the monitoring alarms, and FA rates were very high. A quantitative understanding of the relationship between ECG signal quality and false arrhythmia alarms will facilitate effective interventions to reduce FA rate and alleviate alarm fatigue. The purpose of this study is to quantify ECG signal quality in different aspects and determine whether a relationship exists between false arrhythmia alarms and signal quality. **Methods:** Analysis included 9853 alarms for 6 arrhythmias: Accelerated Ventricular Rhythm (ACC= 2474), Asystole (703), Ventricular Tachycardia (VT=3427), Pause (2047), Ventricular Fibrillation (VF= 139) and Ventricular Bradycardia (VBrady = 1063). Subjects were in five adult ICUs in March 2013 at the University of California San Francisco (UCSF). All alarms were annotated by UCSF ECG experts as true alarm (TA) or FA using standardized criteria. Four signal quality index (SQI) metrics included baseSQI, kSQI, sSQI and bSQI were used. Metrics obtained from 10-second 7-lead ECG preceding each alarm. Non-parametric Wilcoxon rank test tested whether SQIs of FA ECG is different from those from TA ECG. **Results:** The statistical analysis across all 7 ECG leads, showed significantly ($p < 0.05$) lower kSQI for false VFib, lower sSQI/ kSQI for false Asystole, lower baseSQI/bSQI for false VTach, lower sSQI/kSQI/bSQI for false Pause, lower baseSQI/sSQI/kSQI for false VBrady, and lower baseSQI for false ACC. However, at least one of the four SQI metrics from at least one of the 7 ECG leads did not show statistically significant difference between signals from TA and FA. **Conclusions:** Our analysis showed that overall poor signal quality (across all 7 ECG leads) was associated with FA. Furthermore, there existed at least one ECG lead that did not have different signal quality between TA and FA in all aspects of signal qualities captured by the four studied SQI metrics.

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THE INCIDENCE OF SUBGLOTTIC STENOSIS FOLLOWING CARDIAC SURGERY IN INFANTS AND CHILDREN

Katherine Kruse, Prashant Purohit, C. Ross Cadman, Feice Su, Gregory Hammer

Learning Objectives: Acquired subglottic stenosis (SGS) is a complication of tracheal intubation and mechanical ventilation in children following cardiac surgery. Infants <1 year of age may be at high risk due to small tracheal diameter and the need for prolonged postoperative mechanical ventilation. The incidence of SGS in infants has been found to be 2.3%. The use of cuffed endotracheal tubes (ETTs) has also been associated with increased risk of SGS. We hypothesized that the incidence of SGS following cardiopulmonary bypass in pediatrics is higher in younger patients (age <1 year) and in patients intubated with cuffed vs. uncuffed ETTs. **Methods:** We performed a retrospective review of children <18 yr of age who had cardiac surgery with CPB at Lucile Packard Children's Hospital Stanford (LPCH) between January 2009 and May 2014. We recorded demographics, cardiac/other diagnoses, ETT used (size, cuffed vs. uncuffed), duration of CPB and mechanical ventilation, airway complications and outcomes. All patients in our cardiac surgery/CPB database having initial procedures at LPCH and with the diagnosis of "stenosis of larynx" were identified. **Results:** Fourteen of 2,241 (0.62%) patients undergoing cardiac surgery/CPB were diagnosed with SGS by fiberoptic +/- direct laryngoscopy; 13 of 1,052 (1.2%) infants developed SGS. Age <1 year was associated with the development of SGS ($p<0.01$). Eight patients had cuffed and 5 had uncuffed ETTs; this information was missing for one patient. The use of a cuffed ETT was not associated with increased risk of SGS ($p=0.34$). All patients were mechanically ventilated with a mean of 16.6 days (SD 21.24). Six patients required no treatment, 5 had balloon dilation, and 3 required tracheostomy. **Conclusions:** The incidence of SGS in infants after cardiac surgery with CPB at LPCH was lower than previously reported. Age <1 year was a significant risk factor for the development of SGS. Use of a cuffed ETT was not associated with an increased risk of SGS. Patients with SGS were mechanically ventilated for more than 3 days, suggesting that prolonged intubation may be an additional risk factor.

