ABSTRACTS

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1. Acute Kidney Injury Following Hip Fracture Surgery in the Elderly Patients: Incidence, Risk factors and Outcomes

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Background: Mortality after hip fracture remains high in the elderly patients and renal dysfunction has been reported to influence outcomes after femur fracture. However, there is limited information of acute kidney injury (AKI) after hip fracture surgery in the elderly.

Method: A total of 450 patients (> 65 years) with femur fracture undergone surgical operation were enrolled between 2010 and 2013, retrospectively. Clinical and laboratory data were collected and assessment of kidney function was performed at preoperative, postoperative and discharge period. Acute kidney injury was defined as increased in serum creatinine more than or equal to 1.5 fold from baseline. Patients were divided into two groups using definition, AKI and non-AKI group.

Results : The mean age was 78.9 ± 7.0 years and 142 patients had diabetes. AKI occurred in 17.1% of cases (76 of 445 patients). The AKI group had higher prevalence of diabetes compared with the non-AKI group. Laboratory data and operative variables did not differ between two groups. Length of hospital stay was significantly longer (35.7 ± 22.4 vs. 26.7 ± 34.3, p = 0.027) and all cause mortality was higher in the AKI group than in the non-AKI group (Odds ratio 4.3, 95% confidence interval 1.6-11.3; p=0.003).

Conclusion: The AKI is an important adverse event and is associated with increased length to stay in hospital and all casuse mortality. Because baseline characteristics could not predict AKI, serial measurement of renal function is required.

	Total (n=430)	AKI (n=73)	Non AKI (n=357)
Age, years	79.0 ± 7.0	79.3 ± 6.8	78.8 ± 7.1
Gender ,male, n(%)	100 (22.5)	11 (15.1)	87 (24.4)
BMI (kg/m2)	22.2 ± 3.7	21.6 ± 3.5	22.3 ± 3.8
Diabetes	134 (31.2)	15 (20.5)	119 (33.3)
Hypertension	297 (66.7)	46 (60.5)	251 (68.0)
Old CVA	76 (17.7)	13 (17.8)	63 (17.6)
Length of hospitalization stay (days)	28.2 ± 32.7	35.8 ± 22.4	26.7 ± 34.3
All cause mortality*	17 (3.8)	8 (11.0)	9 (2.5)

2. The predictive value of different renal function measures for mortality after cardiac surgery based on traditional s-creatinine and novel s-cystatin C

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Objectives: Acute kidney injury after cardiac surgery is associated with increased mortality. The benefits of using s-cystatin C in patients undergoing coronary artery by-pass grafting (CABG) has not been investigated in detail. In order to investigate the usage of s-cystatin C in identifying those at increased risk of postoperative mortality, this study evaluates s-creatinine and s-cystatin C and their estimated glomerular filtration rate (eGFR) at different time points as predictors for mortality in patients undergoing CABG.

Methods and Measurements: The study included 1955 patients undergoing elective CABG over a median follow-up time of 2.5 years (range 1.0-4.0 years) and analyzed by Cox regression model. Renal function was assessed by s-creatinine and s-cystatin C on the preoperative, first, second and fourth day, as well as at its lowest level. The GFR was estimated according to the Modification of Diet in Renal Disease; the 2009 Chronic Kidney Disease Epidemiology (CDK-EPI) for s-creatinine; the 2012 CKD-EPI formula for s-cystatin C, and the 2012 CKD-EPI formula for s-cystatin C and s-creatinine in combination.

Results: S-cystatin C and eGFR based on s-cystatin C was a stronger predictor for mortality regardless of time-point than s-creatinine and eGFR based on s-creatinine as well as eGFR based on the combination of s-cystatin C and s-creatinine. The highest hazard ratio for mortality was yielded by s-cystatin C and eGFR formulas based on s-cystatin C, and were similar for the preoperative, first postoperative day, and the lowest level of renal function (2012 CKD-EPI: preoperative/ 1 ml increment in eGFR: HR 0.97; 95% CI 0.96-0.98, first postoperative day: HR 0.97; 95% CI 0.96-0.98, and measurement of lowest renal function: HR 0.97; 95% CI 0.96-0.98).

Conclusions: The s-cystatin C based eGFR measured preoperatively and at the first postoperative day is a strong predictor for mortality following CABG and enables clinicians to identify patients at risk of increased mortality in an earlier stage compared to s-creatinine and s-creatinine based eGFR measures.

Renal assessment method	Variable	Chi square	p	HR; 95%CI
APreoperative measures	S-creatinine (µmol/L)	2.56	0.1093	1.00 (1.00-1.00)
A	S-cystatin C (mg/L)	6.97	0.0083	1.30 (1.07-1.58)
A	MDRD eGFR	4.19	0.0406	0.99 (0.98-1.00)
A	CKD EPIcreatinine eGFR	4.07	0.0436	0.99 (0.98-1.00)
A	CKD EPIcystatin C eGFR	22.84	<0.0001	0.97 (0.96-0.98)
A	CKD-EPIcystatin C + creatinine eGFR	14.45	0.0001	0.98 (0.97-0.99)
BPoorest renal function	s-creatinine (µmol/L)	4.90	0.0269	1.00 (1.00-1.00)
B	s-cystatin C (mg/L)	15.22	0.0001	1.41 (1.19-1.68)
B	MDRD eGFR	5.69	0.0170	0.99 (0.98-1.00)
B	CKD EPIcreatinine	6.63	0.0100	0.99 (0.98-1.00)
B	CKD EPI cystatin C	20.57	0.0000	0.97 (0.96-0.98)
B	CKD-EPI cystatin Creatinine	14.37	0.0002	0.98 (0.97-0.99)
C Day 1 post surgery measures	s-creatinine (µmol/L)	3.63	0.0567	1.00 (1.00-1.00)
C	s-cystatin C (mg/L)	13.12	0.0003	1.44 (1.18-1.75)
C	MDRDcreatinine	5.55	0.0185	0.99 (0.98-1.00)
C	CKD EPIcreatinine	6.02	0.0141	0.99 (0.98-1.00)
C	CKD EPIcystatin C	26.20	0.0000	0.97 (0.96-0.98)
C	CKD-EPIcystatin C creatinine	19.43	0.0000	0.98 (0.97-0.99)

3. Pattern and short-term outcome of Community Acquired AKI: Early Results of AIIMS-AKI Cohort Study

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With 0/25 initiative, we at our hospital have started AIIMS-AKI cohort study to evaluate the practice pattern, outcome with risk stratification, biomarkers and strategies to improve outcome.

With IRB approval, in this first phase we reviewed the records of patients admitted with AKI since Jan 2010 till April 2014. Detail demography, pattern, hospital course, treatment and outcome were recorded in a software performa. Present report is first early report of this cohort.

In the study period, of 5022 admissions in the department of nephrology, 165 (3.3%) patient had community acquired AKI (CAKI); 87 (52.7%) males with mean age 41.5 ± 19.8 (13-87) years. 89% belonged to surrounding states with 42% from Delhi itself. Risk factors for AKI were hypertension (18.8%), obstetric related (18.2%), diabetes (8.5%), coronary disease (5.6%), malignancy (2.5%), chronic liver disease (3.1%), CVA (2.5%), surgery (1.8%) and COPD (1.2%). In 52 (31.5%) patients, normal serum creatinine (S.Cr.) before admission was documented. Common presenting features were oliguria (72%), vomiting (47%), edema (30%), dysponea (29%), altered consciousness (27.9%), jaundice (15%) and bleeding (8.5%). On examination edema (39%), dehydration (26%), jaundice (16%) and hypertension in 16.8% was documented. Urine volume at admission was ~800ml/day (Nil-1500ml). CAKI setting was medical in 80%, obstetrical in 18.5% and surgical in 1.5%. Common contributing factors were sepsis (63%), fluid loss (46%), nephrotoxic drugs (34%), contrast (4.2%) and malaria (8.6%). S. Cr. At admission and peak was 8.0 ± 8.2 (1.7-29) and 8.6 ± 4.1 (1.6-21.9) mg/dl. 44 (26.7%) patients had renal biopsy with ATN (32%), cortical necrosis (27%), 11% TMA and AIN each, acute pyelonephritis 4.5% and 14% others. Mechanical ventilation (28.5%), ionotropes (25%), antibiotics (89%) and blood transfusion (44%) were required. 122 (74%) patients required dialysis (mean 3.8 ±5.2, range nil to 27); 5 acute PD, 7 SLED and 110 intermittent HD. 25.4% died, 37.6% were recovering at discharge, 19% recovered completely and 9% each had dialysis dependency and CKD.

Our present data shows that infection and drugs are two important causes of community acquired AKI. Obstetrical AKI is still important in our setting. 75% patients require dialysis. Mortality is 25% and another 20% patients are discharged with residual kidney damage. Follow-up is required to assess long-term outcome of those who are discharged with recovered renal function.

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4. Delta Neutrophil Index is an Independent Predictor for Mortality of Septic Acute Kidney Injury Patients Treated with Continuous Renal Replacement Therapy

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Background and Purpose: Delta neutrophil index (DNI) has been reported as an useful marker for predicting mortality in patients with sepsis, representing elevated fraction of circulating immature granulocytes in acute infection. However, there has been no report on the relationship between DNI and mortality of septic acute kidney injury (S-AKI) patients on continuous renal replacement therapy (CRRT). In this study, we evaluated prognostic value of DNI in predicting mortality of S-AKI patients on CRRT in the intensive care unit.
Methods: We used data about CRRT cohort at the Yonsei University Health System between August 2009 and September 2012. We divided the S-AKI patients into two groups based on the DNI level at CRRT initiation (high,

DNI > 5.6%; low, DNI ≤ 5.6%). Patient survival was estimated by Kaplan-Meier method, and Cox proportional hazards models were used to determine the effect of DNI level on the mortality of S-AKI patients.
Result: A total of 286 S-AKI patients were enrolled in this study. Mean age was 61.0 ± 14.7 years, and 149 patients (52.1%) were in high DNI group. High DNI group showed higher APACHE II score (high DNI, 27.9 ± 7.0; low DNI, 25.4 ± 8.1; P = 0.005) and SOFA score (high DNI, 14.0 ± 3.2; low DNI, 12.1 ± 3.9; P < 0.001), but RIFLE criteria of each two groups was not statistically different (P = 0.072). For 28 days after CRRT initiation, 192 patients (67.1%) were died. The 28-day all-cause mortality was significantly higher in the high DNI group than low DNI group by log-rank test (P < 0.001). In the multivariate Cox proportional hazard model, DNI level at CRRT initiation was an independent predictor for mortality after adjusting age, gender, mean arterial pressure, Hb, platelet, albumin, prothrombin time, activated partial thromboplastin time, APACHE II score, and SOFA score (hazard ratio, 1.010; 95% confidence interval, 1.001 - 1.019; P = 0.035).
Conclusions: This study suggests that DNI level is independently associated with higher all-cause mortality of S-AKI patients on CRRT. Determining DNI levels at CRRT initiation might be helpful for predicting mortality in S-AKI patients.

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5. Association of Urinary L-type Fatty Acid-binding Protein with Long-term Renal Outcome in ICU Patients

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Purpose of the study
Recent studies suggest that acute kidney injury (AKI) increases the risk of chronic kidney disease (CKD) development and progression, but whether any biomarker can predict CKD progression in AKI survivors remains unclear. This study evaluated the performance of urinary biomarkers for long-term renal outcome prediction in an adult ICU population.
Methods used
We did a prospective observational study that enrolled 495 adult patients who had been admitted to the ICU of the University of Tokyo Hospital. We measured three urinary biomarkers at ICU admission; L-type fatty acid-binding protein (L-FABP), neutrophil gelatinase-associated lipocalin (NGAL), and N-acetyl-β-D-glucosaminidase (NAG). Serum creatinine values within 7 days after ICU admission were used for AKI diagnosis. Major adverse kidney events (MAKE): death, new dialysis, and halving of eGFR, at hospital discharge were evaluated. Patients were followed up for three years after ICU discharge and long-term renal outcomes of halving of eGFR or incident end-stage renal disease were evaluated.
Summary of the results
Of 495 patients, 102 patients developed MAKE at hospital discharge. Of 393 patients who discharged from the hospital without MAKE, 159 patients were followed up for three years after ICU discharge. Among them, 26 patients (16.4%) showed CKD progression. The progressors had a significantly higher rate of AKI during the ICU stay. The L-FABP and NGAL levels were significantly higher in the progressors. Multiple logistic regression analysis revealed that only urinary L-FABP was significantly associated with CKD progression after ICU discharge. Receiver operating characteristic analysis showed the area under the curve of urinary L-FABP was 0.68 (95%CI 0.55–0.78).
Conclusion reached
Measurement of urinary L-FABP at ICU admission is expected to be useful for predicting long-term renal function after ICU discharge.

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7. Association of Oliguria with 90-day Mortality in the Critically Ill

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Purpose:
The urine output criterion for acute kidney injury (AKI) has not been validated against a fixed mortality endpoint in a multicenter setting. We aimed to study the association of duration and severity of oliguria with 90-day mortality among general ICU patients.

Methods:
We analyzed data including hourly-recorded urine output (UO) from the prospective, multicenter FINNAKI study conducted in 16 Finnish intensive care units. We used logistic regression to study the association of duration of consecutive oliguria less than 1) 0.5mL/kg/h, 2) 0.3mL/kg/h, and 3) 0.1mL/kg/h with 90-day mortality. We adjusted for 1) fluid accumulation (%) of baseline weight, 2) use of diuretics, 3) use of vasoactive medication, 4) renal replacement therapy, 5) Simplified Acute Physiology Score II score (day 1) without points given for age and renal components, 6) age, 7) sex, and 8) Acute Physiology and Chronic Health Evaluation II admission diagnosis group.

Results:
Of 2160 included patients, 1990 (92.1%) had at least one oliguric episode longer than 0.5 hours, and 608 (28.1%) had UO <0.5mL/kg/h for ≥6 consecutive hours. After multivariable adjustment, the shortest periods of consecutive oliguria that were significantly associated with an increased risk for 90-day mortality were 6 to 12 hours of UO <0.5mL/kg/h (adjusted odds ratio (OR); 95% confidence interval (CI) 1.72; 1.26-2.35) and <0.3mL/kg/h (adjusted OR 2.08; 1.33-3.26). Regarding UO <0.1mL/kg/h, already a period of 3 to 6 hours significantly associated with 90-day mortality (adjusted OR 2.18; 1.31-3.62). The adjusted OR of AKI defined by creatinine criterion was 1.64 (95% CI 1.29-2.08). Addition of oliguria <0.1mL/kg/h for over 3 hours to the definition of AKI did not improve its performance in predicting 90-day mortality, but allowed earlier diagnosis in one tenth of patients with AKI.

Conclusions:
UO less than 0.5mL/kg/h for 6 to 12 consecutive hours and severe oliguria (UO <0.1mL/kg/h) for 3 to 6 consecutive hours were associated with an increased risk for 90-day mortality after adjustments for confounders. The strength of these associations exceeded that of the KDIGO creatinine criterion for AKI. Our findings suggest that the current urine output criterion for AKI is not too liberal.

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8. Withdrawn

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9. Procalcitonin Levels Predict the Outcome of Critically Ill Patients Requiring CRRT

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Purpose: Acute kidney Injury (AKI) in the ICU has been proposed as one of the most leading causes of mortality. Procalcitonin is useful in diagnostic marker of systemic bacterial infection and sepsis which is main cause of AKI in critically ill patients in ICU. However, its role in evaluating patients with AKI requiring CRRT is unclear. The aim of this study was to evaluate the levels of procalcitonin and prognostic factors in ICU patients with AKI requiring CRRT

Method: Between March 2011 to September 2013, we enrolled 175 cases with AKI patients who received CRRT at Dong-A university hospital. The prognostic values of procalcitonin for the mortality during CRRT were investigated, and their cutoff values for death were determined.

Results: The total number of patients who required CRRT in ICU was 175. The average age of the 175 patients was 57.0 ± 16.4 years and 84 patients were male (48.0%). The treatment duration of CRRT was 77 ± 38.6 hours. The area under the curve was 0.78 for prognosis. The cut off value of for procalcitonin was 30.32 ng/ml, with sensitivity of 40.91% and specificity 86.3%, positive predictive ratio 2.99.

Conclusions: Serum procalcitonin may be a crucial role for predicting value in patients during CRRT and can be used for evaluation of AKI prognosis. A large scaled, prospective randomized multi-center trials are needs to confirm the validation of the optimal threshold and independent predictive power of procalcitonin in the critical care setting.

