 20% can reverse its cardiotoxic effects.

Methods:
Female rats (200-300 gm) were used for the study. Asystole was attempted with different IV dosages of Exparel (25 mg/kg, 15 mg/kg over 10 seconds). For the second part of the experiment, asystole was induced with Exparel (15 mg/kg over 10 seconds, IV), and resuscitation with Intralipid 20% (5 ml/kg bolus and 0.5 ml/kg/min maintenance) was started immediately along with chest compressions. Heart rates and ejection fractions (EF) were measured using continuous transthoracic echocardiography at 1, 5, and 10 minutes after cardiac arrest.

Results:
We found that a dose of 25 mg/kg of Exparel caused cardiac arrest immediately. Next we decreased the dose of Exparel to 15mg/kg, that was still enough to cause immediate cardiovascular collapse. Intralipid rescue of Exparel cardiotoxicity was found to be unpredictable as half of the rats were able to be rescued with the usual Intralipid dose that is used for Bupivacaine cardiotoxicity in male rats. The other half of the rats given Exparel toxic dose (15 mg/kg) followed by Intralipid remained with severely poor cardiac function.

Conclusion:
We found a dose of Exparel that reliably induced cardiotoxicity in rats. More experiments are needed to determine Intralipid’s dosage that can reliably reverse Exparel toxicity. Based on our results, Intralipid is unreliable in rescuing Exparel induced cardiotoxicity at the dosage regimen used.

Delara Brandal, MD; Yohei Fujimoto, MD, PhD; Tristan Grogan, MS; Carol Lee, RN-BC; Michelle S. Keller, MPH; Ira Hofer, MD; Maxime Cannesson, MD, PhD

Background:
The United States is in the midst of an unprecedented opioid epidemic [1]. While opioids are widely used in the perioperative setting, little is understood about how perioperative practices influence chronic opioid use. Recent developments in care redesign processes have promoted the application of concepts such as Enhanced Recovery After Surgery (ERAS) to improve quality of care and patient outcomes. Opioid-free analgesia (OFA) and opioid-sparing techniques are key elements of ERAS protocols.

We recently launched an ERAS program for colorectal surgery, and we report the impact of this implementation on perioperative opioid utilization, postsurgical pain scores, and the incidence of opioid prescription at hospital discharge.

Methods:
We conducted a retrospective analysis of adult patients undergoing elective colorectal surgery from January to December 2016. Patients in the intervention group were treated according our ERAS guidelines. These guidelines incorporate glucose management, goal-directed fluid therapy, postoperative nausea and vomiting prevention, lung-protective ventilation, and OFA and opioid-sparing techniques (regional anesthesia, ketamine infusion, intravenous acetaminophen, and oral celecoxib). We compared patients undergoing surgery with the ERAS intervention to a historical control group of propensity matched patients who underwent similar surgeries prior to the ERAS intervention.

The primary outcome measure was a dichotomous indicator noting the presence of an opioid prescription on discharge. Secondary outcome measures were pain score on day of discharge (≤ 4, mild-to-moderate and > 4, moderate-to-severe), OFA (defined as no opioid administered intraoperatively), and utilization of regional anesthesia.

Results:
One hundred and four patients were treated in the ERAS group, and 69 of these patients were matched to a historical control group of 69 non-ERAS patients. ERAS patients were more likely to receive OFA (70% vs 29%, p<0.001) and regional anesthesia (96% vs. 86%, p=0.041) compared to the control group. Moderate-to-severe pain scores were not significantly different in the ERAS and control groups (32% vs 37%, p=0.617), and 94% of patients in both groups were discharged with an opioid prescription. In both groups, all patients with moderate-to-severe pain (44/44) were discharged with an opioid prescription compared to 90.4% (75/83) of patients with mild-to-moderate pain (p=0.050).

Conclusion:
Our retrospective analysis of patients undergoing elective colorectal surgery found that utilization of OFA and regional anesthesia increased significantly after ERAS implementation and was not associated with increased discharge pain scores. However, this did not reduce the incidence of opioid prescription at hospital discharge; nearly 9 in 10 patients with discharge pain scores ≤ 4 in both groups were discharged with an opioid.

Our finding that 90% of patients with mild-to-moderate pain following elective colorectal surgery were discharged with an opioid prescription indicates that physician behavior, rather than patient condition, may be the primary determinant of opioid prescribing practices in our study. In addition to redesigning perioperative care processes, efforts should be made to modify physician perioperative behavior with the ultimate goal of curtailing the use of opioids at the population level.
Abstract #9
Implementing a Novel Triage Questionnaire to Improve Preoperative Efficiency
Kate Lee, MD; Aviva Regev, MD, MBA; Victor Duval, MD; Eilon Gabel, MD; Maxime Cannesson, MD, PhD; Aman Mahajan, MD, PhD