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ARGATROBAN DOSE REQUIREMENTS IN OBESE VERSUS NON-OBESE PATIENTS

Emily McCleary, Jennifer Ashton, Marc Zumberg

Learning Objectives: Though the linear effect of actual body weight on argatroban metabolism has been established in non-obese adults, the effect of body mass index (BMI) and obesity is unclear. Data is needed on argatroban dosing in obese critically ill adults. Critical illness increases bleeding and thrombosis risk; one study found that obesity may further increase risk. A single study failed to show associations between obesity and dosing requirements, but had several limitations. This study was conducted to determine if significant differences exist in average argatroban dose required to achieve therapeutic anticoagulation in obese vs non-obese adults with confirmed or suspected heparin induced thrombocytopenia (HIT). **Methods:** This single-center retrospective cohort study included adults receiving argatroban between May 13, 2011 and September 30, 2014 for confirmed or suspected HIT with at least one activated partial thromboplastin time (aPTT) post initiation. The primary outcome was average dose achieving therapeutic anticoagulation. Secondary outcomes were initial dose, time to goal aPTT, and the proportion of patients with initial aPTT supratherapeutic, therapeutic, and subtherapeutic. Safety was evaluated by the composite of bleeding, new thrombosis, or failure to achieve goal. **Results:** 48 patients were included; 60.4% critically ill, 35% obese. No significant difference existed in average argatroban dose achieving therapeutic anticoagulation in obese vs non-obese patients ($p=0.917$). There were no significant differences in secondary or safety endpoints. Patients with BMI 40 kg/m^2 or greater were more critically ill than those with BMI 30–39.9 kg/m^2 and exhibited a trend toward increased dose achieving therapeutic anticoagulation (3.3 vs 0.96 mcg/kg/min). **Conclusions:** Results suggest argatroban dose requirements and clinical outcomes are similar in obese and non-obese patients. Increased dose requirements may exist in the morbidly obese subgroup. A larger, more comprehensive study is needed to evaluate the potential need for increased initial argatroban dosing in this population.

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EFFICACY AND SAFETY OF MILRINONE VERSUS DOBUTAMINE IN CARDIOGENIC SHOCK

Tyler Lewis, Caitlin Aberle, Diana Esaian, John Papadopoulos

Learning Objectives: The initial management of cardiogenic shock (CS) often includes inotropic therapy with milrinone (MIL) or dobutamine (DOB), but limited data exists on the difference in efficacy between the two agents. The objective of this study was to compare effectiveness and safety between MIL and DOB as initial treatment for CS. **Methods:** This was a retrospective study of patients with CS who received MIL or DOB from January 2013 through February 2015. We excluded patients with mixed shock or mechanical circulatory support. We used a unique primary endpoint, time to resolution of CS or therapeutic failure, with important clinical relevance. Additional outcomes included specific adverse events, length of stay, and mortality. **Results:** A total of 100 patients were included in the analysis, 50 received MIL and 50 received DOB. The median age was 73 yr; primary diagnosis was cardiac surgery; and the most common cause of CS was prolonged cardiopulmonary bypass. Resolution of shock was similar between groups (MIL 76% vs DOB 70%, $p=0.50$) and the median time to resolution of CS was 24 hr in both groups ($p=0.75$). Arrhythmias were nearly twice as common with DOB compared to MIL (62.9% vs 32.8%, $p=0.001$) and DOB was more commonly discontinued due to arrhythmia (14% vs 0%, $p=0.01$). The most common arrhythmia was sinus tachycardia (MIL 8.2% vs DOB 24.2%, $p=0.016$). Hypotension occurred equally (49.2% vs 40.3%, $p=0.32$) and nadir mean arterial pressure was similar (88.5 mm Hg vs 89 mm Hg, $p=0.48$) for MIL and DOB respectively. MIL was more commonly discontinued due to hypotension (16% vs 0%, $p<0.01$) but there was no difference in the use of concomitant vasopressors, their dose or duration of use between MIL and DOB groups. **Conclusions:** MIL and DOB were equally efficacious for the treatment of CS. DOB was associated with a higher risk of arrhythmias. MIL was more commonly discontinued due to clinician perceived hypotension, but there was no difference in the rate of hypotension between groups. MIL may be as efficacious as DOB, but associated with fewer adverse events. Further studies are warranted to assess these findings.