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10. Comparison between different estimates of Glomerular filtration rate during cardiac surgery

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Background:
Renal function during and after cardiac surgery is of great importance as it predicts long-term survival, infection, need of dialysis, stay both in the ICU and ward. The routine of using creatinine to assess renal function has been questioned lately, and both new bio-markers and new methods of estimating Glomerular Filtration Rate (GFR) have been suggested as substitutes. The aim of the present study was compare methods of estimating GFR based on creatinine, Cystatin-C or a combination of the two.

Methods:
In 1965 patients planned for coronary artery bypass surgery, both Cystatin-C and creatinine were sampled pre- and post-operatively during a 3-year period. From these values, GFR was estimated according the MDRD-formula, CKD-EPI- formula for both creatinine and Cystatin-C alone or in combination , Caucasian and Asian Pediatric and Adult subjects (CAPA) for Cystatin-C alone or in combination with creatinine. Mean group values were compared and correlation between the different estimates with CKD-EPI CyC-Creatine as reference.

Results:
See table (Legend:POD=Post-Operative Day. R2 denotes correlation with CKD-EPI CyC-creat)

Conclusion:
In a cardiac surgery population, estimates bases on both cystatin-C and creatinine correlated strongly. Estimates based only creatinine correlated poorly with estimates based on Cystatin-C and creatinine. The accuracy of estimates differed also over time.

	Pre-op		POD 1		POD 2		Max	
	Mean±SD	r^2	Mean±SD	r^2	Mean±SD	r^2	Mean±SD	r^2
CKD-EPI CyC-creat	71.9±21.2		78.1±24.8		61.1±23.1		59.3±23.2	
CAPA CyC-creat	67.0±18.1	0.99	72.6±22.1	0.99	58.1±20.3	0.99	56.5±20.5	0.99
CKD-EPI CyC	66.8±22.6	0.93	73.4±26.4	0.95	54.1±22.1	0.95	52.7±22.5	0.95
CAPA CyC	65.3±20.2	0.92	72.1±25.5	0.92	53.6±20.3	0.95	52.3±20.8	0.94
CKD-EPI creat	77.1±20.4	0.85	81.5±22.4	0.89	69.8±24.5	0.92	67.5±24.6	0.92
MDRD creat	82.2±24.0	0.76	91.5±30.7	0.79	74.2±27.7	0.87	71.0±26.6	0.88

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11. Renal S.O.S in Cardiac Surgery

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Background:Acute kidney injury after cardiac surgery (CS-AKI) is a common complication and its associated with increase morbidity and mortality. Different prediction models identify patients at risk to develop CS-AKI, however the performance of these models, in our population, remain suboptimal. The objective of the study was to identify the incidence of minimal changes in functional biomarkers and/or kidney damage (renal S.O.S) and its association to the development of CS-AKI.

Methods: The study was a retrospective analysis of patients that underwent elective cardiothoracic surgery with extracorporeal circulation and aortic clamping during the years 2012-2013. Perioperative variables and biochemical markers as serum creatinine (SCr), urinary output (UOP) and microalbuminuria were obtained from patient's records. Patients were followed up to 96 hrs or until the patient left the intensive care unit. Kidney injury classification was performed according to AKIN, and Renal S.O.S composite was defined as a SCr increase up to 0.2 mg/dL from baseline, dipstick positive albuminuria and/or UOP between 0.6-1.3 ml/kg/hr within the first 6 hours after cardiac surgery.

Results:347 patients were analyzed. During the first 96hrs after the procedure 143 subjects (41.2%) developed acute kidney injury according to AKIN criteria, 51 patients (16.1%) had severe AKIN. Fifty nine percent of the patients in the early postoperative period developed renal SOS criteria. Outcomes are shown in Table 1. Perioperative variables for the development of renal S.O.S were longer extracorporeal circulation (132 min), longer aortic clamp (84 min), increased surgical bleeding (800 mL) and lower fluid balance (718 mL), all found to have statistical relevance. In adjusted models, out of the SOS criteria, only uresis was significantly associated with the development of AKI and severe AKI with OR 2.81 (1.04-6.49 IC 95%) and OR 2.41 (1.17-4.98 IC 95%), respectively. The full SOS criteria predicted AKI with OR: 2.59 (1.1-5.9 IC 95%), and severe AKI with OR:2.9 (1.3-6.5 IC 95%).

Conclusions: We found that the use of the renal S.O.S criteria during the early postoperative period may predict development of AKI and severe AKI. Renal S.O.S criteria are low cost and widely available, we propose the renal SOS criteria to be included in cardiac surgical ICU prediction models

	Total	non-SOS	SOS	p value
AKI n(%)	143 (41)	50 (35)	93 (65)	0.008
AKI severe n(%)	56 (16)	19 (34)	37 (66)	0.001
days in ICU (IQR 25-75%)	4 (3-5)	3 (3-5)	4 (3-7)	<0.001

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12. Clinical Characteristics in Critically Ill Patients of Alcoholic Ketoacidosis with Acute Kidney Injury

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Purpose of the study
This study was conducted to investigate the characteristics and risk factors of acute kidney injury (AKI) in patients diagnosed with alcoholic ketoacidosis (AKA).

Methods
We retrospectively investigated patients diagnosed with AKA who visited the emergency department of Wonju Severance Christian Hospital from January 2004 to March 2014. Patients with history of chronic alcohol abuse and recent episode of binge drinking who also demonstrated metabolic acidosis in arterial blood gas analysis and increased serum anion gap in serum chemistry were included. We also excluded cases of metabolic acidosis caused by other substances, such as methanol, ethylene glycol, and salicylate.

Results
In a total of 357 AKA cases, 293 (82.1%) were diagnosed with AKI by Kidney Disease Improving Global Outcome (KDIGO) criteria: 80 cases (22.4%) were classified as AKI stage I, 70 cases (19.6%) as AKI stage II, and 143 cases (40.1%) as AKI stage III. Mortality was reported in 84 cases (23.6%), and the mean time from admission to mortality was 6.0 ± 10.7 days. Major causes of death included uncontrolled metabolic acidosis (n=46, 54.8%), septic shock (n=26, 31.0%), and gastrointestinal tract bleeding (n=7, 8.3%). The mortality rate elevated according to increasing stages of AKI. There were significant differences in mean arterial pressure, acute physiology and chronic health (APACHE) II score, sequential organ failure assessment (SOFA) score, urine output in first 24 hours of admission, history of liver cirrhosis, complication of rhabdomyolysis, pneumonia, pancreatitis and in-hospital arrest among the groups. There were no significant differences in the history of alcohol ingestion and initial presenting symptoms.
Independent risk factors for AKI included rhabdomyolysis, pancreatitis, C-reactive protein, serum anion gap, lactate, mean arterial pressure, as adjusted with age, sex, history of liver cirrhosis, and diabetes (Table 1.)

Conclusion
This study was the first to investigate the characteristics of AKI in patients diagnosed with AKA based on the KDIGO criteria. While uncomplicated AKA is known to have good prognosis in general, AKA patients with AKI demonstrate high mortality rates than AKA without AKI, and the major risk factors for AKI in these subjects include comorbidity of rhabdomyolysis and pancreatitis.

	Adjusted OR	95% CI	p value
Rhabdomyolysis	7.14	2.30 - 22.21	0.001
Pancreatitis	3.66	1.14 - 11.79	0.030
C-reactive protein	1.59	1.22 - 2.06	0.001
Serum anion gap	1.15	1.07 - 1.23	<0.001
Serum lactate	1.10	1.02 - 1.19	0.015
Mean arterial pressure	0.98	0.97 - 1.00	0.038

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13. The Incidence and Clinical Course of Acute Renal Failure in Patients with Severe Acute Pancreatitis

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PURPOSE: Although acute renal failure (ARF) commonly develops in patients with severe acute pancreatitis (SAP), the impact of ARF on disease severity is rarely reported in Korea. This study was performed to compare the clinical findings, morbidity and mortality between SAP patients with and without ARF.
METHODS: We retrospectively evaluated the medical records of 102 patients with SAP between january 2001 and June 2008 in 3 hospitals. We investigated the incidence and clinical course of ARF in SAP patients. Then, we compared morbidity and mortality between the patients with ARF and normal renal function (NRF).
RESULTS: Of the total 102 SAP patients, ARF was observed in 39 patients (38.2%). The peak serum creatinine level in ARF patients was 4.5+/-2.3 mg/dL. Eight of the 39 ARF patients (20.5%) received hemodialysis and ten patients (25.6%) died. When compared to NRF patiens, ARF patients (n=39) had higher incidence of dyspnea (17.9% vs 3.2%, p=0.011), loss of consciousness (17.9% vs 1.6%, p=0.003), and APACHE II scores more than 8

(92.3% vs 0%, p<0.001). The ARF group had also higher incidences of sepsis (35.9% vs 7.9%, p<0.001), multiorgan failure (15.4% vs 0%, p=0.001), respiratory failure (28.2% vs 4.7%, p=0.001) and mortality (25.6% vs 3.2%, p=0.001). Multivariate analysis demonstrated thrombocytopenia, hemoconcentration, and high LDH as independent risk factors of ARF in SAP patients.
CONCLUSION: The incidence of ARF was high (38.2%) and ARF patients showed higher morbidity and mortality, compared to NRF patients. We suggest that early management of ARF should be performed for reducing the mortality in SAP patients.

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14. Impact of Improvement of Cardiac Function after Cardiac Valve Surgery to the Renal Outcome in Preoperative Renal Dysfunction Patients

Jiarui Xu[1], Xiaoqiang Ding[1], Bo Shen[1], Zhonghua Liu[1], Jianzhou Zou[1], Yi Fang[1], Lan Liu[2], Chunsheng Wang[2], Jie Teng[1]

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Objective: To evaluate the impact of improvement of cardiac function after cardiac valve surgery to the renal outcome in different extent of preoperative renal dysfunction patients.
Method: Data from patients who had preexisting renal dysfunction (serum creatinine(SCr)>1.2mg/dl, or eGFR≤60 mL/min) and received cardiac valve surgery from April 2009 to May 2011 were analyzed. ΔLVEF= postoperative LVEF－preoperative LVEF. Patients also grouped according to the postoperative cardiac function change as following: Cardiac function not improve (CFNI group)= ΔEF≤0%; Cardiac function improve (CFI group)= ΔEF>0%. Cardiac function significantly improve (CFSI group)= ΔEF≥15%. Cardiac function partial improve (CFPI group)= 0%<ΔEF<15%.
Results: A total of 164 patients were enrolled of which 126 were male (126/38). The mean age was 60±13 years. Pre- and postoperative LVEF were 58±11% and 59±11%. Pre- and postoperative SCr were 1.7±0.8 and 1.6±1.1mg/dl. The postoperative incidence of AKI was 44% (n=72), incidence of AKI requiring replacement therapy (AKI-RRT) was 9% (n=14).
There were 94 patients in CFI group and 70 patients in CFNI group. The AKI incidence in CFI group was significantly lower than in CFNI group(35% vs 57%, P=0.009). The mean relative SCr increase in CFI group was significantly lower than in CFNI group (25[8, 66]% vs 54[19, 106]%, P=0.035). There was no statistical significance of AKI –RRT incidence and postoperative SCr between the two groups (5% vs 13%, P=0.087; 1.5±0.8 vs 1.8±1.5mg/dL, P=0.135).
The AKI incidence in CFSI group and CFPI group were both significantly lower than in CFNI group (34% vs 57%, P<0.05; 36% vs 57%, P<0.05). The postoperative SCr in CFSI group was not only significantly lower than in CFNI group (1.2±0.3 vs 1.8±1.5mg/dL, P<0.05) but lower than preoperative SCr in the same group (1.2±0.3 vs 1.4±0.2mg/dL, P=0.027).
Multivariate logistic regression analysis showed age (OR=1.06, 95%CI: 1.02~1.09) was independent risk factor of AKI after cardiac surgery in patients with preoperative renal dysfunction while improved cardiac function after surgery (OR=0.42, 95%CI: 0.2~0.86) can reduce the risk.
Conclusion: For patients with preoperative renal dysfunction and cardiac function improved after surgery, the AKI incidence would significantly lower than those whose cardiac function not improved and postoperative renal function is probably better than before.

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15. Impact of acute kidney injury risk groups for the development dengue associated kidney injury: A Retrospective study

Tauqeer Hussain Mallhi[1], Amer Hayat Khan[1], Azreen Syazril Adnan[2], Azmi Sarriff[1], Fauziah Jummaat[3], Yusra Habib Khan[1]

[1]Dicpline of Clinical Pharmacy, School of Pharmaceutical Sciences, USM, Penang, Malaysia, [2]Chronic Kidney Disease Resource Centre, School or Medical Sciences, USM, Kelantan, Malaysia, [3]Department of obstetrics and gynecology, School or Medical Sciences, USM, Kelantan, Malaysia

Background: Acute kidney injury (AKI) is one of the neglected manifestations of dengue viral infection resulting in increased hospitalization and mortality. Several risk groups have been defined for the development of acute kidney injury i.e. comorbidities, old age and obesity. There is need to determine impact of these risk groups for the development of kidney injury in dengue infection.
Objective: To determine impact of AKI risk groups in dengue infection for the development of AKI (study group).
Methodology: A 5 years (2009-2012) retrospective database for patients presenting with dengue infection was initiated at tertiary care hospital, Malaysia. Patients with concurrent infections, incomplete demographics, and in complete renal function tests were excluded from study.
Results: Total 405 (Male: 246, Female: 159, ratio 5:3) dengue patients with mean age of 39.8 ± 12.67 years were enrolled in current study. Acute kidney injury was observed in 48 (11.8%) patients. We defined AKI risk groups according to NICE guidelines, 2013 i.e. Old age, pre-existing CKD, hypertension, diabetes, hypercholestremia and obesity. Out of 48 patients with AKI, risk groups were observed in 37 (77%) patients and at least one risk group was found in them. Results of crosstabulation yielded phi coefficient 0.181 demonstrating association between risk groups and occurrence of AKI. Univariate analysis revealed presence old age (Odds ratio [OR], 2.69; P = 0.016), pre-existing CKD (OR, 1.32; P = 0.347), hypertension (OR, 4.79; P < 0.001), diabetes (OR, 7.41; P < 0.001), hypercholestremia (OR, 4.11; P = 0.026) and obesity (OR, 1.13; P = 0.231) at hospital presentation are significant risk groups associated with the development of AKI in dengue infection. Significant risk groups (P < 0.025) were subjected to multivariate analysis and revealed old age (OR, 2.78; P = 0.013), hypertension (OR, 2.17; P < 0.608), diabetes (OR, 6.85; P < 0.001) and hypercholestremia (OR, 1.97; P = 0.331) are significant risk groups associated with the occurrence of AKI in dengue infection.
Discussion: AKI risk groups are significantly associated with development of acute kidney injury in dengue viral infection. Old age, hypertension, diabetes and hypercholestremia are significant AKI risk groups associated with occurrence of AKI in dengue infection. Dengue patients with AKI risk groups should be vigilantly monitored for the development of acute kidney injury.

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16. A case of thrombotic thrombocytopenic purpura in a patient with acute cholecystitis

Young Ok Kim[1], Ho Cheol Song[1], Byung Soo Kim[1], Sung Ro Yun[2]

[1]The Catholic University, Seoul, Korea, [2]Konyang University, Daejeon, Korea

Thrombotic thrombocytopenic purpura (TTP) is rare disease. The diagnostic criteria are microangiopathic haemolytic anaemia (MAHA), thrombocytopenia, acute kidney injury (AKI), central nervous system involvement and fever. TTP may be idiopathic or secondary. Here we report a new case of thrombotic thrombocytopenic purpura in a patient with acute cholecystitis.
A 73-year-old man with hypertension, diabetes was admitted with complaint of abdominal pain and drowsy mentality. Laboratory tests revealed platelet count of 75,000/mm3, lactate dehyrogenase (LDH) of 8798U/L, blood urea nitrogen (BUN) of 58.9mg/dl, and creatinine of 4.72mg/dl. Peripheral blood smear showed ten fragmented RBCs. Abdominal computed tomography (CT) findings showed acute cholecystitis. We diagnosed

thrombotic thrombocytopenic purpura because of thrombocytopenia, acute kidney injury, microangiopathic hemolytic anemia (MAHA) and neurologic abnormality. Therefore, the patient treated with plasma exchange and hemodialysis. On the 7th day of admission, follow-up lab examination showed platelet count 157,000/mm3, LDH 992U/L. ADAMTS-13 activity was mild deficiency (44%). The patient treated with plasma exchange 5 times, hemodialysis 10 times. And he discharged on the 17th day of admission after recovery of AKI. We finally diagnosed him as TTP precipitated by acute cholecystitis.