Introduction:
With the shift towards value-based healthcare delivery, institutions must evaluate ways to decrease the cost of care while maintaining the quality of care provided. Traditional hospital costing methodologies do little to elucidate the true cost of care delivery. Time-driven activity-based costing (TDABC), a methodology developed by Kaplan and Anderson which utilizes a combination of time and resource cost per minute, can be used to more accurately assess overall cost of care and efficiency. In a previous study, we undertook to apply TDABC to the preoperative evaluation process of patients undergoing cataract surgery at the Jules Stein Eye Institute at UCLA. Based on our analysis, we identified opportunities for process improvement and cost reduction. One of these was the implementation of a novel triage questionnaire addressing medical conditions that would warrant further screening. By implementing this questionnaire, our aim is to increase efficiency and decrease overall costs without impacting turnover times, operating room delays, or clinical adverse events.

Methods:
A screening questionnaire was developed based on validated surveys and is in the process of being independently validated. The questions are designed to identify patients with systemic disease significant enough to provide a functional limitation that would impact their ability to undergo cataract surgery. In the pilot phase of the study, the questionnaire was administered to 20 patients. Those answering all “no” (considered a negative screen) did not undergo any further preoperative screening. Patients answering “yes” to any question then proceeded to have the standard full interview and review of records. After these patients underwent surgery, we compared findings on the preoperative evaluation with answers to our questionnaire. We assessed delays, turnover times, and unexpected intraoperative events. We also performed a TDABC analysis of the new screening process including the questionnaire, and compared the time and cost to that of the original process. Data on personnel, space, and equipment cost were obtained from the operations department.

Results:
Fifty percent of patients had a negative screen and had no further evaluation prior to surgery. Though two of these 10 patients had preoperative evaluations that did not correlate with their questionnaire, there were no unexpected adverse events in patients with negative screen. There was also no impact on turnover time or delays as compared to patients not part of the pilot study over the same time frame. From the previous TDABC analysis, the average process time for the original preoperative evaluation process was 128 minutes at a cost of $186. With the triage questionnaire, the average process time was 64 minutes at a cost of $90. The use of the questionnaire demonstrated a 50% reduction in time and a 52% reduction in cost.

Conclusion:
Assessment of cost of care and process inefficiencies with TDABC can provide a basis for workflow optimization. We found that the introduction of a screening questionnaire to guide allocation of resources in the preoperative evaluation process led to a significant reduction in time and cost without negatively impacting operating room turnover or outcomes, leading to a higher value of care.
Abstract #10

Investigating Bupivacaine-induced Cardiotoxicity and Intralipid Rescue in Pregnant Rats
Caitlin Sherman, MD; Catherine Cha, MD; Richard Hong, MD; Shayan Moazeni, BSc; Mansoureh Eghbali, PhD; Soban Umar, MD, PhD

Background:
Pregnant patients routinely get neuraxial anesthesia for labor and delivery. Bupivacaine is one of the most commonly used local anesthetics in obstetric anesthesia. Some laboratory studies have suggested that pregnancy increases the cardiotoxicity of Bupivacaine. We have previously shown that Intralipid (ILP) rescues the heart from Bupivacaine-induced cardiotoxicity in male rats. However, Bupivacaine cardiotoxicity and ILP rescue have not been extensively studied in pregnant rats. We aimed to investigate the cardiotoxicity of Bupivacaine and the potential of ILP’s rescue in pregnant rats.

Methods:
Pregnant female rats (200-300 g, n=4) were used for the study. Rats were anesthetized intraperitoneally with a mixture of Ketamine (80 mg/kg) and Xylazine (8 mg/kg). Tracheostomy was performed using a 16-gauge angio-catheter and rats were ventilated with a ventilator. Femoral vein was accessed through a 24-gauge intravenous catheter. Body temperature was maintained at 37°C. Rats received Bupivacaine bolus (10 mg/kg, IV over ~20 seconds) to induce asystole. Resuscitation with ILP 20% (5 ml/kg bolus, and 0.5 ml/kg/min maintenance) and chest compressions were initiated. Serial B-Mode and M-Mode transthoracic echocardiography was continuously performed using a VisualSonics Vevo 2100 system equipped with a 30-MHz linear transducer. The ejection-fraction (EF, %) and fractional shortening (FS%) were calculated at baseline and at 1, 5 and 10 minutes after ILP treatment. Standard Lead II Electrocardiograms were acquired under anesthesia continuously throughout the experiment. Heart rate (HR, beats per min) EF, and FS, were measured before asystole (baseline) and at 1, 5 and 10 min after ILP.

Results:
All four rats developed cardiac arrest within a few seconds after a toxic dose of Bupivacaine. Interestingly, only 2 out of the 4 rats were rescued with ILP using the usual rescue dose typically used in male rats.

