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COMBINING URINE OUTPUT AND INTRA-ABDOMINAL PRESSURES PREDICT ACUTE KIDNEY INJURY EARLYAmit Prabhakar¹, Kelly Stanton², Daniel Burnett², Katherine Egan¹, Brent Keeling³, Vanessa Moll⁴¹Emory University School of Medicine, Atlanta, GA, ²Potrero Medical, Hayward, CA, ³Emory School of Medicine, Atlanta, GA, ⁴University Hospital Zurich, Zurich, Switzerland

INTRODUCTION: The incidence of acute kidney injury (AKI) in patients undergoing cardiopulmonary bypass (CPB) is well documented. AKI is associated with increased morbidity, mortality, and healthcare expenditures. In this study we applied machine learning methods to continuous urinary bladder monitoring of urine output (UO), intraabdominal pressure (IAP) and core temperature (CT) to predict AKI.

METHODS: This retrospective observational study analyzed data from 30 adult patients undergoing cardiac surgery with cardiopulmonary bypass (CPB). Demographics, vital signs, and laboratory data were extracted from medical records and continuous UO, IAP and CT from the Accury device. Patients with UO KDIGO stage 2 were labeled (<0.5ml/kg/hr for >12hrs). A machine learning method using gradient boosted tree classifier (AKI Predict) was trained and benchmarked using 3-fold cross validation (train on 2/3s data, validate on remaining 1/3). Specifically, patients were tested hourly using 6hr data windows. Features included a p-norm of minute UO, number of hours in oliguria (UO < 0.5 ml/kg/hr), number of minutes spent in abdominal compartment syndrome (ACS) (IAP > 20 mmHg), and median CT. Due to the class imbalance caused by windowing of the data, precision and recall were used to assess performance.

RESULTS: 16 out of 30 patients (median age, 66 [IQR: 60-70] years; 19 [63.3%] male patients) met the criteria for AKI Stage 2. Median CPB pump time and median ICU length of stay across all patients was 2.00 hours and 2.81 days, respectively. Precision and recall were 70.0 +/- 20.9% and 54.1 +/- 20.1%, respectively, for an algorithm capable of detecting AKI [17hrs 3 mins +/- 2hrs 24mins prior to KDIGO criteria. 6 hrs foley catheter data were used to predict stage 2 AKI. Numbers of hours in oliguria and in ACS were the most important predictors of AKI, with relative gain values of 0.359 +/- 0.147, and 0.275 +/- 0.102 respectively.

CONCLUSIONS: Continuous bladder monitoring of IAP, UO and CT enabled prediction of stage 2 AKI in cardiac surgery patients undergoing CPB. The machine learning algorithm based on these data shows sufficiently high specificity and precision for application in clinical practice but needs to be validated in prospective trials.

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HYPOGLYCEMIA AFTER HYPERKALEMIA TREATMENT IN EMERGENCY DEPARTMENT WITH OR WITHOUT RENAL DYSFUNCTIONBrady Diveley¹, Brian Gilbert², Joel Huffman², Spencer Dingman²¹Coxhealth, Springfield, MO, ²Wesley Healthcare Center, Wichita, KS

INTRODUCTION: Insulin utilization, during the treatment of hyperkalemia, increases the risk for hypoglycemia. The objective of this study was to determine the incidence of hypoglycemia after treatment with 10 units of intravenous (IV) insulin in patients with renal dysfunction versus patients without renal dysfunction for hyperkalemia in the emergency department (ED).

METHODS: This was a retrospective, single-center, cohort study. Patients were stratified based on whether or not renal dysfunction was present. Patients were included if they have had baseline potassium > 5.0 mEq/L, documented pre-treatment blood glucose (BG) value \geq 70 mg/dL, and treated with 10 units of IV regular insulin within the ED. The primary endpoint was the incidence of hypoglycemia (BG < 70 mg/dL).

RESULTS: A total of 139 patients were included for analysis with 90 patients in the renal dysfunction group compared to 49 patients in the non-renal dysfunction. Hypoglycemic events occurred in 17% of the renal dysfunction group and 10% of the non-renal dysfunction groups ($p=0.448$). Additionally, there were no statistically significant differences in severe hypoglycemic events with ($p=0.214$), median time to hypoglycemic events ($p=0.294$), or mortality ($p=1.000$). Of note, a significant difference was seen in length of hospital stay with a median of six days in the renal dysfunction group and 5 days in the non-renal dysfunction group ($p=0.015$).

CONCLUSIONS: This study found no difference in the incidence of hypoglycemic events after treatment with 10 units IV insulin for hyperkalemia when comparing patients presenting with renal dysfunction versus patients without renal dysfunction in the ED.