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17. Risk factors of Long-term Survival and Progressive Chronic Kidney Disease Associated with Acute kidney injury after cardiac surgery

Yimei Wang[1], Jiarui Xu[1], Bo Shen[1], Zhonghua Liu[1], Jianzhou Zou[1], Yi Fang[1], Lan Liu[2], Chunsheng Wang[2], Jie Teng[1], Xiaoqiang Ding[1]

[1]Department of Nephrology, Zhongshan Hospital, Shanghai Medical College, Fudan University, [2]Department of Cardiovascular Surgery, Zhongshan Hospital

Objective: To study risk factors of long-term survival and progressive chronic kidney disease (CKD) for patients with acute kidney injury (AKI) after cardiac surgery.
Methods: Patients received cardiac surgery and with no history of CKD in our hospital from April 2009 to December 2012 were prospectively selected and grouped according to if AKI occurred. AKI was staged by AKIN classification. The main endpoints were long term mortality and progressive CKD in a follow up of 2 years. Progressive CKD was defined as GFR≤30ml/min per 1.73 m2 or ESRD (starting renal replacement therapy or receive renal transplantation).
Results: Among the total of 3245 patients enrolled, the AKI incidence was 39.9% (n=1295). After 2 year period followed up, Kaplan-Meier survival estimates showed the accumulated survival rates of AKI group were significantly lower than non-AKI group (82.3% vs. 93.7%, p<0.001). The 2 year accumulated survival rates of patients with AKI stage 1, 2 and 3 were 89.9%, 78.6% and 61.4%, respectively.The accumulated progressive CKD prevalence was significantly higher in AKI than in non-AKI group (6.8% vs. 0.2%, P<0.001). Even if the renal function recovery is completed at discharge, AKI is still the risk factor for accumulated overall survival (RR 1.79, 95%CI 1.28 to 2.52) and progressive CKD (RR 1.92, 95%CI 1.37 to 2.69).
Cox proportional hazards regression model showed that after adjusted for age, diabetes, hypertension, type of surgery, cardiopulmonary bypass time et al, the adjusted hazard ratio (AHR) of AKI for accumulated survival was 1.74(95%CI 1.27 to 2.37) and was proportional to its severity. AKI was also the independent determinant for progressive CKD with the AHR of 20.32(95%CI 4.55 to 97.31) after adjusted for other risk factors.
Conclusion: AKI was independent risk factor for long-term survival and progressive CKD after adjusted for other risk factors, even for those with complete renal recovery at discharge.

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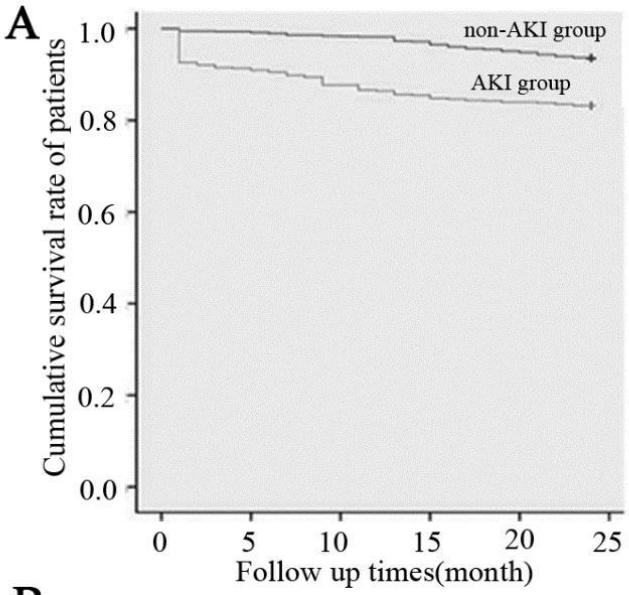
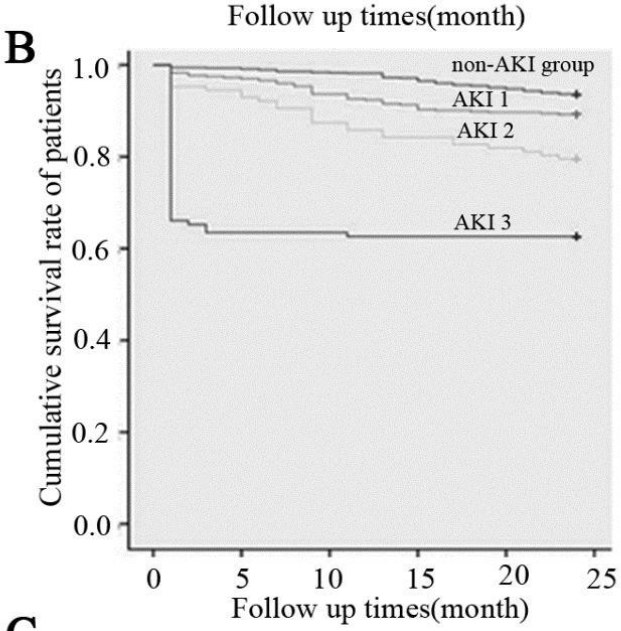
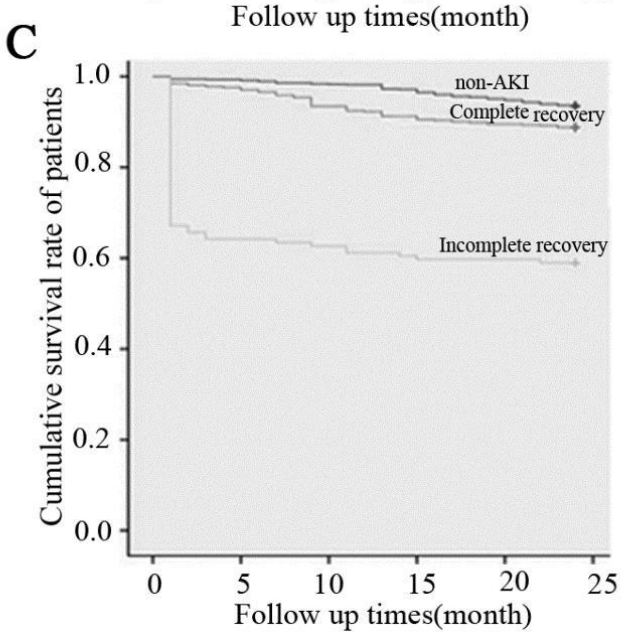

A
non-AKI group
AKI group
Cumulative survival rate of patients
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
20
25
Follow up times(month)


B
non-AKI group
AKI 1
AKI 2
AKI 3
Cumulative survival rate of patients
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
20
25
Follow up times(month)


C
non-AKI
Complete recovery
Incomplete recovery
Cumulative survival rate of patients
1.0
0.8
0.6
0.4
0.2
0.0
0
5
10
15
20
25
Follow up times(month)

18. Acute Kidney Injury in the Pediatric Critical Care Unit: Factors Associated with Nephrology Involvement and Follow Up

Chloe J Butler[1], Julia M Steinke[2], Dawn M Eding[3], Douglas J Degraaf[3], Mary B Avendt[4], Akunne N Ndika[3], Nathalie G Hautala[3], Richard M Hackbarth[2]

[1]Grand Rapids Medical Education Partners, Grand Rapids, MI, USA, [2]Helen DeVos Children's Hospital, Grand Rapids, MI, USA, [3]Spectrum Health, Grand Rapids, MI, USA, [4]Cincinnati Children's Hospital, Cincinnati, OH, USA

Purpose: Acute kidney injury (AKI) is a common problem in the pediatric critical care unit (PCCU). The association between AKI and chronic kidney disease (CKD) is well established. Our center participated in the AWARE (Assessment of Worldwide AKI, Renal Angina and Epidemiology) study. As a corollary to this study we wished to determine for our center how often AKI was recognized in PCCU patients and whether presence of AKI triggered a nephrology consult or follow up after discharge home.
Methods: Data was collected over 4 months. Inclusion criteria were age >3 months, hospital duration >48 hours, admission diagnosis not associated with congenital heart surgical repair and no history of CKD. Patients were excluded if a KDIGO score based on creatinine clearance was not obtained. Of the 95 patients enrolled at our institution who met these criteria, 22 (23%) patients were found to have AKI with a KDIGO score of ≥1 based on creatinine clearance. Initial data collection included established risk factors for AKI including medical co-morbidities, fluid resuscitation, inotropes, nephrotoxic medications, diuretics, urine output < 1 ml/kg/hr, hypertension, mechanical ventilation, need for renal replacement therapies (RRT), ECMO, PRISM III and PELOD scores. Retrospective chart review was used to identify inpatient nephrology consultation and outpatient follow up appointment. All risk factors were then compared using Fischer's Exact Test to establish patterns in consult placement. The sample size was too small to analyze factors in follow up.
Results: 8/22 (36.4%) patients had an inpatient nephrology consultation and 3/17 (17.6%) had scheduled nephrology follow up. Five patients expired prior to discharge (4/5 with nephrology consults prior to their death). 10/22 (45.4%) patients had AKI documented within their medical record, with 8/10 receiving nephrology consultation. Only the need for RRT (p=0.01) and PRISM score (p=0.04) correlated with obtaining nephrology consult.
Conclusion: Many PCCU patients with AKI do not see a nephrologist during their hospital stay or following their discharge. In this single center sample, nephrology consultation in PICU patients with AKI is highly variable with few identifiable predictors. Possible explanations are an under-identification of AKI or lack of appreciation for its long-term consequences.

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19. Withdrawn

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20. Clinical study of CRRT for 57cases of neonate

HIROTSUGU KITAYAMA[1], Naohiro Wada[1], Masayoshi Yamada[1], Yuuichi Uno[1], Noriko Murata[1]

[1]Shizuoka children's hospital

Back ground)
Recently we could come to perform CRRT for neonates, because recent CRRT device is accurate. CRRT for neonate does not clarify diagnosis, vascular access and so on.
Methods)
From 2002 to 2013, there were 57 patients who were performed CRRT and neonate in NICU. We confirm diagnosis, vascular access, CRRT device, modality of CRRT, mortality of all and mortality of Sepsis.

Results)
There are 57 neonate patients performed CRRT. Vascular access are femoral vein, umbilical vein, internal jugular vein, umbilical artery, radial artery and subclavian vein as frequency series. Technical skills of insertion depend on department of pediatric cardiology, neonatologist, cardiac surgeon, critical care and nephrology. CRRT device were perista pump, ACH-07(QB20ml/hr～) and JUN505(QB1ml/hr～).
Concerning with modality of CRRT, there are PD(18 cases), CHF(4 cases), CHD(3 cases), CHDF(36 cases), PMX-DHP(14 cases) and PEX(1 case) were also performed.
From 2002 to 2007, there are 18 patients with PD out of 30. From 2007 to 2013, there are 5 patients with PD out of 28.
In diagnosis as series of high frequency, there are Sepsis, congenital heart disease, congenital diaphragm hernia, digestive system disease (perforation and so on) ,congenital metabolic disease, persistent pulmonary hypertension of neonate, meconium aspiration syndrome, transient abnormal myelopoiesis, hyperkalemia, kidney disease and fetal hydrops.
The mortality was 59.3% in previous term. In following term, the mortality was 50%. In both previous term and following term, the mortality was 53.4%. Mortality of sepsis was 42.9%.
Conclusion)
Team medicine, accuracy of CRRT device and technical skills of blood access insertion make it possible to perform CRRT for neonate. We could safely perform CRRT for neonate.

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21. The Safety Of Connecting Neonatal And Pediatric Dialysis Circuit To The Extra Corporeal Membrane Oxygenation (ECMO) Circuit During ECMO Treatment.

Jonas A Lindholm[1], Kristina Albo[1], Leif Mitander[1]

[1]*Karolinska University Hospital, Stockholm, Sweden*

Background
In Neonate patients the circulating volume is sometimes doubled due to the volume in the ECMO circuit. The ECMO circuit is therefore primed with blood. A dialysis circuit would further dilute the blood and is therefore primed with blood. Heparin is used for the ECMO circuit. The dialysis machine is connected into the ECMO circuit leading to excellent access which allows dialysis 24 hours per day. Although there are risks of suctioning air into the ECMO circuit. There have been no incidents with the use of Continuous Reno Replacement Therapy, CRRT in our unit.
During 2010 and 2011 CRRT was used in 41 Neonate or Pediatric patients. Filters used were Gambro HF20 for patients <12kg and Gambro ST60 >12kg. Filter survival time registered was due to clotting. During intra hospital transports the dialysis circuit is disconnected from the ECMO circuit and the dialysis is looped running only the blood pump.

Results
The patient's charts were investigated and reasons for start of CRRT were noted. 20-21% of CRRT was started due to Acute Kidney Injury (AKI) and the remaining due to fluid control demands. All filters function stopped because of clotting. Mortality and survival to discharge from ECMO ICU was registered. ECPR patients 1 Neonate and 7 Pediatruc patients. Mortality Neonates 24% incl ECPR, 25% excl ECPR. Mortality Pediatric 42% incl ECPR, 20% excl ECPR.

Discussion
There are no differences in survival between patients treated with CRRT compared to the general survival in our ECMO unit.

Conclusion
The majority of the ECMO patients in our unit are treated with CRRT. We conclude it is a safe method to use the

ECMO circuit as access for the CRRT treatment.

n=41	CRRT days	Filter time hrs	Dilution post ml/h	Dialysate ml/h	Dose ml/kg/h	Fluid withdrawal ml/h	Weight loss %	Creatinine µmol/L	Urea mmol/L
Neo 3,91 (1.9 - 6.0kg)	10 (1-54)	48 (12-120)	86 (40-150)	67 (0-150)	53 (25-115)	19 (5-43)	18 (0-41)	78 (13-189)	5,2 (0,8-11,6)
Ped 15,32 (6.8 - 23.5kg)	7 (2-27)	55 (24-96)	241 (40-600)	681 (100-750)	41 (21-89)	70 (9-175)	6 (0-14)	39 (17-88)	6,6 (1,3-18,1)

22. Impact of Fluid Balance on Non-renal Organ Recovery in Critically Ill Children Requiring Continuous Renal Replacement Therapy

Sachin D Tadphale[1], Archana V Dhar[1], Raymond P Quigley[1], Diane Gollhofer[2], Vinai Modem[1]

[1]University of Texas Southwestern Medical Center, [2]Children's Medical Center - Dallas

Purpose:
Fluid overload (FO) and acute kidney injury (AKI) adversely impact morbidity and mortality in critically ill children. CRRT can provide renal support in these children. In this study, our objective was to assess the association between fluid balance after CRRT initiation and non-renal organ recovery.

Methods:
This was a retrospective cohort study in critically ill children requiring CRRT for AKI and/or FO over 3 years. Primary outcome was worsening non-renal organ function after CRRT initiation. Primary predictor variable was the fluid balance (FB) on CRRT day 3. FB was measured as cumulative fluid accumulation from admission and expressed as percentage of admission body weight. Patients with and without improvement in non-renal organ function were compared with respect to severity of illness at admission (PIM 2 score), diagnoses, co-morbidities, need for cardio-respiratory support, severity of organ dysfunction (PELOD score), renal dysfunction and FB at CRRT0. FB on CRRT day 3 was assessed as an independent predictor of outcome in a multivariable logistic regression model.

Results:
158 patients underwent CRRT during the study period of whom 72 met criteria. Median PIM 2 score was 8.4 and overall mortality was 36%. Children with and without worsening non-renal organ dysfunction did not differ with respect to gender, age, race, severity of illness and co-morbidities. Renal function was similar between them at ICU admission and CRRT0. Patients with worsening of non-renal organ dysfunction had higher FB compared to those without, both at CRRT0 (mean 25% vs. 11%, p 0.007) and even after CRRT initiation. FB on CRRT day 3 was a significant predictor of worsening non-renal organ dysfunction (OR 1.06, CI (1.01-1.13), p 0.04).

Conclusion:
In this cohort, higher fluid balance on CRRT day 3 was associated with worsening non-renal organ dysfunction. Fluid removal on CRRT can potentially impact organ function recovery in children.