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THE VASOPRESSOR USE IN CARDIAC INTENSIVE CARE UNIT: 7 YEARS COHORT STUDY

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Learning Objectives: The use of vasopressor was common in cardiac intensive care unit (CICU). Due to the lack of conclusive evidence in superiority in efficacy among various types of vasopressors, the choice of vasopressor use mainly

depends on the physician preference. This study aims to describe the prevalence of vasopressor use and the trend in the use of each vasopressor medication in CICU over the past 7 yr. **Methods:** This is a descriptive study conducted at a tertiary referral hospital. All cardiac ICU admissions at our institution between January 2007 and December 2013 were included in this study. The use of vasopressor within given CICU day (12.00 am – 11.59 pm) during CICU stay was reviewed. Vasopressors were defined as the continuous intravenous administration of norepinephrine, epinephrine, dopamine, phenylephrine, or vasopressin regardless of duration and dosage. The use of each vasopressor was reported as the vasopressor utilization index (VUI), using the following formula Vasopressor utilization index (VUI) = (The total number of ICU days on a given vasopressor)/(The total number of ICU days on any vasopresor). **Results:** Out of 5,659 ICU days with vasopressor use, dopamine was used for 4,320 (76%), norepinephrine for 958 (17%), vasopressin for 661 (12%), epinephrine for 534 (9%), and phenylephrine for 471 (8%). From 2007 through 2013, there was a slight decreasing trend in the use of epinephrine (VUIepinephrine was 0.13 in 2007 and 0.06 in 2013), phenylephrine (VUIphenylephrine was 0.14 in 2008 and 0.05 in 2013), and vasopressin (VUIvasopressin was 0.19 in 2007 and 0.08 in 2013). Norepinephrine and dopamine trends did not change In the cardiac care unit, use of low-dose dopamine is still common (VUIlow-dose dopamine was 0.46) without any decreasing trend in its utilization. **Conclusions:** Dopamine was the most commonly used vasopressor from 2007 through 2013 in cardiac ICU. Despite several recent trials and guidelines showing the adverse effects of dopamine use, it is still used frequently in the cardiac care unit.

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INTRAVENOUS CHLOROTHIAZIDE IN ACUTE HEART FAILURE REFRACTORY TO LOOP DIURESIS AND ADJUNCT METOLAZONE

Maria Cardinale, Jerry Altshuler, Jeffrey Testani

Learning Objectives: Thiazide diuretics can be used to augment diuresis in patients with congestive heart failure resistant to loop diuretics. Although intravenous (IV) thiazide diuretics are expected to provide improved bioavailability compared to oral agents, an improvement in diuresis has not been conclusively demonstrated in the literature. This study aimed to evaluate the use of IV chlorothiazide in critically ill heart failure patients deemed unresponsive to metolazone. **Methods:** This retrospective study analyzed acute decompensated heart failure (ADHF) patients who were determined to be loop diuretic resistant according to an institutional protocol. All patients received at least one dose of metolazone 10 mg or greater followed by at least one dose of IV chlorothiazide 500 mg if response to metolazone was considered inadequate. Patients were excluded if they were not receiving loop diuretics for an acute exacerbation of chronic congestive heart failure or if the index dose of metolazone was administered within 2 hr of chlorothiazide. **Results:** A total of 45 patients (90 doses) were included in the analysis. The average IV furosemide equivalent dose of loop diuretics given over the 24-hour period prior to the index dose was 496 mg. The average length of stay was 34.7 days, and in-hospital mortality was 35.6%. The median 12-hour urine output was greater following administration of chlorothiazide compared to metolazone (1075 mL; IQR: 573–1513 mL vs. 875 mL; IQR: 427–1293 mL), but the difference was not significant (P=0.408). Compared to metolazone, a greater proportion of chlorothiazide doses resulted in an increase in urine output of at least 500 mL during the 12 hr following the dose relative to the 12 hr prior to the dose (31.1% vs. 22.2%, P=0.0015). However, there was no difference in the achievement of net-negative urine output of 500 mL or greater during the 12 hr following chlorothiazide or metolazone (42% vs. 35.5%, P=0.164). **Conclusions:** In this study, IV chlorothiazide resulted in improved diuresis in ADHF patients determined to be refractory to loop diuretics and adjunctive oral metolazone.