Conclusion:
ILP unreliably rescued Bupivacaine-induced cardiac arrest in pregnant rats. More experiments are needed to find out the optimal rescue dosage regimen of ILP for Bupivacaine-induced cardiac arrest in pregnant rats.
Hypothesis-Based Poster Presentations
Abstract #1
Isoflurane Increases Myocardial Sympathoexcitation In A Porcine Model Of Chronic Ischemia
Tiffany Williams, MD, PhD; Kimberly Howard-Quijano, MD, MS; Tatsuo Takamiya, MD; Yukiko Kubo, MD; Aman Mahajan, MD, PhD

Background:
Anesthetics directly and indirectly affect the electrophysiologic function of the myocardium. Isoflurane (ISO), a commonly used volatile anesthetic, offers both cardioprotection via mitochondrial ATP-sensitive KATP channels and cardiodepression via L-type Ca2+ channels. The above effects of anesthetics may be exaggerated in patients with myocardial ischemia (MI) as there is often increased sympathetic output which increases cardiac excitability. The aim of this study was to examine the electrophysiologic effects of ISO in a porcine model of chronic ischemia. We hypothesized that under ISO anesthesia there will be diminished cardiac excitability when compared to alpha-chloralose (AC), a commonly used anesthetic in veterinary medicine with minimal cardiovascular side effects.

Methods:
Yorkshire pigs, healthy controls (n=3) and chronic infarcts (8 weeks post myocardial infarction, n=3) were anesthetized and underwent median sternotomy with placement of a 56 epicardial lead sock over the heart for cardiac electrophysiologic measurements of activation recovery intervals (ARI) and dispersion of repolarization. ARI is a surrogate marker for action potential duration and dispersion of repolarization is a measure of ventricular arrhythmogenicity. Hemodynamic monitoring of heart rate and dP/dt max was also performed. All measures were obtained with ISO only, ISO + phenylephrine bolus, and alpha-chloralose infusion only (40 mins after discontinuation of ISO).

Results:
ISO as compared to alpha-chloralose, in both control and chronic ischemia hearts, was associated with increased myocardial sympathoexcitation as demonstrated by a significant reduction in ARI (ISO: 353 ± 39 vs. AC: 422 ± 66ms, p=0.04) and repolarization time (ISO: 382 ± 38 vs. AC: 450 ± 67ms, p=0.04), with no change in activation time. Phenylephrine bolus during ISO attenuated the ARI reduction (ISO: 344 vs ISO+Phenylephrine: 357ms), with no change in ARI during alpha-chloralose. With ISO, heart rate increased (ISO: 72 vs. AC: 65) and dP/dt decreased (ISO: 1096 ± 320 vs. AC: 1448 ± 387ms, p=0.04). ARI corrected for heart rate showed similar pattern of reduction (ISO: 387 ± 33 vs AC: 435 ± 34ms, p=0.03). Dispersion of repolarization did not demonstrate a significant difference between ISO and alpha-chloralose though dispersion in healthy controls (516ms) was in the normal range while elevated in chronic ischemia (1549ms).

Discussion:
The shortening of ARI and repolarization time seen during ISO anesthesia demonstrates a likely increase in myocardial sympathoexcitation via either direct or indirect mechanisms. The associated increase in heart rate as well as the ARI lengthening with phenylephrine suggests indirect sympathoexcitation due to a reduction in systemic vascular resistance with minimal blunting of the baroreceptor reflex under ISO anesthesia. These findings give important insight into the effect of inhaled anesthetics on myocardial electrophysiology in the clinical setting. Elevated sympathetic activity (ARI) in the background of increased arrhythmogenicity (dispersion of repolarization) may in part explain the observed incidence of post-operative arrhythmias in patients with previous MI.
Abstract #2
The Prevalence of Coronary Artery Disease in Liver Transplant Recipients Aged 65 and Older
Christine Nguyen-Buckley, MD; Jennifer Scovotti, MA; Brent Ershoff, MD; Christopher Wray, MD

Background:
The average age of liver transplant (LT) candidates is increasing; 75% of patients waiting for LT are older than 50 years. LT recipients older than 70 years have comparable mortality to those less than 60 years, although older patients have more cardiovascular complications. While the prevalence of coronary artery disease (CAD) in LT patients has been reported in multiple studies, the prevalence in older adults has not been defined.

Methods:
We performed a retrospective single-center cohort pilot study of 288 patients aged 65 years and older who received a LT from 2004 to 2015 to determine the prevalence of CAD in this sample. Liver-heart and re-do transplants were excluded. CAD was defined as 50% or greater occlusion of at least one coronary artery on angiography or as having had previous coronary intervention. Cox regression was used to model the association between CAD and mortality.

Results:
The prevalence of CAD was 13.2% (38/288; 95% CI: 9.7%,17.6%). There were no statistically significant differences in clinical and demographic variables between CAD (+) and CAD (-) groups. Mortality was 37.5% for all patients (median follow-up 25.5 months). There was no difference in the adjusted mortality between the CAD (+) and CAD (-) groups (HR:0.70; 95% CI: 0.31,1.6, p=0.39) (Graph 1). Of the 288 patients, 68 patients had a negative stress test and were included in the CAD (-) group. The remaining 220 patients underwent angiography.