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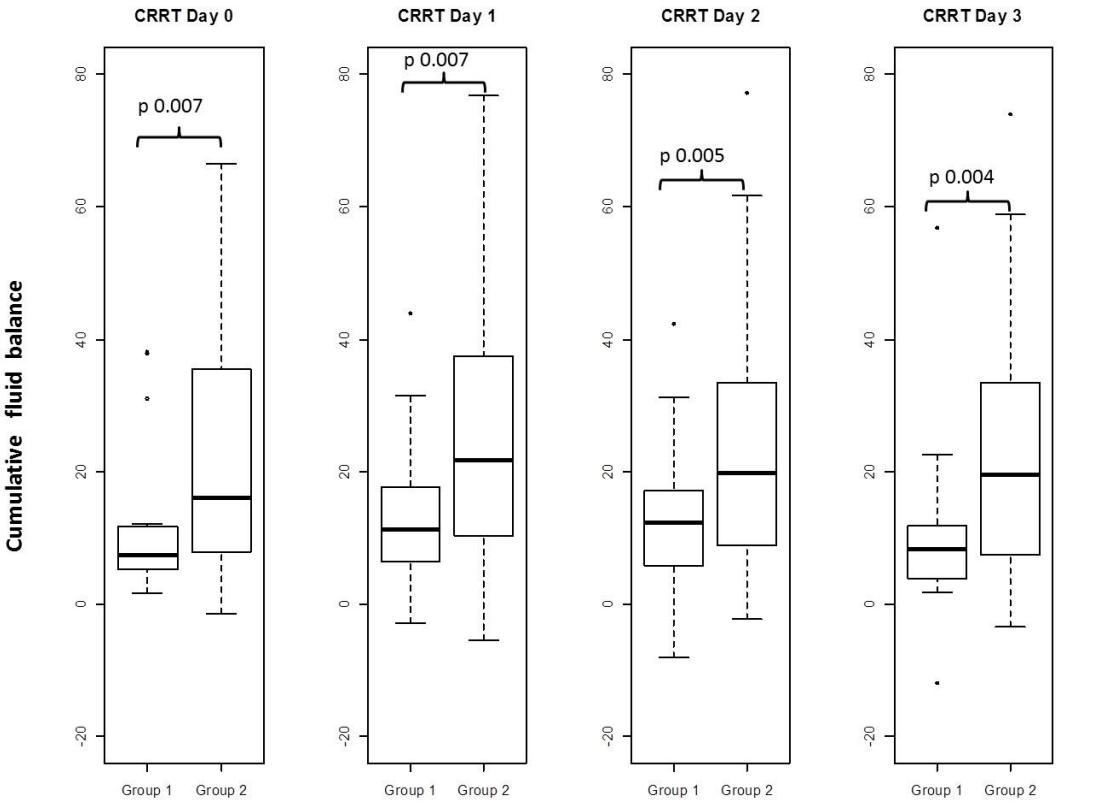

Group 1 – Improved non-renal organ dysfunction; **Group 2** – Worsening non-renal organ dysfunction

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23. Prevalence and outcome of acute kidney injury in Chinese hospitalized patients in a single center.

Yimei Wang[1], Jie Teng[1], Xiaoqiang Ding[1], Jiarui Xu[1], Zhouping Zou[1]

[1]*Zhongshan Hospital , Fudan University, Shanghai , China*

Objectives: This study was to determine the prevalence and mortality rate of acute kidney injury (AKI) among hospitalized adult patients in a tertiary metropolitan hospital of China, and to evaluate the impact of AKI on 28d mortality, cost and length of stay (LOS).
Methods: Patients of Zhongshan Hospital, Fudan University, Shanghai, China between November 3rd, 2014 and November 9th, 2014 were screened by the hospital database. The presence and severity of AKI were assessed by the KDIGO criteria. Follow-up biochemical and clinical data were used to determine short-term (28 days) outcomes.
Results: There were 2563 patients during the study period and 92(3.59%) met the diagnostic criteria of AKI. The median age of AKI patients was 64 years, 70.7% were male, 12% received renal replacement therapy. 23 patients (25%) were community-acquired AKI, the leading cause was drug (21.7%), infection (17.4%) and heart failure (13.0%). Hospital-acquired AKI was 75%, the leading cause was surgery (62.7%), infection (14.5%) and drug (8.7%).The AKI group had significantly longer LOS than the non AKI group (19 vs 8 days). The 28d mortality of AKI was 7.6%.Of AKI patients, AKI stage (KDIGO criteria), malignancy and albumin were independent risk factors of 28d mortality according to multivariate logistic regression.
Conclusions: AKI is prevalent in the Chinese hospitalized patients. Slight elevations of serum creatinine are associated with significantly increased mortality, LOS and hospital cost. Moreover, outcomes are related directly to the severity of AKI.

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24. Myocardial Reperfusion Score By Coronary Angiography And Contrast Induced Nephropathy. A Cohort Study.

Benjamin Mora-Mendoza[1], Juan-Carlos Bamac-Arrivillaga[1], Marcos-Teodoro Rodriguez-Avalos[1], Armando Vazquez-Rangel[1]

[1]*Instituto Nacional de Cardiologia Ignacio Chavez, Mexico, Distrito Federal, Mexico*

Purpose: Although several independent variables have been associated with contrast induced nephropathy (CIN) after coronary angiography, the role of achieving coronary reperfusion has not been evaluated in detail, considering that this has been related to inflammation and oxidative stress.
Methods: A retrospective cohort study including patients requiring coronary angiography from January 1st 2011 to December 31st 2011 at the Instituto Nacional de Cardiologia Ignacio Chavez, a third-level academic referral center in Mexico City. Baseline characteristics and procedure-related variables were captured. Coronary reperfusion was defined as an increment in the TIMI myocardial perfusion (TMP) grade with a final score of 2 or 3 assessed individually in each main vessel (right coronary, left coronary, anterior descending and circumflex arteries), and patients starting with TMP 3 were considered as a control group. CIN was defined as a relative 25% or an absolute 0.5 mg/dL increment in serum creatinine within 48 hrs.
Results: A total of 576 patients were analyzed and 101 (17.5%) developed CIN. Overall, 78.0% were males, 59.3 ± 12.5 years old, 37.5% were diabetic, 51.7% had hypertension, 87.7% arrived with acute coronary syndrome, 4.5% had cardiogenic shock on admission, eGFR was 86.3 (70.1-99.2) ml/min, and 160 (85.7-250) ml of contrast media were used. Patient distribution was 245 (42.2%) in control group, 83 (14.3%) with none reperfused, 225 (38.7%) with one reperfused, and 23 (4.0%) with more than one reperfused vessel. CIN was present in 13.5, 19.3, 18.2 and 43.5% respectively. In bivariate analysis, age, LVEF, emergency procedure, glucose, hemoglobin, high-density lipoprotein, amount of contrast media, and reperfusion were significantly associated with CIN. Compared to control group, OR for CIN was 1.53 (0.79-2.96) (p=0.202) for none reperfused, 1.43 (0.87-2.36) (p=0.159) for one reperfused, and 4.94 (2.00-12.18) (p=0.001) for more than one reperfused vessel. In the adjusted multivariate analysis, achieving reperfusion for more than one vessel remained as a significant risk factor for CIN (OR 3.45 [1.23-9.68], p=0.019).
Conclusion: After coronary angiography, achieving reperfusion for more than one vessel was associated with a higher risk for CIN, independent from co-morbidities, clinical status and amount of contrast media. The negative impact on serum creatinine should be weighted versus the theoretical positive impact on cardiac prognosis in future studies.

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25. Validation of four Scores to Predict Contrast Induced Nephropathy in a Mexican Population.

Marcos T Rodriguez[1], Armando Vazquez[1], Emmanuel S Villalobos[1], Johana Balderas[1]

[1]*Instituto Nacional de Cardiologia Ignacio Chavez*

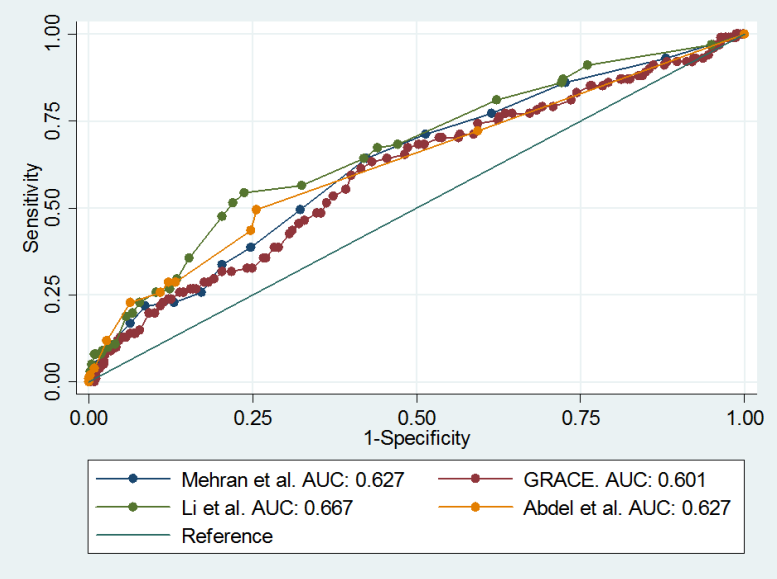
Purpose: Population characteristics could affect the performance of predictive scores for contrast induced nephropathy (CIN) after coronary angiography. The aim of this study was to validate four clinical scores (Mehran et al, GRACE, Li et al, Abdel et al) to predict contrast induced nephropathy in our population.

Methods: Retrospective cohort including adult patients undergoing percutaneous coronary angiography at the Instituto Nacional de Cardiologia Ignacio Chavez in Mexico City from January 2011 to December 2011. For discrimination, areas under curve (AUCs) and goodness of fit by Hosmer-Lemeshow (H-L) statistic were used. For calibration, logistic regressions introducing original variables were developed.

Results: A total of 578 patients were analyzed, 101 patients (17.5%) developed CIN, the analysis of the incidence observed in our population vs those reported in the original studies were shown to be significantly different for Mehran (H-L 25.74, p=0.001), Li (H-L 56.74, p=0.001), and Abdel (H-L 65.56, p=0.001), except for GRACE (H-L 1.29, p=0.255). AUCs for CIN by Mehran, GRACE, Yong Li and Abdel were 0.65, 0.66, 0.60 and 0.62

respectively. After calibrations AUCs did not improved. Remarkably, diabetes, age, heart failure, previous myocardial infarction, LVEF, gender or heart rate did not significantly contribute to risk assessment in our population. Only renal function, hemodynamic status, anemia, emergency procedure and amount of contrast media are significant predictors of CIN in our population.

Conclusions: Clinical scores underestimate the risk of CIN, these scores did not adequately predict the probability of develop CIN in our population.



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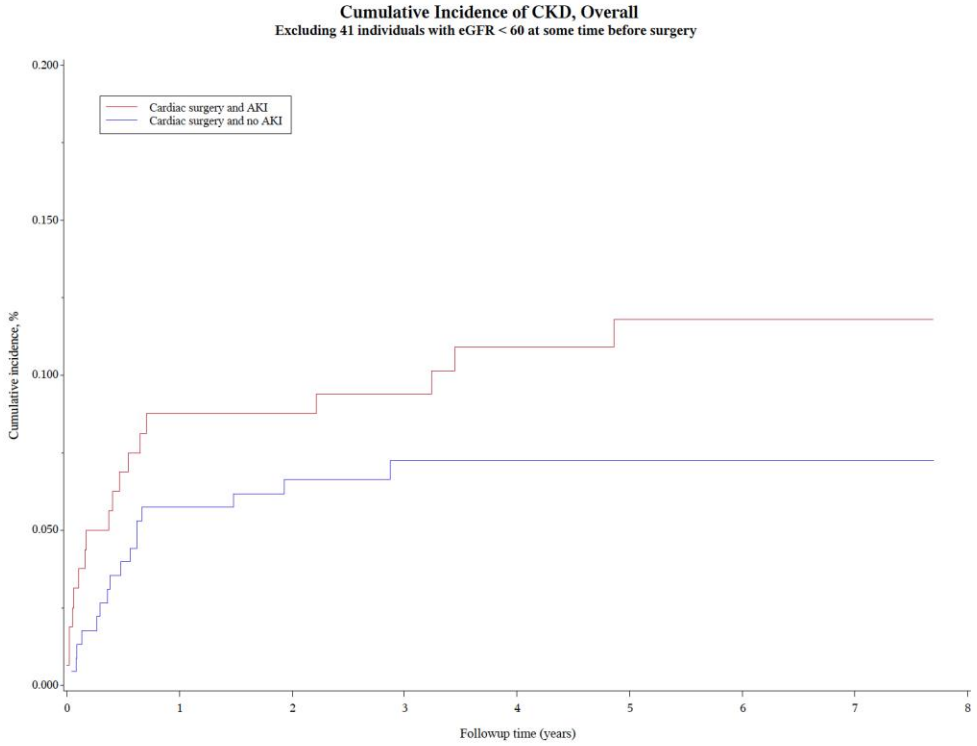
27. Acute Kidney Injury post Cardiac Surgery and the Development of Chronic Kidney Disease in Congenital Heart Disease Survivors

Nicolas L Madsen[1], Stuart L Goldstein[1], Trine Frøslev[2], Christian F Christiansen[2], Morten Olsen[2]

[1]Cincinnati Children's Hospital Medical Center, [2]Department of Clinical Epidemiology, University of Aarhus, Denmark

Background: Among CHD survivors, there is a distinctive history of cardiac surgery (CS) associated acute kidney injury (AKI) at rates up to 30-50%. The magnitude of the link between CS associated AKI and the development of chronic kidney disease (CKD) is unknown.
Objective: To determine the association of CS AKI with CKD in CHD survivors.
Methods: Using Danish regional population-based registries, this cohort study aimed to include all CHD patients born from 1990-2010 with first time CS between 2005 and 2010 before the age of 15 years. Utilizing in- and out-patient lab data (LABKA), we identified subjects fulfilling any KDIGO stages of AKI. A unique personal identifier enabled unambiguous data linkage and virtually complete follow up. We computed cumulative incidences of CKD stages 3-5 for patients with and without post-surgery AKI using creatinine measurements during follow-up. Individuals with an eGFR < 60 prior to the date of surgery were excluded. Using Cox regression we computed corresponding hazard ratios, adjusting for sex, age at first surgery, calendar period of surgery, and CHD severity.
Results: Out of 387 CHD survivors undergoing CS, 160 (41%) experienced AKI. Infants with CS in the first year of life constitute the majority (143/160, 89%) of subjects with AKI. Median follow up for all subjects was 4.66 years. The cumulative incidence of CKD at 5 years following surgery for subjects with and without post CS AKI was 12% (95% CI:7%-18%) and 7% (95% CI:4%-11%), respectively (Figure). The corresponding hazard ratio was 1.8 (95% CI: 0.8-3.7).
Conclusion: These pilot data indicate that CHD survivors with AKI following CS have an increased risk for CKD.

More analysis is forthcoming to elucidate the relationship of post CS AKI and CKD; an important clinical relationship given the potential that AKI is a modifiable exposure and the longitudinal health burden of CKD.



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28. Divergence of Serum Creatinine and Urea in Survivors of Critical Illness: Implications for Assessment of Renal Function and Nutritional Status during Recovery

John R Prowle[1], Ivana Kolic[1], Jeremy Purdell-Lewis[1], Christopher J Kirwan[1]

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Introduction
Acute kidney injury (AKI) complicates over 50% of ICU admissions and episodes of AKI are a major risk factor for development or progression of chronic kidney disease (CKD). However critical illness is associated with reduction in muscle mass, reducing creatinine production and its serum concentration. Conversely active muscle breakdown and protein catabolism may increase urea production and serum concentration. Thus neither marker may accurately assess true recover of renal function after AKI.

Methods
We performed a single-centre, retrospective analysis of AKI diagnosis in patients with ICU admissions of 5 days or more who survived to hospital discharge between 2009 and 2011. We have previously analysis serum creatinine changes and the assessment of renal function in this population [1]. In an additional analysis we have now compared serum creatinine with urea at hospital admission, ICU discharge and hospital discharge. We stratified our analysis by maximal AKI category in hospital.

