AKI: Biomarkers, Risk Factors, Treatments, Outcomes

Subgroup analysis of patients with urea reduction >50% with kidney replacement therapy,
Urea reduction in AKI and mortality

Background: Urea is a toxin present in AKI. It is reasonable to think that its decrease could be associated with better clinical evolution. We explore the association between urea reduction and mortality in patients with AKI.

Methods: In this prospective cohort in AKI patients, we create 4 groups of urea reduction (UrR) by their percentage decrease magnitude: 0, 1-25, 26-50 and >50. The objectives were to assess the association of UrR and mortality within 10 days of admission; find the characteristics of patients with UrR >50% and identify which KRT modality (hemodialysis, peritoneal dialysis and conservative) achieved this goal.

Results: A total of 651 AKI patients were included. AKI stage 3 was present in 58.5%, sepsis in 45.9%, the mean urea value was 154 mg/dL, kidney replacement therapy (KRT) started in 32.4%, and 18.9% died. 50% did not reduce urea (UrR 0%). A trend to decrease risk of death was observed with the magnitude of UrR. The best survival (94.3%) was observed in those with UrR >50%, and worst (72.1%) in those with UrR 0%. After adjusting for confounders, 10-day hospital mortality was higher in groups that did not reduce urea (UrR 0%).

Conclusions: In our prospective cohort 50% with AKI did not reduce urea, and this was associated with an increased risk of death. Achieving UrR of at least 25% decreased the risk, and a greater magnitude of UrR with any treatment was associated with better survival.

Serum Potassium Trajectory During AKI and Mortality

Background: The association between serum potassium (sK) trajectory and mortality or the need for kidney replacement therapy (KRT) during acute kidney injury (AKI) has not been explored.

Methods: In this prospective cohort study, AKI patients were divided in 8 groups based on sK (mEq/L) trajectories, (1) normoK, sK between 3.5-5.5; (2) corrected hyperK, sK > 5.5 to normoK; (3) corrected hypoK, sK < 3.5 to normoK; (4) fluctuating potassium, sK increased / decreased in and out of normoK; (5) uncorrected hypoK, sK < 3.5; (6) normoK to hypoK, sK normal and decreased to hypoK; (7) normoK to hyperK; (8) uncorrected hyperK, sK > 5.5. We assessed the association of sK trajectories with mortality and the need for KRT.

Results: In 311 AKI patients. AKI 3 was present in 63.9%. KRT started in 36%, and 21.2% died. After adjusting for confounders, 10-day hospital mortality was higher in group 7 and 8 (OR 1.37 and 1.63 p < 0.05, respectively), and KRT initiation was higher in group 8 (OR 1.40 p < 0.05) compared with group 1. Mortality in different subgroups of patients did not change the primary results.

Conclusions: In our prospective cohort, most patients with AKI had dyskalemia. NormoK to hyperK and Uncorrected hyperK were associated with death, while only uncorrected hyperK was correlated with the need for KRT.

Urea reduction in AKI and mortality risk

Subgroup analysis of patients with urea reduction >50% with kidney replacement therapy, conservative management and mortality

The association between sK trajectories and 10-days mortality

OR of unadjusted 10-days mortality in different subgroups of patients with uncorrected hyperK

Serum Sodium Trajectory During AKI and Mortality Risk

Background: The association between serum sodium (sNa) level and mortality or the need for kidney replacement therapy (KRT) during acute kidney injury has not been explored.
Methods: In this prospective cohort, we enrolled AKI patients and divided them into 5 groups based on the sNa level trajectories up to 10 days: 1) stable Na (135-145), 2) fluctuating Na levels (increased/decreased in and out of normonatremia), 3) uncorrected hypernatremia, 4) corrected hypernatremia, and 5) uncorrected hypernatremia. We assessed the association of sNa trajectories with mortality and the need for KRT. A total of 288 patients were included. AKI was present in 50.4%. KRT started in 25% patients, and 15.6% died. After adjusting for confounders, 10-day hospital mortality was higher in group 5 (HR 3.12, p = 0.03), and KRT initiation was higher in group 3 (HR 2.44; p = 0.03) compared with group 1. Conclusions: Our in our cohort, most patients with AKI had alterations in sNa. Uncorrected hypernatremia was associated with death, and uncorrected hyponatremia was correlated with the need for KRT.