Conclusion:
In this study we report the prevalence of CAD in LT patients aged 65 years or greater at a single center. The prevalence of CAD was similar to previous reports in younger LT cohorts. Although there was no statistically significant difference in mortality between those with and without CAD, this study was not powered to assess mortality.
Validation of Preoperative Assessment Scores in Critically Ill Patients
Andrew T. Young, MD; Curtis C. Copeland, MD; Tristan R. Grogan, MS; Eilon Gabel, MD; Vadim Gudzenko, MD

Background:
The majority of current preoperative scoring systems have been focused on elective, outpatient, and non-cardiac surgery. We have previously developed a novel index for assessment of perioperative risk among patients admitted to the intensive care unit (ICU) undergoing non-cardiac surgery. This index assigns 1 point each for the presence of hypotension or vasopressor use, history of congestive heart failure (CHF), history of diabetes, or emergent surgery: it demonstrated superior discriminatory power compared to the sequential organ failure assessment (SOFA), revised cardiac risk index (RCRI), and American Society of Anesthesiologists physical status classification (ASA). The purpose of this study was to validate the findings in the original cohort.

Methods:
After approval by the institutional review board we retrospectively obtained clinical, surgical, and mortality data for 152 adult patients admitted to the ICU preoperatively. Inclusion criteria included a pre-existing advanced airway (endotracheal tube or tracheostomy) and a procedure requiring general anesthesia, while excluding cardiac and bedside procedures. The RCRI and ASA classification was derived from the preoperative anesthesia assessment, and SOFA score was calculated using minimum values for the 24 hours prior to the procedure; component variables not available were given a score of 0. As in the original study, the novel index was composed of elements from the RCRI, a simplified SOFA blood pressure variable, and the surgical element of emergent status. Patients were included in the study only once, using the first eligible procedure. There was an emphasis on replicating the methodology of the derivation cohort. The primary outcome was survival to discharge.

Results:
Of 152 patients included in the analysis, 50 did not survive to discharge (33%). There was no preoperative assessment with a particularly high predictive power of the primary outcome (AUC>0.75). Still, higher SOFA and novel index scores were significantly associated with death prior to discharge, with p<0.001 and p=0.045, respectively. Neither ASA classification nor RCRI were associated with the primary outcome, though ASA classification nearly reached statistical significance (p= 0.061 and p=0.66, respectively). The areas under the receiver operator curve (AUC) demonstrated best discriminatory power for the SOFA score (AUC 0.73), with the novel index at 0.60, ASA at 0.59, and RCRI at 0.52.

Conclusion:
This study validated the finding of unusually high postoperative mortality rate among critically ill patients receiving a general anesthetic. It provides additional support for incorporating the SOFA score into the preoperative assessment of patients in the intensive care unit, given its ability to predict death prior to discharge (AUC > 0.7 in both the validation and derivation cohorts). The novel index failed to maintain statistical superiority to the SOFA score in the validation cohort, suggesting that the simple, binary components may more appropriately be considered as major risk factors for the primary outcome. The repeated weak performances of ASA and RCRI highlight the current limitations assessing operative risk in critically ill patients. Critically ill patients with advanced airways present significant challenges to all anesthesiologists, mandating further investigation to improve their preoperative assessment and perioperative management to potentially improve their survival to discharge.
Abstract #4
Lumbosacral Transitional Anatomy and Low Back Pain: A Pilot Prospective Epidemiologic Analysis
Benjamin Maslin, MD and Michael Ferrante, MD

Background:
Lumbosacral transitional vertebrae are commonly encountered in patients who present with low back pain. The effect, if any, of lumbosacral transitional anatomy on the risk of developing radicular back pain versus facet mediated low back pain is unclear. We hypothesize that the presence of lumbosacral transitional anatomy is related more to the risk of developing low back pain with radicular features than facet-mediated pain on the basis of pathologic anatomy.

Methods:
All patients presenting to the SM SurgiCenter for fluoroscopically guided lumbar epidural or facet injections with a single interventionalist between the dates of 4/7/16 and 1/27/17 were analyzed. Those with transitional vertebra had x-rays films saved. The fluoroscopic images and procedural details of patients who presented with lumbosacral transitional anatomy were analyzed for various anatomic, pathologic and demographic variables.

Results:
Among those who presented for epidural steroid and facet interventions, 11% (82/751) were found to have lumbosacral transitional anatomy, of which the most common morphologies observed were Castelli classes Ia (21%), IIa (21%), IIb (15%), IIIb (14%) and IIIa (7%). Among those patients with lumbosacral transitional anatomy, 63.4% (52/82) were treated with epidural steroid injections and 36.6% (30/82) were treated with facet interventions.