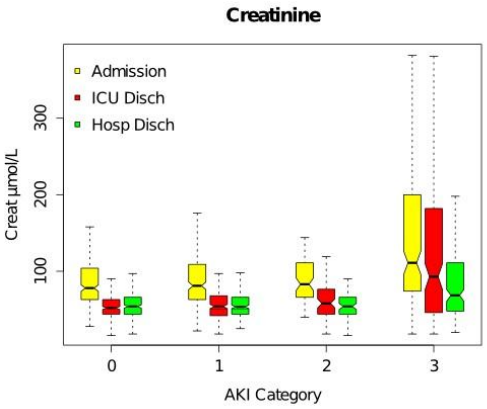
Results
We identified 700 cases, with a 66% incidence of AKI. In all patients median creatinine decreased significantly from hospital admission toICU discharge (84 vs. 56µmol/L $p<0.001$). Conversely Urea rose significantly from hospital admission to discharge (5.8 vs 7.5mmol/L $p<0.001$). These changes occurred irrespective of the presence and severity of AKI and while decrease in Creatinine persisted to hospital discharge whereas Urea increases were

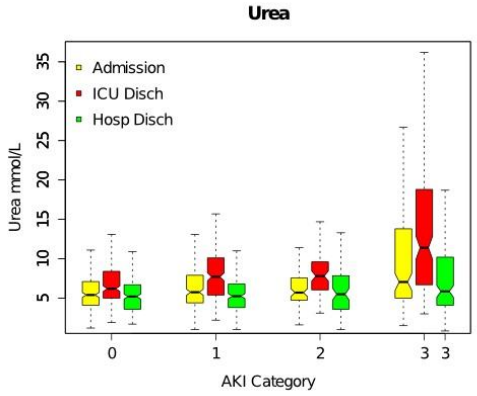
more transient (Figs 1,2). Median Urea:Creatinine ratio almost doubled (67 to 126, p<0.001) from admission to ICU discharge and remained significantly elevated in all AKI categories at hospital discharge.

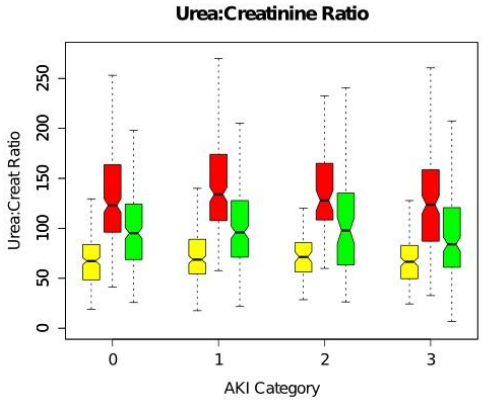
Conclusions

There is a complete divergence between creatinine and urea changes from admission to ICU discharge across all AKI categories. Reduction in serum creatinine at ICU and hospital discharge is likely to reduced creatine production [2] reflecting loss of muscle mass that accompanies critical illness [3]. Increases in urea may reflect reduced clearance or increased production accompanying protein breakdown. Interpretation of renal function and nutritional status in survivors of critical illness is complicated by their competing influences on traditional biochemical markers of renal function.

[1] Prowle JR, et al. CJASN 2014;9:1015-23.
[2] Schetz M, et al. Intensive Care Medicine 2014;40:1709-17.
[3] Puthucheary ZA, et al. JAMA 2013;310:1591-600







29. Withdrawn

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30. Renal Outcomes in Critically-Ill Patients Receiving Propofol or Midazolam: a Propensity Scoring Analysis

Tacyano T Leite[1], Etienne Macedo[2], Alexandre B Liborio[1]

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PURPOSE: Propofol has been shown to provide protection against renal ischemia/reperfusion injury experimentally, but clinical evidence is limited to patients undergoing cardiac surgery. There is no data about its potential renoprotection in critically-ill patients. Based on the potentially beneficial effects of propofol, this study intends to evaluate the renal outcomes of patients receiving exclusively propofol during the first 48 hours of ICU stay in comparison to patients receiving midazolam.
METHODS: Data were obtained from the Multiparameter Intelligent Monitoring in Intensive Care (MIMIC-II) database (2001–2008). Patient selection criteria included adult patients in their first ICU admission, need for mechanical ventilation and treatment with propofol or midazolam. Propensity score analysis (1:1) was used and renal-related outcomes - acute kidney injury (AKI), oliguria, cumulative fluid balance and need for renal replacement therapy (RRT) – were evaluated during the first 7 days of ICU stay.
RESULTS: There were 1,406 propofol–midazolam matched patients. AKI in the first 7-day ICU time period was statistically lower in propofol-treated patients when compared with midazolam-treated patients (OR: 0.58, 95% confidence interval [CI], 0.47–0.73). Propofol-related protection was observed in both urine output (OR 0.637, 95%CI 0.516–0.786) and serum creatinine AKI criteria (OR 0.683, 95%CI 0.546-0.854) – Figure 1. Patients receiving propofol had oliguria less frequently (12.2 vs. 19.6%, p<0.001) and had diuretics prescribed less often (8.5 vs. 14.2 %, p=0.001). Also, during the first 7 days of ICU stay, patients receiving propofol less frequently achieved cumulative fluid balance greater than 5% of body weight (50.2 vs. 58.6%, p=0.002). Need for RRT in the first 7-day ICU time was also less frequent in propofol-treated patients (OR 0.571 95%CI 0.341- 0.955). ICU mortality was lower in propofol-treated patients (14.5 vs. 29.7%, p<0.001) – Table 1.
CONCLUSION: In this large, propensity-matched ICU population, patients treated with propofol had a reduced risk of AKI, fluid-related complications and need for RRT.

Figure on following page

Outcome	Midazolam-Matched (n=703)	Propofol-Matched (n=703)	P value	Odds-Ratio (95% CI)
Oliguria (<400 ml/day)	124/632 (19,6 %)	73/596 (12,2 %)	<0,001	0,572 (0,418 - 0,783)
Diuretic use	100 (14,2 %)	60 (8,5 %)	0,001	
Cumulative fluid balace > 5% BW	412 (60,7 %)	353 (53%)	0,004	0,731 (0,589 - 0,908)
Renal Replacement Therapy	41 (5,8)	24 (3,4)	0,031	0,571 (0,341 - 0,955)
ICU mortality	209 (29,7)	102 (14,5)	<0,001	0,401 (0,308 - 0,870)

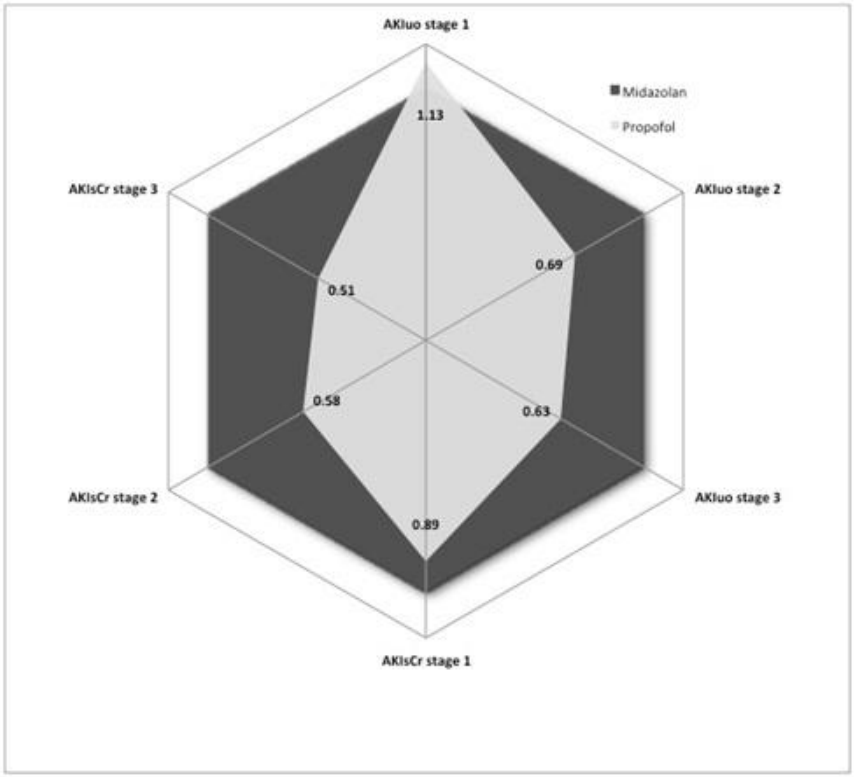

Figure 1: Acute kidney injury odds ratio according to AKI stage and classification criteria (urine output or serum creatinine).

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31. Acute Kidney Injury is More Common in Neonates with Single Ventricle Heart Disease After Surgical Norwood than Hybrid Stage I Palliation

Bryan H Goldstein[1], Stuart L Goldstein[1], Prasad Devarajan[1], David Kwiatkowski[2], Bradley S Marino[3], David L Morales[1], Catherine D Krawczeski[2], David S Cooper[1]

[1]Cincinnati Children's Hospital Medical Center, [2]Lucile Packard Children's Hospital at Stanford, [3]Ann & Robert H. Lurie Children's Hospital of Chicago

Background: Norwood palliation for single ventricle (SV) heart disease is associated with significant risk of acute kidney injury (AKI), which portends a worse prognosis. Hybrid stage I palliation (Hybrid) avoids exposure to bypass and circulatory arrest, potentially conferring a lower AKI risk.
Methods: Single-center prospective observational trial of 7 consecutive SV neonates undergoing Hybrid palliation. Serum creatinine (SCr) and novel urinary biomarkers (BM; NGAL, IL-18, L-FABP and KIM-1) were obtained before and at intervals after palliation. AKI was defined as a ≥50% increase in SCr within 48h post-procedure. BM data were compared with a contemporary cohort of 12 SV neonates that underwent Norwood palliation.
Results: Hybrid patients were smaller and more likely to be high-risk candidates compared to Norwood patients. Baseline IL-18 concentrations were higher in the Hybrid cohort. While baseline SCr was similar between cohorts, there was a trend toward higher peak SCr and higher rate of AKI in the Norwood cohort. Peak NGAL and L-FABP concentrations were also higher in the Norwood cohort, suggestive of greater renal injury.
Conclusion: Despite inclusion of a higher risk patient population, Hybrid palliation for SV heart disease may be associated with lower AKI rates than the Norwood procedure. Given the morbidity and mortality associated with AKI in SV neonates, Hybrid palliation may offer a potential advantage in high-risk patients.

Table on following page

	Hybrid cohort (n=7)	Norwood cohort (n=12)	p-value
Age (days)	10 ± 3.7	8.7 ±3.8	0.47
Weight (kg)	2.6 ± 0.5	2.9 ± 0.3	0.05
Length (cm)	44.6 ± 2.4	48 ± 1.3	<0.001
HLHS or variant	5 (71%)	7 (58%)	0.8
Genetic anomaly	3 (43%)	1 (8%)	0.26
High risk candidate	6 (86%)	1 (8%)	0.002
Serum Creatinine			
Baseline	0.53 ± 0.19	0.57 ± 0.22	0.66
Peak	0.56 (0.47, 74)	0.7 (0.63, 0.94)	0.06
AKI by SCr	2 (29%)	8 (62%)	0.17
NGAL			
Baseline	56.7 (10.5, 86.3)	7 (5, 16.2)	0.12
Peak	108.9 (56, 137.6)	339.1 (128.2, 615.1)	0.04
IL-18			
Baseline	33.4 (13.8, 187.1)	6.3 (6.3, 16.4)	0.03
Peak	171.3 (45.4, 241.4)	57.4 (37.1, 96.6)	0.35
L-FABP			
Baseline	6.4 (3, 72.7)	6.6 (5.6, 16)	0.92
Peak	39.4 (13.7, 75.6)	125.8 (54.3, 226.3)	0.04
KIM-1			
Baseline	102 (59, 835.8)	59 (69, 296.4)	0.67
Peak	506.5 (293.5, 1504.5)	1362.8 (1064, 2070.8)	0.14

32. The Protective Effects of Off-Pump Coronary Artery Bypass on Acute Kidney Injury: A Meta-analysis of Randomized Controlled Trials

Narat Srivali[1], Charat Thongprayoon[1], Wisit Cheungpasitporn[1], Wonngarm Kittanamongkolchai[1], Peter J Edmonds[1], Stephen B Erickson[1]

[1]*Mayo Clinic, Rochester, MN.*

Backgroud: The objective of this meta-analysis was to compare the effects of off-pump and on-pump CABGs on acute kidney injury (AKI) and the need of dialysis after surgery.
Methods: Comprehensive literature searches for randomized controlled trials (RCTs) of CABG with on-pump and off-pump was performed using MEDLINE, EMBASE, Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials Systematic Reviews and clinicaltrials.gov from inception through September 2014. Primary outcomes were the incidence of AKI and the need of dialysis. Mortality was assessed among the studies that reported renal outcomes. Pooled risk ratios (RR) and 95% confidence interval (CI) were calculated using a random-effect, generic inverse variance method.
Results: 33 RCTs with 17,322 patients were included in our analysis. Patients in the off-pump CABG group had overall lower incidence of AKI (19.1%) compared to the on-pump CABG group (22.2%). There was a protective effect of off-pump CABG on the incidence of AKI compared to the on-pump CABG group [risk ratios (RR): 0.87; 95% CI: 0.77–0.98]. However, there was no significant difference in the need for dialysis in the off-pump group compared to the on-pump group (RR: 0.84; 95% CI 0.63-1.13). Within the selected trials, post hoc analysis assessing the mortality outcome demonstrated a pooled RR of 0.97 (95% CI, 0.77-1.23) in off-pump vs on-pump CABGs.
Conclusions: Our study demonstrates a beneficial effect of off-pump CABG on the incidence of AKI. However, our meta-analysis does not show benefits of the need of dialysis or survival among patients undergoing off-pump CABG.

33. INCIDENCE AND OUTCOME OF ACUTE KIDNEY INJURY ON RENAL REPLACEMENT THERAPY PATIENTS IN A TERTIARY CARE CENTRE

HARITHA SUBRAMANYAM[1], RAM PRASAD ELUMALAI[1], SOUNDARAJAN PERIYASAMY[1], JAGADEESAN DAKSHINAMOORTHY[1]

[1]*SRI RAMACHANDRA UNIVERSITY,CHENNAI*

AIM:
To study the outcome of Acute Kidney Injury (AKI) patients on renal replacement therapy in our tertiary care centre.

MATERIAL AND METHODS:

The study was conducted on 82 acute renal failure patients between January 2013 – December 2013 in our centre. The underlying etiology and outcome of AKI patients on RRT were studied. AKI patients on intermittent Hemodialysis, Sustained low efficiency dialysis (SLED), continuous renal replacement therapy (CRRT) and acute peritoneal dialysis were included .

RESULTS:

In our study 57 were males (69%) and 25 were females (31%). The age ranged between 27 – 62 years with a mean age of 36 years.
The cause of AKI is due to Sepsis 26(31%), CAD 13 (15.6%), acute gastroenteritis 10(12.5%), road traffic accidents 8(9.3%), multi organ dysfunction 5(6.25%), dengue 5(6.25%),), Leptospirosis 8(9.3%), snake bite 2(3.12%) and rhabdomylosis 5(6.25%).
53(64.37%) patient were initiated on hemodialysis, 16 patients on SLED (20.1%), 8(9.31%) on continuous renal replacement therapy, 5(6.25%) on acute peritoneal dialysis.

Among 82 patients, 51 patients (62.5%) were recovered completely and 31 patients (37.5%) were died of underlying causes.

CONCLUSION:

The common cause of acute kidney injury in our study was due to sepsis & CAD. The survival rate was 62.5% probably due to early dialysis & continuous renal replacement therapies.

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34. Improving the Gold Standard: Can Urine Biomarkers Help Refine AKI Definition in Premature Infants?

Behtash Saeidi[1], David Askenazi[1], Russell L Griffin[1], Brian Halloran[1], Namasivayam Ambalavanan [1]

[1]*University of Alabama at Birmingham*

Background: At birth, serum creatinine (SCr) reflects maternal creatinine and decreases over time at a rate that depends on gestational age. In the first week of life, newborns lose 5-15% of their weight which is regained later. Incorporating changes in fluid status into SCr-based definitions could improve the definition of acute kidney injury (AKI) and its association with clinical outcomes in neonatal, pediatric and adult cohorts. Urinary AKI biomarkers may improve our ability to detect neonatal AKI, and guide SCr-based definitions.
Methods: We performed a prospective cohort study to determine which urine biomarkers are best associated with 2 SCr-based AKI definitions and whether the association varied by day of life. We enrolled 113 newborns with the birth weight (BW) ≤ 1200 gr between February 2012 and June 2013. Urine biomarkers and SCr were collected in the first four days of life and day 14. AKI status was first defined according to the neonatal AKI definition (adapted from KDIGO AKI definition, whereby AKI is defined as a rise in SCr by 0.3mg/dl from the lowest previous SCr value). Next, AKI was defined using fluid-adjusted (FA) SCr, which accounts for the change in total body weight (TBW = 0.8 x weight in kg). The FA-SCr was defined as SCr x [TBW + (current weight – birth weight)]/ TBW. For both AKI definition outcomes, a receiver operating characteristic analysis was done utilizing logistic regression, calculating the area under the curve (AUC) for each biomarker on days 1-4 and day 14.
Results: The incidence of AKI by day 14 was 29/113 (26%) by the SCr-based and 19/113 (17%) for the FA-SCr based definition. An increase in AUC from 0.76 to 0.78 for Cystatin C, 0.73 to 0.86 for Urine neutrophil gelatinase-associated lipocalin (NGAL), 0.74 to 0.81 for osteopontin (OPN), 0.76 to 0.81 for Clusterin, 0.72 to 0.85 for kidney injury molecule-1 (KIM-1), 0.68 to 0.76 for vascular endothelial growth factor (VEGF), and 0.74 to 0.77 for Alpha Glutathione S-Transferase (αGST) was observed on day four when using FA-SCr AKI definition compared to SCr AKI definition. NGAL on day 4 of life showed the highest AUC for FA-SCr AKI at AUC=0.861.
Conclusions: Urine biomarker measurement on day four of life may provide the best predictive value for AKI. Additionally, using the FA-SCr AKI definition improves the sensitivity and specificity of these biomarkers. Further studies in larger populations will be needed to provide better insight to define neonatal AKI.