Results: The prediction model showed area under the curve of the receiver-operating characteristic (AUC-ROC) curve 0.74 (95% CI 0.71-0.76) in pooled analysis of all cohorts. Overall differences between observed and predicted incidence rates were 3.0% (17.7% observed and 16.9% predicted probability), 3.6% (35.2% and 34.8%), and 2.0% (69.3% and 70.3%) in the low- (0-2 points), intermediate- (3-5 points), and high-score (6-7 points) groups, respectively. In an analysis of each cohort, four cohorts including one temporal cohort showed similar good discriminatory power (AUC-ROC 0.770, 0.731, 0.735, and 0.725, respectively), while one cohort showed poor discriminatory power (AUC-ROC 0.556). Conclusions: Our prediction model for successful discontinuation of CRRT in critically ill patients showed good performance in one temporal and three external cohorts, with poor performance in one external cohort. Our results support the need of an appropriate protocol for the discontinuation of CRRT.

TH-PO049
A Comparison Among Adult Patients Receiving Extracorporeal Membrane Oxygenation With and Without Continuous Renal Replacement Therapy at an Integrated Healthcare System
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Background: Extracorporeal Membrane Oxygenation (ECMO) is being increasingly used among critically ill patients some of whom have multiple organ failure and need concurrent use of continuous renal replacement therapy (CRRT). Limited data are available regarding outcomes among such patients.

Methods: We report retrospective data on patients who were treated with ECMO with or without CRRT over a period of 36 months (Jan 2019 – Mar 2022) at hospitals within a single integrated healthcare system in Pennsylvania. Patients with end stage renal disease were not eligible to receive ECMO within this system.

Results: 166 patients were treated with ECMO of whom 50 (30.1%) received CRRT during the course of their treatment. Mean age of patients on ECMO was 52.1 years (interquartile range 43-64), 68.1% were male; and 23.5% had Covid-19. Reasons for ECMO included cardiac arrest (43%), post cardiac surgery (18%), acute respiratory distress syndrome (38%) and transcatherter aortic valve placement (2%). Patients received either Venoarterial (VA) ECMO (45.8% patients; mean age 60.0) and its variant extracorporeal cardiopulmonary resuscitation (eCPR) (19.6%; mean age 59.9) or Venoovenous (VV) ECMO (44.6%; mean age 44.4). A comparison among patients who needed CRRT versus those who did not is provided in figure 1. 38% patients who received CRRT survived to discharge compared to 62.9% who did not receive CRRT (p=0.003).

Conclusions: Nearly 1 in 3 patients treated with ECMO needed CRRT at some point during their care. Patients who needed CRRT on ECMO were significantly less likely to survive to discharge. Nephrology service was involved in the care of ECMO patients from the beginning in some cases. However, there remains a need for early multi-disciplinary care for critically ill patients requiring ECMO therapy.

TH-PO048
Temporal and External Validation of the Prediction Model for Successful Discontinuation of Continuous Renal Replacement Therapy
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Background: Continuous renal replacement therapy (CRRT) is widely used as a preferred modality of renal replacement therapy (RRT) in critically ill patients with acute kidney injury (AKI). However, there is no consensus criterion for discontinuing CRRT. We evaluated the usefulness of the prediction model developed in our previous study through one temporal cohort, four external cohorts.

Methods: A total of 1517 critically ill patients with AKI who underwent CRRT from 2018 to 2020 in five medical centers were included in the validation. Patients who underwent CRRT for more than 2 days and survived for 7 or more days after CRRT discontinuation were selected. Successful discontinuation of CRRT was defined as no restarting RRT for 7 days after CRRT discontinuation. The prediction model was composed of 4 variables: urine output (> 300 mL/day, score 4) on the day before discontinuation and blood urea nitrogen (BUN < 35 mg/dL, score 2), serum potassium (< 4.1 mmol/L, score 1), and mean arterial blood pressure (50-78 mmHg, score 1) on the discontinuation day.

Results: The prediction model showed area under the curve of the receiver-operating characteristic (AUC-ROC) curve 0.74 (95% CI 0.71-0.76) in pooled analysis of all cohorts. Overall differences between observed and predicted incidence rates were 3.0% (17.7% observed and 16.9% predicted probability), 3.6% (35.2% and 34.8%), and 2.0% (69.3% and 70.3%) in the low- (0-2 points), intermediate- (3-5 points), and high-score (6-7 points) groups, respectively. In an analysis of each cohort, four cohorts including one temporal cohort showed similar good discriminatory power (AUC-ROC 0.770, 0.731, 0.735, and 0.725, respectively), while one cohort showed poor discriminatory power (AUC-ROC 0.556). Conclusions: Our prediction model for successful discontinuation of CRRT in critically ill patients showed good performance in one temporal and three external cohorts, with poor performance in one external cohort. Our results support the need of an appropriate protocol for the discontinuation of CRRT.