Conclusion:
Prima facie, it might be anticipated because of pain that patients with transitional anatomy may congregate within a Pain Center, raising incidence above expected norms. This is not true (12% incidence within the general population). However, patients with lumbosacral transitional anatomy may be more predisposed to requiring treatment for radicular pain than facet mediated pain (P<0.05 Chi-square). Further work will examine the shapes and anatomic dimensions of the transverse processes on the prevalence of pain.
Abstract #5

Tracking Outcomes in Pain Patients Using Personal Fitness Devices
Goonjan Shah, MD; Andrew Park, MD; Andrea Poon, MD; Isaac Jenabi, MD; Ankush Bansal, MD; Michael Ferrante, MD

Background:
The prevalence of chronic low back pain was 10% in 2006, an increase of over 150% from 1992. Back or spine problems are also the second most common cause for disability. Over 80% of these patients seek care for their back pain and some are referred to specialists for interventional pain procedures such as epidural steroid injections (ESIs). While ESIs are well established as beneficial in certain types of back pain, the effectiveness of many interventions for pain are widely debated. Unfortunately, comparative effectiveness and outcomes research in pain medicine is limited. This lack of data exposes patients to unnecessary medications or interventions that carry significant risk and cost. This study aims to use personal fitness devices and cloud-based data aggregation to create a platform for obtaining the data needed to gauge the effectiveness of various interventions in patients suffering from chronic pain.

Objective/Importance:
We aim to develop a more relevant and simpler method to gauge effectiveness of pain medicine procedures. Current studies use surveys, invasive nerve recordings, or biomarkers to test interventions. These cumbersome assessments increase the cost of performing large scale effectiveness studies and also fail to directly measure activity or sleep, known to be altered by pain and critical to a patient’s quality of life. We will validate the Fitbit, a personal fitness device, in assessing the effects of a pain intervention. This will create a framework for large-scale patient centered outcomes and comparative effectiveness studies in the chronic pain population.

Methods:
We aim to validate the use of the Fitbit for patient centered outcomes after lumbar epidural steroid injections (LEISIs) in patients with radicular back pain. LEISIs have been shown to have good short and long term relief of pain symptoms in over 60 – 80% of patients presenting with radicular pain where the pain is due to nerve compression and radiates along that nerve’s innervation. Thus they provide an excellent intervention in which to validate a new tool for effectiveness assessments. The Fitbit is a band worn on the non-dominant wrist and is capable of recording steps taken, intensity of activity, hours slept, and awakenings during sleep on a minute to minute basis. This data is then synced to the Fitbit data cloud and accessible through web-based interfaces to allow individuals to track their physical activity. Prior studies have validated the consumer grade Fitbit against research-grade accelerometers in different clinical settings. We will use the Fitbit to make objective assessments of function and sleep in the setting of pain interventions. Specifically, we will compare Fitbit data against that of the currently standards of the Oswestry Disability Index (ODI), the brief pain inventory (BPI), and the Roland Morris Disability questionnaire (RMDQ). We will correlate results from the ODI, BPI, and RMDQ against Fitbit results for total number of steps per day, intensity of activity, and amount and quality of sleep. Data analysis will assess the bivariate correlation using Pearson and Spearman correlations comparing the change in individual assessments against the change in Fitbit measures of activity and sleep aggregated over the 3 days prior to survey completion, in addition to comparing items specifically discussing activity and sleep to corresponding Fitbit measures. Patients identified by pain physicians as candidates for LESI will be further screened for recruitment to this study. Using the clinician’s decision to offer a LESI allows for a pragmatic design that will increase the external validity of the results and speed enrollment. Major exclusion criteria then need only include patient refusal to participate or inability to wear the Fitbit. No clinical or treatment plans will be modified or altered. A total of 22 patients have been enrolled and completed the study to date.

Results:
Currently 22 patients have completed the study. Data analysis is pending completion.
Abstract #6
Improving the Accuracy of Anesthesiology Resident Case Logs using an Anesthesia Information Management System Database
Chester Chan, MD, MS; Eilon Gabel, MD, MS; Tristan Grogan, MS; Judi Turner, MD, PhD

Background:
Anesthesiology residents in the United States are required to fulfill graduation requirements outlined by the American College of Graduate Medical Education (ACGME) and manually log cases corresponding to these requirements. Published studies have shown that these case logs are inaccurate, so we expected less than 50% of residents at our institution to have accurate case logs as defined by having a total greater than or equal to the number of cases they had performed according to our Anesthesia Information Management System (AIMS) database. We hypothesized that residents who received AIMS case data via email would have more accurate case logs than those who did not receive case data, with a persistent effect beyond the period of intervention.

Methods:
We conducted systematic reviews of the ACGME graduation requirements and the information within our AIMS database to create an algorithm that suggests a category for a given case. We collected data over eight weeks to establish a baseline accuracy of case logs. We randomized 64 anesthesiology residents at our institution into intervention and control arms, with 31 residents receiving emails containing AIMS case data every two weeks, and 33 residents receiving no emails. We collected data for an additional four weeks to assess persistence of any intervention effect.