Table on following page

	AUC day1	AUC day1	AUC day 2	AUC day 2	AUC day 3	AUC day 3	AUC day 4	AUC day 4	AUC day 14	AUC day 14
	SCr AKI	FA-SCr AKI	SCr AKI	FA-SCr AKI	SCr AKI	FA-SCr AKI	SCr AKI	FA-SCr AKI	SCr AKI	FA-SCr AKI
Cystatin C	0.685	0.669	0.699	0.722	0.722	0.704	0.760	0.785	0.620	0.681
NGAL	0.657	0.616	0.671	0.688	0.717	0.721	0.735	0.861	0.720	0.749
OPN	0.661	0.688	0.680	0.676	0.700	0.688	0.740	0.811	0.693	0.763
Clusterin	0.665	0.638	0.699	0.721	0.711	0.708	0.765	0.810	0.654	0.765
KIM1	0.686	0.642	0.684	0.743	0.730	0.704	0.720	0.853	0.596	0.723
VEGF	0.637	0.624	0.705	0.724	0.718	0.713	0.684	0.765	0.626	0.680
αGST	0.668	0.755	0.674	0.757	0.737	0.722	0.737	0.767	0.584	0.668

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35. Nephron Regeneration after Acute Kidney Injury in the Zebrafish

Kristen K McCampbell[1], Kristin N Springer[1], Rebecca A Wingert[1]

[1]*University of Notre Dame*

The zebrafish kidney is an excellent system for renal regeneration and disease studies, as it is composed of functional units known as nephrons that contain highly conserved proximal and distal tubule segments similar to other vertebrates including mammals. After zebrafish nephrons incur damage, there is robust epithelial regeneration within existing nephrons and new nephrons are produced from renal progenitors. The mechanisms responsible for these kidney regeneration phenomena remain poorly understood and a major limitation in the field has been the paucity of methods to label adult nephron cell populations. Here, we present labeling methods that can be used in whole mount preparations or tissue sections to gage renal composition and assess nephron functionality. We validated these markers by extensive comparisons to the expression domains of solute transporter genes that uniquely identify each nephron segment. Next, we characterized the cellular changes resulting from acute gentamicin injury to establish the timing of renal cell death after injury, the proliferative compartments within the kidney, and the gene expression changes associated with nephron regeneration. Taken together, these data have provided a greater understanding of the full cycle of regenerative events. These data provide an important descriptive atlas that documents the series of events that ensue after damage in the zebrafish kidney, thus availing a valuable resource for the scientific community that can facilitate the implementation of zebrafish research to delineate the mechanisms that control renal regeneration.

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36. Cell cycle arrest biomarkers accurately predict acute kidney injury in cardiothoracic surgery patients

Kianoush Kashani[1], Kyle Gunnerson[2], Lakhmir S Chawla[3], Azra Bihorac[4], Andrew D Shaw[5], Ali Al-Khafaji[6], Matthew Lissauer[7], John A Kellum[6]

[1]Mayo Clinic, [2]University of Michigan Health System, [3]George Washington University Medical Center , [4]University of Florida , [5]Duke University , [6]University of Pittsburgh Medical Center, [7]Rutgers Robert Wood Johnson University Hospital

Introduction: Large volume shifts associated with the use of cardiopulmonary bypass and use of diuretics make interpretation of serum creatinine and urine output data difficult. Early identification of patients with risk of AKI is an essential step in prevention and management of complications in post-cardiac surgery patients. We recently reported data from two multi-center studies of 728 (Sapphire) and 408 (Topaz) patients where a panel of urinary tissue inhibitor of metalloproteinases-2 (TIMP2) and insulin-like growth factor-binding protein 7 (IGFBP7), both markers of cell cycle arrest, were validated for risk stratification for moderate to severe AKI (KDIGO stages 2 and 3) in a heterogeneous cohort of critically ill patients. In this analysis, we report the performance characteristics of this novel biomarker panel ([TIMP2]•[IGFBP7]) in patients undergoing cardiothoracic (CT) surgery.
Hypothesis: We hypothesized that the urinary [TIMP2]•[IGFBP7] test would identify critically ill CT surgery patients who are at high risk of developing moderate to severe AKI.
Methods: We conducted subgroup analyses of patients undergoing CT surgery from the Sapphire and Topaz studies. Subjects were enrolled and samples obtained within 24 hours of ICU admission. We constructed receiver operating characteristic (ROC) curves using urinary [TIMP2]•[IGFBP7] for prediction of moderate to severe AKI within 12 hours. Analyses were done for each study separately and then pooled data was used for analysis. We also examined the relative risk for AKI using a pre-specified cutoff for [TIMP2]•[IGFBP7] of 0.3.
Results: There were 105 and 55 CT surgery patients in Sapphire and Topaz, respectively. Demographics for the two studies were similar. Overall, 14 patients (9%) reached the endpoint of AKI. The area under the ROC curve (AUC) for Sapphire (KDIGO stage 2-3) was 0.81 (95% CI 0.60-1.00, p=0.004) and for Topaz was 0.89 (95% CI 0.81-0.98, p<0.0001). The AUC for the pooled analysis was 0.86 (95% CI 0.76-0.97, p<0.0001); the relative risk for AKI above the 0.3 cutoff was 7.0 (95% CI 1.6-30.2, p=0.003).
Conclusions: For CT surgery patients, the urinary [TIMP2]•[IGFBP7] test accurately identifies patients at risk for developing AKI within the subsequent 12 hours.

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37. The Commonly Used Surrogates For Baseline Renal Function In Acute Kidney Injury Diagnosis

Wisit Cheungpasitporn[1], Charat Thongprayoon[1], Wonngarm Kittanamongkolchai[1], Patompong Ungprasert[1], Narat Srivali[1], Kianoush Kashani[1]

[1]Mayo Clinic, Rochester, MN

Background and objectives: Baseline serum creatinine (SCr) level is frequently missing in clinical practice. This study aimed to investigate the effect of varied methods of baseline SCr determination on acute kidney injury (AKI) diagnosis, and prediction of 60-day mortality in critically ill patients.
Design, setting, participants, & measurements: This is a single-center retrospective study conducted at a tertiary referral hospital. All adult intensive care unit (ICU) patients admitted January 1 through December 31, 2011, with at least one measured SCr value during ICU stay, were included in this study. The baseline SCr was considered either an admission SCr (SCrADM) or an imputed SCr, using Modification of Diet in Renal Disease (MDRD) formula, based on an assumed glomerular filtration rate (GFR) of 75 ml/min/1.73m2 (SCrGFR-75). Determination of AKI was based on the Kidney Disease: Improving Global Outcomes (KDIGO) SCr criterion. The primary outcome was 60-day mortality after ICU admission.
Results: Out of 9,277 ICU patients, 7,772 patients were included in the analysis. AKI was detected in 1,277

(16.4%) using the SCrADM and 2,329 (30.0%) using SCrGFR-75 (P<.001). Compared with patients without AKI regardless of baseline SCr methodology, the 60-day mortality risk of patients who developed AKI using the SCrADM and SCrGFR-75 was significantly increased (OR=3.62; 95% CI, 2.95-4.44). Similarly, the risk of 60-day mortality in patients who met AKI criteria using either SCrADM or SCrGFR-75 but not the other was significant higher than in patients without AKI (OR = 2.46; 95% CI, 1.71-3.46 using SCrADM and OR = 1.47; 95% CI, 1.19-1.81 using SCrGFR-75). The C-statistic for 60-day mortality of SCrADM and SCrGFR-75 as baseline SCr were 0.63 and 0.67, respectively (P=.001).
Conclusions: The use of an imputed SCr, as a surrogate for baseline kidney function, can detect more AKI cases and provides better predictive ability for 60-day mortality when compared to admission SCr. We suggest using the MDRD formula backward estimation when baseline outpatient SCr measurements are not available.

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38. Role of NA/K Citrate in Prevention of Contrast Induced Acute Kidney Injury following Cardiac Catheterization

Hala S El-Wakil[1], Salah Naga[1], Mohamed Loutfi[1], Ahmed Shehata[1]

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Introduction and aim: Contrast-induced acute kidney injury (CI-AKI) is caused by intravenous or intra-arterial administration of a contrast medium and represents one of the leading causes of acute kidney injury. Treatment of CI-AKI is exclusively supportive and different approaches for prevention of this complication have been tested. Aim of the present study is to assess the role of Na/K citrate in prevention of CI-AKI among patients undergoing cardiac catheterization.

Methods: This study included 200 adult patients undergoing coronary catheterization. Patients were randomly selected as 1:1 basis and divided into two equal groups,group I received the conventional preventive measures in addition to Na/K citrate (Study group), while group II received conventional preventive measures only (Control group). Na/K citrate was given in a dose of 5 gm of granules diluted in 200 mL of water one hour before the contrast material is injected and Four hours after the administration of the first dose. The study was conducted in accordance with the ethical guidelines of the 1975 Declaration of Helsinki and an informed consent was obtained from each patient.
Laboratory investigations included renal functions, lipid profile tests and complete urine analysis including albumin to creatinine ratio and urine PH. Serum creatinine level were repeated 48 hours after the intervention to diagnose the occurrence of CI-AKI. Echo-cardiogram and assessment of risk score for prediction of CI-AKI. Catheter related factors were investigated.

Results: The incidence of CI-AKI was 7% in study group in contrast to 27% in control group with statistical significant difference (P=0.00). The urine PH in study group before Na/K citrate ranged between 5.6-6.5 with a mean of 6.06±0.28 while after Na/K citrate, it ranged between 6.5-7.7 with a mean 7.27±0.27 with significant level (P=0.00). Low urine PH, low ejection fraction and high contrast material volume were significantly associated with the occurrence of CI-AKI. On the other hand, Mahran score, cholesterol, LDL cholesterol, triglyceride levels as well as urinary albumin level were poorly related to occurrence of CI-AKI.

Conclusions: Na/K citrate has a beneficial role in prevention of CI-AKI among patients undergoing cardiac catheterization. Further studies to confirm the underlying mechanisms for the protective role of Na/K citrate should be encouraged.

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39. Common Chronic Comorbid Conditions Do Not Affect Performance Of Cell Cycle Arrest Biomarkers For Risk Stratification Of Acute Kidney Injury

Michael Heung[1], Luis M Ortega[2], Lakhmir S Chawla[3], John A Kellum[4]

[1]University of Michigan, [2]Allegheny General Hospital, [3]George Washington University, [4]University of Pittsburgh

Introduction
Identification of acute kidney injury (AKI) can be challenging in patients with underlying chronic disease, and biomarkers often perform poorly in this population. Diabetes mellitus (DM) and chronic kidney disease (CKD) are both risk factors for AKI and possible confounders for biomarkers. We recently reported data from two multi-center studies of 728 (Sapphire) and 408 (Topaz) critically ill patients where a panel of urinary tissue inhibitor of metalloproteinases-2 (TIMP2) and insulin-like growth factor-binding protein 7 (IGFBP7), both markers of cell cycle arrest, were validated for risk stratification for moderate to severe AKI (KDIGO stages 2 and 3). Here we report performance characteristics of this novel biomarker panel ([TIMP2]•[IGFBP7]) in patients with DM, CKD, or both.

Methods
We conducted subgroup analyses of patients with DM and CKD with or without AKI from the Sapphire and Topaz studies. We constructed receiver operating characteristic (ROC) curves using urinary [TIMP2]•[IGFBP7] for prediction of moderate to severe AKI within 12 hours. We also examined the relative risk (RR) for AKI using a pre-specified cutoff for [TIMP2]•[IGFBP7] of 0.3. Biomarker concentrations were also measured in 378 apparently healthy subjects.

Results
There were 326 patients with DM, 97 patients with CKD, and 50 patients with both DM and CKD in the combined Sapphire and Topaz studies . Demographics for the two studies were similar. Overall, 56 patients (15%) developed moderate-severe AKI. The area under the ROC curve was 0.83 (95%CI 0.77-0.89), 0.91 (95%CI 0.85-0.97), and 0.89 (95%CI 0.80-0.99), respectively, for patients with DM, CKD, and both DM and CKD. The RR for AKI above the 0.3 cutoff was 13 (95%CI 4-40), 32 (95%CI 2-530), and 22 (95%CI 1-361), respectively, for patients with DM, CKD, and both DM and CKD. In the absence of AKI, neither DM nor CKD nor both resulted in [TIMP2]•[IGFBP7] distributions above those for apparently healthy subjects.

Conclusions
For patients with underlying comorbidities, DM, CKD, or both, urinary [TIMP2]•[IGFBP7] levels are not elevated in the absence of AKI and the test accurately identifies patients at risk for developing AKI within 12 hours in these populations.

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40. Follow-up Renal Assessment of Injury Long-term after Acute Kidney Injury (FRAIL-AKI)

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Background: Novel urinary renal damage biomarkers detect acute kidney injury (AKI) after cardiac surgery utilizing cardiopulmonary bypass (CPB-AKI). Although there is growing focus to determine if AKI truly leads to chronic kidney injury and chronic kidney disease (CKD), no studies to date have assessed if novel urinary biomarkers remain elevated long-term after CPB-AKI.

Objectives: The goal of this study was to assess if there was clinical or biomarker evidence of long-term kidney

injury in patients who experienced AKI after cardiac surgery utilizing cardiopulmonary bypass.

Methods: We performed a cross-sectional evaluation for signs of chronic renal injury using both traditional measures and novel urinary biomarkers, using a population of 372 potentially eligible children [119 AKI positive, 253 AKI negative] who underwent cardiopulmonary bypass surgery (CPB) for congenital heart disease at Cincinnati Children's Hospital Medical Center from 2004-2007. Fifty-two [33 AKI positive, 18 AKI negative] patients agreed to long-term assessment.

Results: At long-term follow-up (mean 7 years; SD 0.98), AKI positive and negative patients had similarly normal assessments of kidney function by eGFR, proteinuria, and blood pressure measurement. However, AKI positive patients had higher urine concentrations of IL-18, KIM-1, and L-FABP; but lower urine NGAL concentrations compared to AKI negative patients (Figure).

Conclusions: Novel urinary biomarkers could serve as a more sensitive marker of chronic kidney injury following CPB-AKI. Future studies are needed to understand the clinical relevance of persistent elevations, as observed with KIM-1 and IL-18, when assessing for potential long-term renal consequences of CPB-AKI.