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RACIAL VARIATIONS IN ECMO UTILIZATION AFTER CONGENITAL CARDIAC SURGERY

Titus Chan, Cindy Barrett, Ravi Thiagarajan, Susan Bratton

Learning Objectives: Previous studies have demonstrated racial/ethnic disparities in children undergoing congenital heart surgery. Extracorporeal membrane oxygenation (ECMO) has been used to increase survival after congenital heart surgery. For this reason, variations in post-operative ECMO usage in children undergoing congenital heart surgery may be associated with disparities in hospital survival. **Methods:** All children in the Pediatric Health Information Systems (PHIS) dataset undergoing a Risk Adjustment for Congenital Heart Surgery (RACHS) procedure from 2003–2014 were examined. Multivariate, multinomial logistic regression models examining hospital survival without ECMO usage, survival after ECMO and dying without ECMO usage were constructed. **Results:** Of 109,213 children undergoing a RACHS procedure, the major racial/ethnic groups included white (54%), black (12%), Hispanic (17%) and "other" race/ethnicity (11%). The overall post-operative ECMO usage rate was 2.3% and was highest in black (2.5%) and "other" race/ethnicity (2.6%) patients. Black patients (Odds Ratio (OR)=1.25, 95% Confidence Interval (CI)=1.11–1.41) and "other" race/ethnicity patients (OR=1.46, 95%CI=1.27–1.68) were at increased odds of overall mortality compared to white patients. In multivariate models adjusting for basic demographics, surgical complexity and other comorbidities, black patients had lower adjusted probabilities of surviving without ECMO (Relative Risk Ratio (RR)=0.79, 95%CI=0.65–0.96), similar rates of surviving after ECMO, and higher rates of dying without ECMO (RR=1.27, 95%CI=1.04–1.54) when compared to white patients. Patients of "other" race/ethnicity had lower rates of surviving without ECMO (RR=0.67, 95%CI=0.54–0.84), lower rates of surviving after ECMO (RR=0.61, 95%CI=0.43–0.86), and higher rates of dying without ECMO (RR=1.49, 95%CI=1.20–1.85). **Conclusions:** Black children and children of other race/ethnicity are at increased odds of mortality after congenital heart surgery. These disparities can be traced to variations in ECMO utilization and ECMO outcomes across racial/ethnic groups.

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PROCALCITONIN AS A BIOMARKER OF BACTERIAL INFECTION IN NEONATES AFTER CONGENITAL HEART SURGERY

Sujata Chakravarti, Timothy Lee, Diane Reformina, Puneet Bhatla

Learning Objectives: Major infections after pediatric cardiac surgery are associated with increased morbidity and mortality. Risk factors include young age and complexity of surgery, both of which are present in the neonatal population. Unfortunately, bacterial infection (BI) is often difficult to differentiate from systemic inflammatory response syndrome caused by cardiopulmonary bypass (CPB) after congenital heart surgery (CHS). Procalcitonin (PCT) has emerged as a reliable biomarker of BI in various populations, including cardiac surgical patients. Nonetheless, data describing the utility of procalcitonin in predicting BI in neonates after CHS are scant. The objective of this study is to determine if procalcitonin is a sensitive and specific marker of BI in neonates after CHS. **Methods:** The electronic medical records of all patients admitted to the Congenital Cardiovascular Care Unit between January 2013 and April 2015 were reviewed. Patients between 0 and 30 days of age who underwent CHS requiring CPB in whom PCT was drawn between post-operative days 0 to 8 due to suspicion of infection were included. Patients with pre-operative proven BI were excluded. The Wilcoxon rank sum test was used for nonparametric variables. The diagnostic performance of procalcitonin was evaluated using a receiver operating characteristic curve (ROC). The institution's IRB waived the need for informed consent. **Results:**45 patients met inclusion criteria. The median age was 3 days (Range 0 to 30 days). 44% were female. 5 patients met criteria for inclusion into the BI group. The median PCT for the BI group was (3.42 ng/mL, IQR 3.11 to 5.90) was significantly higher than the median PCT for the non-infected group 0.73 ng/mL, IQR 0.34 to 3.57), p=0. 05. Overall the PCT level that yielded the best compromise between the sensitivity (100%) and specificity (72.5%) was 3 ng/mL with an area under the ROC curve of 0.74. **Conclusions:** We found that elevated procalcitonin levels is a reliable marker of BI in neonates after CHS. Limitations include retrospective review and small sample size.

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DELAYED DIAGNOSIS OF N-STEMI INCREASES ADVERSE ADVENTS AND HOSPITALIZATION RATES

Dave Milzman, Danny milzman, Jeff Dubin

Learning Objectives: EKG with classic changes for an acute STEMi are rapidly identified and taken to PCI for optimal outcome. Rapid diagnostic protocols and intervention for N-STEMI events are lacking. In the absence of EKG changes