Results:
During the intervention, post-intervention, and overall study periods, a higher percentage of residents in the intervention arm than the control arm had accurate case logs (74% vs. 58% during intervention, 68% vs. 48% post-intervention, and 71% vs. 52% overall). However, this difference was not statistically significant during any of these periods (p = 0.19 during intervention, p = 0.08 post-intervention, and p = 0.13 overall). Residents in the intervention arm were surveyed following the study, and the majority (83%) wanted to continue receiving emails.

Conclusion:
Although no significant difference in accuracy was found between the intervention and control arms, accuracy in both arms exceeded our expectation, and a greater percentage of residents in the intervention arm had accurate case logs throughout the study. A survey of residents in the intervention arm found that the majority wanted to continue receiving emails.
Introduction:
The treatment of malignant pleural mesothelioma (MPM) often involves a multimodal approach, including surgery, chemotherapy, and radiation. Surgical management for MPM is controversial, but it has a role in the curative approach to management of MPM due to the limitations of chemotherapy and radiation. Two curative surgical approaches to treating MPM include pleurectomy/decortication (PD) and EPP (extrapleural pneumonectomy), and investigators have compared the effectiveness of these techniques in local control of disease as well as mortality outcomes. Several series have suggested that patients with MPM treated with PD may have an overall better median survival than after EPP.

In the anesthesiology literature, researchers are investigating the incidence of intraoperative hypotension and elevated troponin levels in noncardiac surgery, and their relationships to postoperative mortality. The evidence supports the conclusion that intraoperative hypotension, defined as SBP < 70 mmHg, MAP < 50 mmHg, and DBP < 30 mmHg, is associated with increased operative morbidity and mortality, as are elevated troponin levels after noncardiac surgery.

As a center for MPM, UCLA has one of the largest American cohorts of patients undergoing thoracotomy for complete PD, and our study examines their outcomes. Our aim is to determine the incidence of significant hypotension (intraoperative and postoperative) and its association with adverse events, along with other factors contributing to ICU admission, 30-day readmission, and mortality. As part of quality improvement, these results may suggest avenues for modification of the postoperative care pathway.

Case Series:
We reviewed the electronic records of 71 patients diagnosed with mesothelioma who underwent thoracotomy for complete visceral and parietal pleurectomy and decortication between April 2013 and November 2016.

Mortality: Overall, surgical mortality, defined as death within 30 days or before discharge, occurred in two patients, for a mortality rate of 2.8 percent. One patient expired eight days after discharge home, on post-operative day (POD) 38. Follow-up information was not available for all patients because a number of them obtained primary care outside the Los Angeles area. An additional 19 patients are known to have expired at intervals ranging from one month to 17 months after surgery, with 13 of these patients surviving less than six months after surgery.

ICU Admission: Overall, 17 patients (24 percent) were admitted to ICU (Table 1). 

a) Transfer from OR to PACU to ICU: Six of the 17 patients were extubated in the OR and transferred to PACU. Three of these patients were discharged from anesthesia care and were boarding in PACU, but subsequently became unstable from causes including hypotension and atrial fibrillation and were transferred to ICU. The other three patients were persistently hypotensive in PACU and were transferred directly to ICU on pressor infusions. One patient required reintubation; the average length of stay (LOS) in hospital was 11.5 days, with a range of 7 to 16 days.

b) Transfer from OR direct to ICU: Five of the 17 patients were transferred to ICU directly from the OR. Details on these five patients may be found in Appendix A.
Case Series Continued:
c) Transfer from ward to ICU after acute event: Six of the 17 patients were extubated, discharged from PACU, and sent to the ward. They experienced adverse events on the ward that necessitated emergency ICU transfer, with length of stay from 14 to 58 days. Five of these experienced either cardiac arrest or near-arrest cardiorespiratory events following prolonged hypotension during the first few postoperative days. These events are described in detail in Appendix B.

30-day Readmission: Some patients were readmitted to outside hospitals. Information in our electronic record is not complete and therefore is not included in this analysis.

Of the 15 patients who survived to hospital discharge after admission to ICU, two were readmitted to this hospital within 30 days of discharge. One patient was readmitted 10 days after discharge for a loculated hydropneumothorax, and stayed in hospital for three days. The second (Patient 4 in Appendix B) was sent from a skilled nursing facility (SNF) for failure to thrive, required hemodialysis, and remained in the hospital for an additional 53 days.

Of the 54 patients who were not admitted to ICU, 21 presented to this hospital again within 30 days (Table 2). Four of these were Emergency Department visits only, while 17 patients required admission (31.5 percent). The most common symptom prompting the patient to seek care was shortness of breath. Causes of readmission included empyema, wound infection, pleural effusion, pericardial effusion, anemia, and dehydration precipitating acute kidney injury. Length of stay after readmission ranged from one to 75 days: two patients expired.