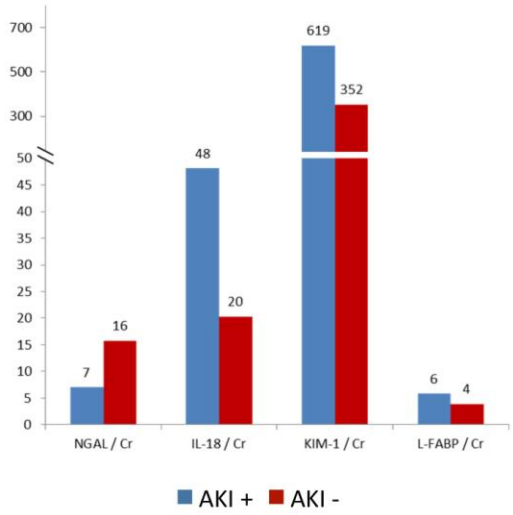

Figure - Comparison of Novel Urinary Biomarkers at Long-term Follow-up

At the time of longitudinal follow-up, AKI positive patients had higher urinary concentrations of IL-18 (p=0.005), KIM-1 (p=0.03), and L-FABP (p = 0.001) but lower urine NGAL concentrations (P = 0.006) compared to AKI negative patients. AKI = Acute Kidney Injury; KIM = Kidney Injury Molecule; L-FABP = Liver Fatty Acid Binding Protein; NGAL = Neutrophil Gelatinase-Associated Lipocalin

41. Prediction of The Development of Delayed Graft Function Using Acute Kidney Injury Criterion In Kidney Transplantation From Deceased Donors

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Purpose: In this study, we investigated the development of delayed graft function in kidney transplantation (KT) from deceased donors (DD) according to the severity of acute kidney injury based on various acute kidney injury criterias.
Methods: We analyzed 204 renal transplant recipients who took kidney from 156 deceased donors. We calculated the AKI stage of deceased donor according to KDIGO or RIFLE criteria and compared the predictability for the development of delayed graft function (DGF) and the change of allograft function
Results: In both equations, DGF more frequently developed than in the non-AKI group In the AKI group, ($p < 0.05$) and allograft function assessed by the Modification of Diet in Renal Disease (MDRD) equation showed a significantly deteriorating pattern at 2 weeks and 1, 3, and 6 months after KT compared to that in the non-AKI group ($p < 0.05$, comparison at each time point). In ROC analysis, RIFLE criteria showed higher predictability compared to KDIGO criteria in the prediction of the development of DGF. In both criteria, allograft function at 12 months from KT and long-term allograft and patient survival rates did not differ between the AKI and non-AKI groups.
Conclusions: In DDKT, the RIFLE criteria showed superior prediction for the development of DGF compared to KDIGO. However no difference was detected in the prediction of allograft function during long term follow up.

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42. Better Early, Late, or Never? Continuous Renal Replacement or Rhabdomyolysis Induced Acute Kidney Injury

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[1]R Adams Cowley Shock Trauma Center University of Maryland Medical Center

BACKGROUND: Continuous renal replacement therapy (CRRT) has been used for the treatment of rhabdomyolysis induced renal failure; however, timing of initiation has not been demonstrated to change outcome and thus is a focus of our study.

METHODS: In a retrospective, case-control study, all trauma patients presenting to the Emergency Department (ED) over a 5 year period with rhabdomyolysis, with a creatinine kinase exceeding 5,000 IU/L, were analyzed based on timing of CRRT, mortality, outcomes, and trends.

RESULTS: Of 369 patients with rhabdomyolysis, 48 (13%) received CRRT (cases). Cases were matched in a 1:4 ratio with 194 control patients who did not receive CRRT. The mean ISS in CRRT group was 29.4 (standard deviation,SD,15.4) compared to 25.9 (SD13.2) in the control. The ICU length of stay (35.3 days vs 15.5, SD 22.2 vs 12.3, P<0.0001) and overall length of stay (26.4 days vs 9.8, SD 27.9 vs 13.5, P<0.0001) was higher in the CRRT verses control group. Mortality was higher in the CRRT group (33.3% vs 9.8%, P<0.0001) and mainly in the first 24 hours (17%). 35.4% of the CRRT group were discharged or died on CRRT. Only ISS was an independent risk factor for death, regardless of CRRT (OR 1.06, CI 1.03-1.10, P<0.0001). The unadjusted risk factor for death between cases and controls was higher in CRRT (OR 4.61, CI 2.1-9.89).
In the CRRT group, BUN peak (67.5 vs 25.5, P<0.0001), creatinine peak (3.88 vs 1.73, P<0.0001), and peak K+ (6.2 vs 5.0, P<0.0001) were all statistically significantly higher compared to controls. The base deficit peak (-9.6 vs +2.8, P<0.0001), creatinine kinase peak (55087 vs12557, P<0.0001), and peak myoglobin (60605 vs 6401,

P<0.0001) were all significantly higher in the CRRT group.
Of those requiring CRRT, early verses late initiation of CRRT showed no difference in length of stay, mortality, duration of CRRT, or HD requirement at discharge.

CONCLUSIONS: Patients who received CRRT were more critically ill, had greater elevation of serum markers for acute kidney injury (AKI), and a higher severity of rhabdomyolysis compared to controls. The initiation of CRRT may predict higher mortality and length of stay in AKI. In this cohort, timing of CRRT did not change mortality, outcome, or duration on CRRT. Dosing, setting, and technical aspects pertaining to CRRT may contribute to outcome. Larger prospective studies are indicated to determine efficacy and timing of CRRT.

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43. LONGER SESSIONS OF POLYMYXIN-B IMMOBILIZED FIBER COLUMN HEMOPERFUSION (PMX) AMELIORATE RENAL OUTCOME AND MORTALITY IN SEPTIC SHOCK WITH ACUTE KIDNEY INJURY

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Aim: PMX could stabilize hemodynamics and improve clinical outcome in septic shock by adsorption of inflammatory cytokines. PMX was already reported to be beneficial for abdominal septic shock after surgery (EUPHAS study, JAMA 2009). Moreover, this column has also been reported to keep efficient adsorbing endotoxin over 24 hours. However, it has not been determined that therapeutic optimization of PMX for septic shock, those infected sites had been surgically uncontrollable or undetectable. In a recent study from Japan, mortality in non-surgical septic shock with each 2 hours-PMX session twice was 64.7 %. The aim of this study was to evaluate whether longer sessions of PMX ameliorated clinical outcome of septic shock and AKI without surgical control.
Methods: Consecutive 11 cases with non-surgical septic shock and AKI that required renal replacement therapy (RRT) from 2007 to 2014 were included. All cases needed inotropic agents and PMX was performed longer than 4 hours. Sequential Organ Failure Assessment (SOFA) score at the initiation of PMX, change in mean blood pressure (mBP) and inotropic score (IS), 28-days mortality and renal outcome were evaluated.
Results: Median age of the cases was 64 (42-93). Gram negative bacteria were cultured in 8 cases. Eight needed mechanical ventilation. Median SOFA score at the initiation of PMX was 13 (6-22). Classifying by KDIGO AKI criteria, 9 were stage 3 immediately before PMX initiation. Median summed duration of PMX was 21.5 (10-43.5) hours. Compared with the time of PMX initiation, median mBP increased from 67.0 mmHg to 78.5 mmHg at 72 hours later (P<0.05). IS decreased from 20 to 0 (P<0.05). Median Serum creatinine decreased from 2.45 mg/dl to 0.80 mg/dl at 28-days or discharge (P<0.05) and mortality was 27.2 % (9/11). All deceased cases had active malignancy.
Conclusion: This study could show longer sessions of PMX combined with RRT drastically improved mBP, use of inotropic agents, renal function and survival rate in cases with non-surgical septic shock and AKI via not only continuous adsorption of inflammatory factors in both upstream and downstream of septic cascade but also correction of fluid and acid-base imbalances and uremia.

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44. Acute Kidney Injury After Transcatheter Aortic Valve Replacement: A Meta-Analysis

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Background/Objectives: The objective of this meta-analysis was to evaluate the risk of acute kidney injury (AKI) in patients who underwent transcatheter aortic valve replacement (TAVR).

Methods: A literature search was performed using MEDLINE, EMBASE, and Cochrane Database of Systematic Reviews and clinicaltrials.gov from inception through October, 2014. Studies that reported relative risks, odd ratios or hazard ratios comparing the AKI risk in patients who underwent TAVR versus those who had surgical aortic valve replacement (SAVR), were included. We performed the pre-specified sensitivity analysis including only propensity score-based studies. Short and long-term mortality risk was evaluated among the studies that reported AKI outcome. Pooled risk ratios (RR) and 95% confidence interval (CI) were calculated using a random-effect, generic inverse variance method.

Results: 3 randomized controlled trials (RCTs) with 1852 patients and 14 cohort studies with 3113 patients were enrolled in analysis to assess the risk of AKI in patients undergoing TAVR. The pooled RRs of AKI in patients undergoing TAVR were 0.65 (95% CI, 0.36-1.15, I2=75%) in analysis of RCTs and 8 studies with propensity score analysis and 0.76 (95% CI, 0.44-1.34, I2=79%) in analysis of observational studies. Sensitivity analysis in RCTs and studies with propensity score analysis using standard AKI definition demonstrated a significant association between TAVR and lower incidence of AKI (RR: 0.35; 95% CI 0.25-0.50, I2=0%). Our meta-analyses of RCT and studies with propensity score analysis did not find associations between TAVR and reduced risks of severe AKI requiring dialysis (RR: 0.82; 95% CI 0.38-1.79, I2=63%) and short-term mortality (RR: 0.84; 95% CI 0.56-1.26, I2=9%). However, we found a significant reduced long-term mortality in patients who underwent TAVR compared to patients who had SAVR with a pooled RR of 0.72 (95% CI, 0.52-1.00, I2=55%) in the meta-analysis of RCTs and studies with propensity score analysis.

Conclusions: Our meta-analysis demonstrates an association between TAVR and lower risks of AKI and long-term mortality compared to SAVR.

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45. Is Continuous Renal Replacement Therapy Beneficial in Management of Septic Acute Kidney Injury?

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Background: Sepsis is the most common cause of acute kidney injury (AKI) and patients with septic AKI have an increased risk for death. Continuous renal replacement therapy (CRRT) is regarded as preferential treatment modality for septic AKI. We evaluated the beneficial effect of CRRT in management of septic AKI patients.
Methods: We retrospectively reviewed demographic data, microbiology, clinical manifestations, and outcomes of the AKI patients at intensive care unit (ICU) of Myongji hospital during a 10-year period from 2003 to 2012. We divided the study patients into two groups according to CRRT provision; CRRT and CRRT-free.
Results: During the study period, there were 766 critically ill patients with AKI. Among them, 377 underwent CRRT. The patients in the CRRT group were younger than the CRRT-free group (67.3 vs. 69.8 years). There were more patients with congestive heart failure, chronic kidney disease, and liver cirrhosis in CRRT group, and there were more patients with cerebrovascular disease in CRRT-free group. The patients in the CRRT group

showed higher APACHE 2 score and pro-BNP, and lower Glasgow coma scale, mean arterial pressure, platelet count compared to the CRRT-free group. Blood culture was drawn in 88.3% of the CRRT group and it was similar to the CRRT-free group. There were more culture-positive patients in the CRRT group than the CRRT-free group (37.5% vs. 26.9%). However, the spectrum of microbiology, proportion of multidrug-resistant strains, and the primary focus of infection were not different between the two groups. While cephalosporin or quinolone monotherapy was common in the CRRT-free group, more powerful antibiotics such as vancomycin, tazobactam, or imipenem was frequently used in the CRRT group. In addition, glycopeptides-based combination therapy was common in this group. The CRRT group showed worse renal function, longer ICU stay and higher mortality. Conclusion: Although there was no difference in microbiology and the primary focus of infection according to CRRT provision in the septic AKI patients, we usually used more powerful antibiotics in patients treated with CRRT. Despite of the higher culture positivity and allowance of use of more potent antibiotics, CRRT did not improve clinical outcomes in the septic AKI patients.

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46. Dichloroacetate (DCA) Prevents Cisplatin-Induced Acute Kidney Injury (AKI) By Regenerating Renal Tubular Cells

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Background and Aim
Cisplatin-induced nephrotoxicity is a common side effect of cisplatin cancer therapy that is caused by the death and shedding of proximal convoluted tubular cells leading to AKI. In preliminary studies we found that DCA, a novel anti-cancer agent, protects the kidney from cisplatin-induced AKI. In this study we investigated the mechanism of AKI prevention.
Methodology
Groups of male 8 week old balb/c mice ($n \geq 6$) were either pre-treated with saline or DCA (250 mg/kg) daily for five days and then administered cisplatin intraperitoneally (20mg/kg). Saline- and DCA-only groups were also included as controls. 72 hours after cisplatin administration kidney injury markers in serum and urine (creatinine (SCr), blood urea nitrogen (BUN), γ-glutamyltranferase (GGT), N-acetyl-β-(D)-glucosaminidase (NAG) and tumor necrosis factor (TNFα)) were measured. Kidney histology (H&E), apoptosis (caspase 3 and TUNEL assays) and cellular proliferation (BrdU staining) were also assessed.
Results
The extensive proximal tubule damage and elevation in SCr and BUN evident in cisplatin only-treated mice was significantly alleviated in mice co-treated with cisplatin and DCA (SCr 1.9±0.2 vs 0.6 ±0.1 mg/dl, $p < 0.0001$; BUN 46.4±3.2 vs 27.1±1.8 mg/dl, $p < 0.0001$). The TNFα level in serum was significantly elevated over controls to similar levels in both the cisplatin only and DCA co-treated groups (28.3±2.3 pg/ml vs 29.8±5.1 pg/ml). The urinary NAG/Crt (23.50 ± 2.6 pg/ml vs 5.4 ± 0.7, $p<0.0001$) and GGT/Crt (2.7±0.19 vs 1.4±0.3 pg/ml, $p<0.01$) ratios were significantly increased in the cisplatin/DCA co-treatment group compared to the cisplatin only group. Compared to cisplatin-only treated mice, DCA preserved cellular integrity as assessed histologically and prevented apoptosis with reduced kidney caspase 3 activity (1775 ± 162.3 RFU/mg vs 1233 ± 143.1 RFU/mg, $P<0.05$) and significantly fewer TUNEL+ cells in kidney sections of DCA/cisplatin co-treated mice. DCA co-treatment resulted in a significantly higher proportion of BrdU+ cells compared to the cisplatin only group (98±11vs 60±4 cells/mm2, $p<0.05$).
Conclusion
DCA protected mice from cisplatin-induced nephrotoxicity. Renal Tubule cell damage and apoptosis were significantly ameliorated by DCA administration and appears to be due to apoptosis inhibition and enhanced regeneration of tubule cells. DCA is a promising anti-cancer agent and this work supports its translation for clinical use in conjunction with cisplatin.

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47. Withdrawn

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48. Involvement of Autophagy Activation in Tubular Cell Protection Against Ischemia/Reperfusion-induced Acute Kidney Injury in Transgenic Mice Overproducing Omega-3 Polyunsaturated Fatty Acids

Won Min Hwang[1], Se Hee Yoon[1], Sungro Yun[1], Young Ok Kim[2], Ho Cheol Song[2]

[1]Department of Nephrology, College of Medicine, Konyang University, [2]Division of Nephrology,Department of Internal Medicine, The Catholic University of Korea

Backgound: The exogenous supplement of omega-3 poly-unsaturated fatty acids (ω-3 PUFAs) might prevent tubular cell damage induced by renal ischemia/reperfusion-induced acute kidney injury (AKI). In accordance with these studies, we recently elucidated that elevated level of endogenous ω-3 PUFA suppressed AKI-induced renal tubular damages by using fat-1 transgenic mice overproducing ω-3 PUFA. However, underlying mechanisms beneath these beneficial effect is largely unknown.
Methods : We demonstrated that significant enhancement in autophagy activity was seen in fat-1 mice compared with control by performing ultrastructural observation of autophagosomes and biochemical analysis of beclin-1 and microtubule-associated protein 1A/1B-light chain 3 (LC3) expression.
Results: At 30 minutes after AKI challenges, obvious elevation of autophagy signals were clearly observed in control mice. Meanwhile, postoperative changes in levels of autophagy activity were hardly detectable in fat-1 mice. Most importantly, protective properties against AKI-induced tubular damage in fat-1 were seriously abolished by intraperitoneal injection of 3-MA, an autophagy inhibitor.
Conclusion : Taken together, we might suggest that basal autophagy activation possibly contributes to protective effect of ω-3 on AKI-induced renal damages.