Discussion:
The short-term surgical mortality rate of 2.8 percent in our series is comparable to or less than that reported in other large series. However, the incidence of significant postoperative hypotension and other adverse events is of concern. Emergency transfer to ICU from the ward was associated with prolonged LOS and poor-quality outcomes.

Comparison with the experience of other major centers (Stanford University, Oregon Health Science University, University of Chicago) reveals that their patients undergoing major resection of mesothelioma routinely go to the ICU first for postoperative care, and are transferred to the ward when stable.

Other risk factors identified during this review include:
• Preoperative anemia;
• Preoperative weight loss, poor nutritional status;
• Postoperative chest tube blood and fluid losses;
• Continuing need for postoperative volume replacement;
• Institution of beta blockade and/or calcium channel blockade for prophylaxis or treatment of atrial fibrillation;
• Sympathetic blockade from bupivacaine in epidural infusions.

To date, these patients have not routinely been seen in our department’s Preoperative Evaluation and Planning Center (PEPC), nor has there been a standard protocol to optimize preoperative conditions including anemia, diabetes, or malnutrition.

The chronic bed shortage in the Ronald Reagan Medical Center puts constant pressure on physicians and staff to move patients out of the PACU. Late-night staffing is often stretched, and the thoracic surgery service is reluctant to send patients to the ICU. These factors may have contributed to some patients being discharged from anesthesia care at a time sooner than optimal.
Heart failure, one of the most common and severe cardiovascular diseases, is defined as the inability of the heart to pump sufficient blood to support the body. Hundreds of genes undergo changes in expression during heart failure, yet the mechanisms for how these processes are coordinated are unknown. Packaging of DNA into nucleosomes forms the cell type specific chromatin architecture through which normal transcriptomes are maintained and upon which disease processes act to alter gene expression. Nucleosome assembly protein 1 like 4 (NAP1L4) is a histone chaperone that possesses both nucleosome assembly and disassembly functions.

We found NAP1L4 to be up-regulated in a pressure overload mouse model of hypertrophy and failure. Knockdown of NAP1L4 in cardiomyocytes lead to a cell size decrease and attenuated the hypertrophic phenotype in response to phenylephrine. Moreover, NAP1L4 knockdown reversed expression changes of hypertrophy-associated genes that are induced by phenylephrine, namely decreasing the expression of ANF and increasing the expression of alpha-MHC and SERCA. In exploring the transcriptome of the failing heart after pressure overload, we sought to investigate another class of epigenetic regulators called circular RNAs (circRNAs), a noncoding RNA species that has only recently been identified and is thought to participate in regulating mRNA stability and turnover. Analyses of ribo-zero RNA sequencing data in our lab identified a total of 1105 circRNAs, several of which we have subsequently confirmed to be related to cardiac phenotype, including circRNAs for Myocardin, Titin and the Ryanodine receptor. Taken together, these projects are exploring new mechanisms to sculpt the cardiac transcriptome through chromatin structure and elucidating a new class of cardiac RNAs.
Epigenetic Regulation of the Heart: Therapeutic Insights from Two Disease Models
Douglas J. Chapski, BS; Todd Kimball, BS; Irene Shih, BS; Elizabeth Soehalim; Enrique Balderas, PhD; Vincent Ren; Niels J. Galjart; Bing Ren; Yibin Wang, PhD; Thomas M. Vondriska, PhD; Manuel Rosa-Garrido, PhD

Chromatin architecture plays a major role in controlling gene activation and repression. Chromatin structural proteins serve as building blocks that govern aspects of higher order chromatin structure. CTCF is a chromatin structural protein that, depending on its environment, can function as a gene activator or repressor (like a transcription factor), while also mediating chromatin loop formation. Our previous studies found that CTCF mRNA levels negatively correlate with heart weight in a murine model of heart failure. Moreover, left ventricular assist device implantation results in increased CTCF protein levels, suggesting that alleviation of some aspects of heart disease (e.g. normalizing load) is associated with restoration of CTCF levels. To mechanistically determine the role of CTCF in development of cardiac disease, we generated cardiac-specific tamoxifen-induced CTCF knockout mice.

CTCF knockout mice display enhanced cardiac hypertrophy with reduced ejection fraction, much like mice that underwent transverse aortic constriction (TAC), a model of pressure overload hypertrophy. To determine downstream effects of CTCF depletion on the transcriptome, we used RNA-seq to interrogate gene expression. In the mice subjected to either CTCF depletion or TAC, we observed activation of the so-called fetal gene program that is characteristic of disease. Moreover, we observed a large overlap in the number of differentially expressed genes between the two pathologies (loss of CTCF and pressure overload). To further investigate the effect of CTCF depletion on chromosomal architecture, we performed high-throughput chromosome conformation capture on CTCF knockout and TAC mice. Although large-scale topological domains were largely unaffected by the cardiac perturbations, we observed differences in chromatin loop profiles, suggesting that nuanced changes in chromatin architecture can cause organ level pathologies. These findings have implications for the investigation of human cardiomyopathies, as chromatin structural rearrangements could themselves be therapeutic targets to regulate entire gene expression profiles.
Abstract #10
Risk of CLABSI with Internal Jugular Vein Cannulation in the Presence of Tracheostomy
Dana L. Russell, MPH; Razmik Ghukasyan; Tristan R. Grogan, MS; Joseph S. Meltzer, MD

Background:
The Centers for Disease Control and Prevention (CDC) recommends using the subclavian vein and avoiding the femoral vein for insertion of non-tunneled, short-term access catheters to reduce the risk of Central Line-Associated Bloodstream Infections (CLABSI). However, there are no evidence-based recommendations with regard to choosing among subclavian, jugular, or femoral sites when other frequently manipulated devices (e.g. tracheostomy) that could potentially increase the risk of infection are in place. A limited number of studies have observed a greater incidence of CLABSI in patients with tracheostomy; however, the studies are small in number and of questionable generalizability. The purpose of our study is to further define the influence of tracheostomy on the risk of CLABSI in patients with internal jugular vein cannulation.

Methods:
Our retrospective case-control study included adult ICU patients with CLABSI at Ronald Reagan UCLA Medical Center from March 2013 to December 2015. A case was any patient with CLABSI who had an IJ central line for > 2 calendar days at time of CLABSI (n=85). CLABSIs were identified by ongoing, routine surveillance using standard CDC definitions. Controls included all non-infected patients with IJ in the same ICU on the date of CLABSI (n=976). A conditional logistic regression model was constructed to estimate the relative risk ratio for different variables including: age, length of stay, tracheostomy, number of lines, number of lumens, adherence to maximal sterile barrier precautions for line placement, and line dwell times. There was no repeat sampling of either cases or controls.

Results:
In the multivariate model, the risk of CLABSI did not increase in patients with IJ and tracheostomy as compared to patients with IJ alone (RR = 0.88, CI 0.44-1.76, p=0.71). Cases and controls did not differ with respect to age (p=0.91), length of stay (p=0.73), number of lines (p=0.95), number of lumens (p=0.22) and line dwell times (p=0.25) but did differ with respect to adherence to maximal sterile barrier precautions utilized for line placement (p=<0.001).

Conclusion:
In our critically ill adult patient population, we found no significant association between tracheostomy and risk of CLABSI in patients with IJ central lines after accounting for several well-studied predictors of infection. The lack of evidence to support this risk should be considered by practitioners when selecting a site for cannulation.
Abstract #11

Presence of Atherosclerotic Lesions in Lungs of Patients with Pulmonary Hypertension

Sara Mottahedan, BM; Shayan Moazeni, BSc; Gregory Fishbein, MD; Abbas Ardehali, MD; Aman Mahajan, MD, PhD; Mansoureh Eghbali, PhD; Soban Umar, MD, PhD

Introduction:
Endothelial dysfunction, inflammation and vascular remodeling are features seen in all types of pulmonary hypertension (PH). Pro-inflammatory mechanisms such as HDL dysfunction have been observed in patients with PH. Specifically, studies by Ross et al. and others have shown HDL dysfunction and oxidized lipids in the lungs of patients with PH. Interestingly, atherosclerosis is characterized by vascular remodeling as seen by intimal cell and smooth muscle cell proliferation and migration as well as inflammation with the presence of oxidized lipids as seen by foamy macrophages. Given the mechanism of PH and the presence of oxidized lipids in lungs of all types of PH, we are investigating the presence of atherosclerosis in the pulmonary arteries of patients with idiopathic pulmonary arterial hypertension (iPAH) and idiopathic pulmonary fibrosis (IPF) associated pulmonary hypertension in explanted lungs.

Methods:
Human explanted lung samples from patients with iPAH (n=4) and IPF associated PH (n=5) undergoing lung transplants were used for the study. Lungs were fixed with paraformaldehyde and OCT blocks were prepared. Lungs were cut in 4μM thin sections using a cryostat. We evaluated the pulmonary arteries via cryo-sections stained with Masson’s trichrome and Oil-Red-O stains. Images were acquired using a high-resolution microscope equipped with a camera.

Results:
Both iPAH and IPF associated PH demonstrated pulmonary vascular remodeling in the lungs as seen with trichrome staining. Atherosclerosis was observed in both iPAH and IPF related PH as seen by intimal hyperplasia of the pulmonary arteries and the presence of sub-endothelial foamy macrophages.

Conclusion:
We have demonstrated the presence of atherosclerotic lesions in lungs of patients with pulmonary hypertension. These findings need to be corroborated with molecular data and may have therapeutic implications for patients with pulmonary hypertension.