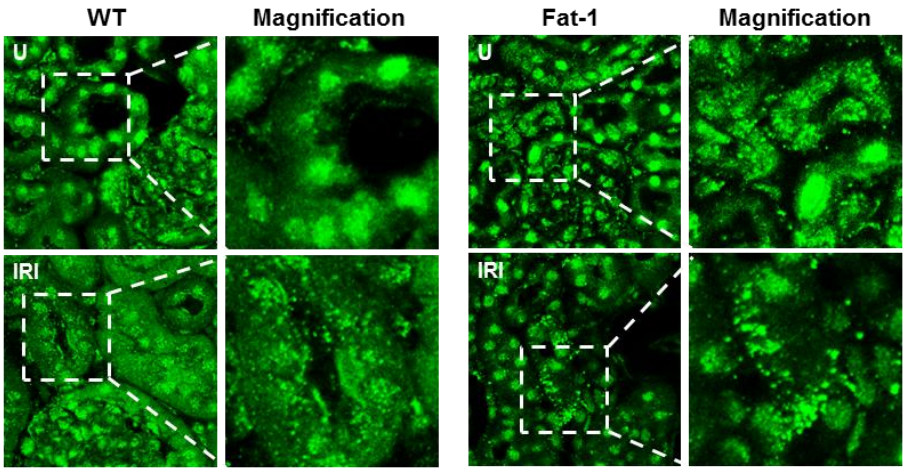

Figure. Demonstration of basal autophagy activation in fat-1 mice renal tubular cells by laser confocal microscopic observation of anti-LC3 immunoreactivities

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49. The (DoReMIFA) Dose Response Multicenter Investigation Fluid Assesment: management of fluids in ICU

F Garzotto[1], A Lorenzin[1], D Martín-Langerwerf[2], L Cachafeiro[3], R Robert[4], A Marinho[5], M Ostermann[6], J Teng[7], C Tetta[8], C Ronco[1]

[1]St. Bortolo Hospital and IRRIV (On behalf of the Doremifa Investigators), [2]Hospital Universitario del Vinalopó, Servicio de Medicina Intensiva, Elche, Spain, [3]Hospital La Paz, Servicio de Medicina Intensiva, Madrid, Spain, [4]CHU de Poitiers, Service de Réanimation Médicale, Poitiers, France, [5]Hospital Do Porto, Dp. Anestesia e Cuidados Intensivo, Porto, Portugal, [6]Guy's & St Thomas NHS Foundation, Dp. Adult Critical Care, London, United Kingdom, [7]Zhongshan Hosp, Shanghai, China, [8]Fresenius Medical Care, Bad Homburg, Germany

Introduction

Acute kidney injury (AKI) is associated with high mortality and significant health resource utilization. 5-6 % of ICU patients also requires renal replacement therapy (RRT). Recent data highlight the importance of fluid balance in patients with AKI. Moreover dangerous thresholds (10% and 20%) are associated with increasing mortality. In general, a positive cumulative fluid balance portends higher morbidity and an increased risk for worse clinical outcome. Fluid balance should be recognized as a potentially modifiable biomarker and determinant of clinical outcome in these patients.

Methods

We developed an observational, prospective, multicenter study (DoReMIFA) on critical ill patients. Of the 1636 patients recorded we calculated the daily percentage of FluidOverload (FO%) as the cumulative daily Fluid Balance (intake-out) on patient weight. The maximum (M_FO%) has been extracted among 4 categories: Overall, no AKI, AKI (RRT not included), RRT patients. We also analyzed the mortality among these groups. Results are reported as median, 25 and 75 percentiles and non-parametric Kruskal-Wallis test with Bonferroni correction has been applied.

Results

Our results show an higher percentage of patients treated with CRRT (11.5%) if compared with literature (5-6%). As show in Figure 1 the M_FO% is appreciably low in each group. None of the 75 percentile exceed the 20% with the worst value (15.2%) reached by RRT group. M_FO% is under 20% and 10% respectively on 94.1% and 82.0% of all patients. M_FO% significantly characterize the 3 groups ($p < 0.001$). At the end of the CRRT (Figure2) median FO% decrease to 3.3% from 8.0% ($p<0.05$). Mortality is strongly correlated with the median M_FO% value. The days in which FO is > 5% is also significatively different in the 3 groups.

Conclusions

Despite a relatively high level of cumulative FO% for RRT patients (Median 8%, IRQ: 2.8% -15.2%), both the high number of patients treated with extracorporeal therapies and an overall low fluid accumulation seems to reflect, for the first time, a careful and accurate fluids management in all the ICUs. CRRT was also effectively used to reduce FO% while Mortality (51.3%) remains high for overloaded patients.

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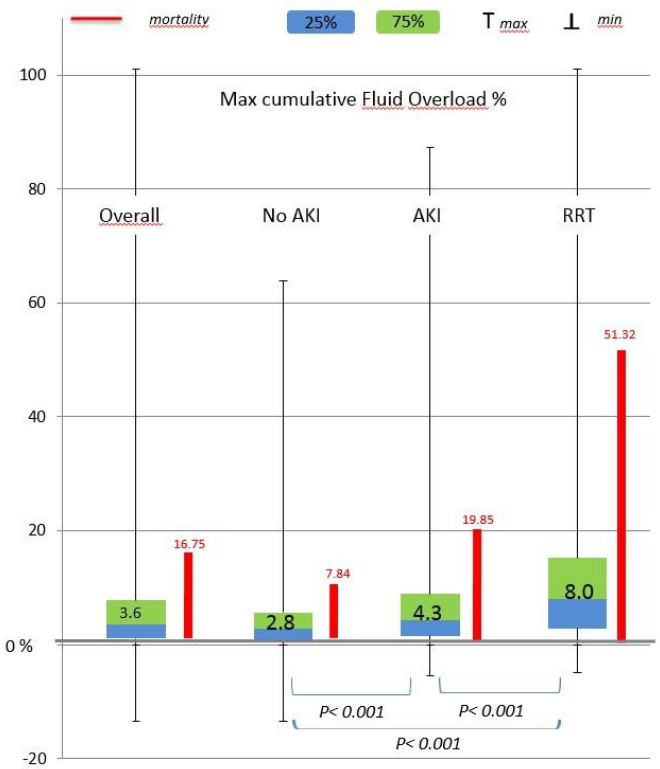

Figure 1

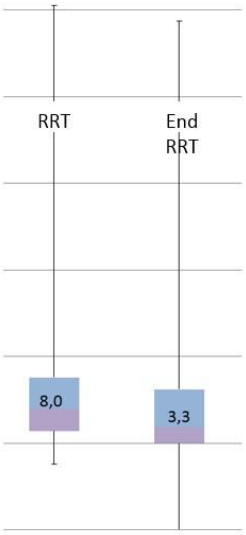

Figure 2

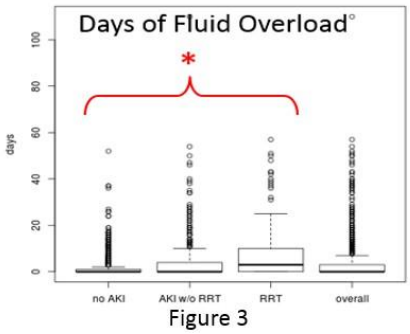

Figure 3

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50. Even Modest Fluid Overload is Associated with Mortality in Critically Ill Patients with Acute Kidney Injury

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[1]*The Center for Critical Care Nephrology, CRISMA, Department of Critical Care Medicine, University of Pittsburgh*

Purpose: Although positive fluid balance is associated with poor outcome in patients with acute kidney injury (AKI), the magnitude of this association is uncertain. We examined the association between fluid balance and risk-adjusted hospital mortality among critically ill patients with AKI.

Methods: We analyzed a large intensive care unit (ICU) dataset involving adults admitted to a tertiary care academic medical center over 8-year period. Cumulative daily fluid balance was calculated until the end of the ICU stay or initiation of renal replacement therapy divided by hospital admission weight expressed as percentage. Fluid overload (FO) was defined as > 5% weight gain from hospital admission and AKI according to the KDIGO criteria. We constructed propensity score to account for indication bias for fluid administration using age, sex, body mass index, race, comorbidity, malignancy, surgery, severity of illness score, baseline creatinine, use of vasopressors and mechanical ventilation; suspected sepsis, oliguria, hypotensive index, and AKI in the first 24 hours of ICU admission. Patients with > 5% FO were propensity matched with 3 controls. We also examined the association between fluid balance and mortality in the non-matched cohort using logistic regression.

Results: Of 13,358 patients, the distribution of cumulative fluid balance for <0%, 0%-5%, and > 5% body weight was 81.8%, 13.3%, and 4.9%, respectively. The corresponding mortality rate was 10.6%, 17.4%, and 29.7%,

respectively (P<0.001). The distribution of AKI was: 80%, 85.7%, and 91%, respectively. After matching, patients with FO had two-fold higher mortality compared with controls (30.7% vs. 15%, P<0.001). After accounting for differences in age, sex, comorbidity, AKI, surgery, severity of illness and the propensity score, FO > 5% compared with 0%-5% balance, was associated with increased mortality (adjusted OR, 1.63, 95% CI, 1.24 - 2.15; P<0.001). Whereas, <0% balance, compared with 0%-5% balance, was associated with lower mortality (adjusted OR, 0.82. 95%CI, 0.69-0.98; P=0.034).

Conclusion: Fluid balance has variable association with mortality in critically ill patients with AKI. While modest fluid overload is associated with increased mortality, negative balance is associated with lower mortality.

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51. Advance Prediction of AKI Based on EHR Data

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STUDY PURPOSE: Acute kidney injury (AKI) has long been recognized as an important hospital problem. To test the hypothesis that AKI is predictable in advance based on electronic health record (EHR) data, a retrospective analysis of hospital inpatients was performed to develop a predictive model for identifying patients that are at-risk for AKI. METHODS USED: All adult, non-prisoner inpatient hospital encounters for a full calendar year at the Ohio State University Wexner Medical Center were initially eligible for inclusion in the study. Occurrences of AKI were determined by applying the AKI Network Level 2 and 3 criteria. Study encounters were selected by applying a monitoring criterion related to the availability of a 6-hour urinary output rate and serum creatinine concentration difference from baseline. 878 AKI encounters were selected for which the monitoring criterion was met for 6 or more hours immediately prior to the first AKI event. 5096 control encounters were selected for which there was a period of 6 or more hours during which the monitoring criterion was met. A study database was populated with the following data types for each study encounter: demographic data, medications administered, lab test results, urinary output rates, vital measurements, present-on-admission (POA) diagnoses, problem list diagnoses and procedures performed. Statistical optimization routines were applied to select the risk factors that were most predictive of a future occurrence of AKI with a goal of predicting AKI 24 hours in advance of its occurrence. Selected risk factors were employed in a logistic regression model to produce an AKI risk index on a scale of 0 to 100. The risk index was derived from two-thirds of the study data and the remaining one-third was employed for performance evaluation. RESULTS: The selected risk factors and their multiplicative contributions to the odds of a future AKI event are reported in the included table. The risk index derived from the selected risk factors was very effective at predicting the future occurrence of AKI as evidenced by an 85% area under the receiver-operator characteristic (ROC) curve at 6 hours prior to the AKI event. Areas under the ROC curve were 84% at 12 hours prior and 89% at 24 hours prior to the AKI event. CONCLUSIONS: Based on the results of this study, it is concluded that patients who are at-risk for AKI can be identified in advance based on data typically stored in an electronic health record (EHR) system.

RISK FACTOR	MULTIPLICATIVE CONTRIBUTION TO ODDS OF AKI
Open Heart Surgery	4.67
Patient Weight (doubling)	3.88
Ventilator Use	3.11
6-Hr Urinary Output < 0.9 ml/kg/hr	2.72
Low Blood Pressure (past 48 hrs)	2.35
Congestive Heart Failure POA	2.07
Nutritional Deficiencies POA	1.91

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52. AMPK Activator AICAR Attenuates Acute Kidney Injury in Experimental Model of Sepsis

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Background: Sepsis-associated AKI is frequently observed in the ICU and its presence confers increased mortality. The lack of complete understanding of its pathogenesis and treatment is a significant barrier to progress.

Purpose: Utilize rodent model of sepsis to investigate the pathogenesis of sepsis-induced AKI and evaluate therapies targeting renal oxygenation and mitochondrial dysfunction.

Methods: Using a rodent model of cecal ligation and puncture (CLP), we assessed renal function, mitochondrial oxygen consumption, ATP generation and molecular assays to examine mitochondrial function 24 hours post-injury. 5-aminoimidazole-4-carboxamide ribonucleotide (AICAR), a stimulator of AMP-dependent protein kinase, was administered at a dose of 200 mg/kg 24 hours prior to CLP surgery to determine if sepsis-induced kidney injury could be mitigated.

Results: Data presented as mean±sem. GFR was significantly reduced in CLP mice (345±19 uL/min vs. 155±35 uL/min; p=0.004). Mitochondria from CLP animals exhibited no difference in rates of coupled and uncoupled respiration, but ATP generation measured in the same samples was significantly lower, along with decreased expression of complex III and complex IV. CLP mitochondria also demonstrated increased fission (increased DRP-1 expression), decreased biogenesis (decreased PGC-1a expression) and reduced AMPK expression. AMPK activation with AICAR significantly improved GFR post-CLP compared to untreated mice (267±24 uL/min vs. 155±35 uL/min, p=0.02).

Conclusions: Renal mitochondria in the setting of sepsis demonstrate dissociation between oxygen consumption and ATP generation. Additionally, mitochondria from septic animals exhibit increased fission and reduced biogenesis. Lower AMPK levels may be the primary event leading to mitochondrial dysfunction. Treatment with AICAR, an AMPK activator, diminishes acute kidney injury in septic mice. Specific downstream pathways including biogenesis, fission-fusion balance and autophagy to explain mitochondrial dysfunction and response to AMPK activation are being examined.

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53. Kidney Injury Molecule 1 (KIM-1) as a Biomarker for Contrast-Induced Acute Kidney Injury

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Introduction and aim: Contrast-induced acute kidney injury (CI-AKI) is caused by intravenous or intra-arterial administration of a contrast medium and represents one of the leading causes of acute kidney injury. Early detection of CI-AKI is crucial and different biomarkers for detection of this complication have been tested. KIM-1 as one of these biomarkers for AKI is a type 1 transmembrane glycoprotein that is normally expressed in kidney tissue. It shows marked up regulation in proximal renal tubular cells in response to ischemic or nephrotoxic AKI. Aim of the present study is to assess the role of KIM-1 in early diagnosis of CI-AKI among patients undergoing coronary angiography.
Methods: This study included 40 patients undergoing coronary angiography. Based on creatinine criteria of CI-AKI, patients were classified into two groups:
• Group 1: included 20 patients with CI-AKI as a study group.
• Group 2: included 20 patients without CI- AKI as a control group

AKI was defined as an increase in serum creatinine (SCr) of ≥ 0.3 mg/dl or ≥ 1.5 times baseline SCr within 48 h per 2012 KDIGO guidelines.
Exclusion criteria included CKD stage 5, advanced congestive heart failure, history of reaction to contrast medium, and use of potentially nephrotoxic medicines.
Serum KIM-1 was assessed by ELISA before and 6 hours after administration of the contrast material in coronary angionpraphy.
Results:
Serum KIM-1 in CI-AKI group, 6 hours after the administration of the contrast increased to 1.78±0.44 ng/mL in comparison to basal value which was 1.54±0.07ng/mL, while in non CI-AKI group the post KIM-1 increased to 2.25±1.48ng/mL in comparison to basal value which was 1.87±0.79ng/mL. There were no significant differences in the pre, post values as well as the delta of KIM-1 between the CI-AKI and non CI-AKI groups(p=0.07,0.17,0.0.93 respectively).
Conclusion:
Serum KIM-1 could not be used as a biomarker to diagnose early cases of CI-AKI. Other biomarkers as NGAL, Cystatin C, IL18 should be studied in larger studies.

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54. Role of AMPK Activation in the Renal Response to Sepsis

Kui Jin[1], Hui Li[1], Jacob Volpe[1], David Emlet[1], Nuria Pastor-Soler[1], Michael R Pinsky[1], Brian S Zuckerbraun[1], Kenneth Hallows[1], John A Kellum[1], Hernando Gomez[1]

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Purpose: The role of energy regulating pathways in the protection from sepsis induced acute kidney injury (AKI) is unknown. We have previously shown that stimulation of AMP-activated protein kinase (AMPK), a master regulator of energy balance can limit sepsis induced AKI, and improve recovery, respectively. Here we tested the hypotheses (H) that 1. AMPK is activated as part of the response of the tubular epithelial cells to sepsis, and 2. Absence of AMPK activation in such response is associated with increased AKI. Methods: H1: Fifteen 10 week C57BL/6 wild type mice were subjected to cecal ligation and puncture (CLP) (n=12) or sham surgery (n=3), and sacrificed after 2, 16, 18 and 24 h to measure AMPK activation. H2: Seven 10-week C57BL/6 wild type and 10 AMPK beta-1 knock out mice (KO) weighing 30-35g, were randomly assigned to pretreatment with the AMPK activator AICAR (100mg/kg intraperitoneal, 24h before CLP) or vehicle (control). Animals were sacrificed, and blood and tissue samples were collected at 24 h after CLP. AMPK activation (pThr172) was examined by western blot of kidney lysates. Plasma AKI (Creatinine (SCr), NGAL, Cystatin C) and inflammatory markers (IL-6, TNF-α, IL-10) were assessed using ELISA. *=p<0.05. Results: CLP induced AKI in both groups, with a trend of higher markers of AKI and inflammation in KO (Cys C WT 297±39 vs. KO 366±39, WT sham 37.3±0.6 ng/ml*; IL-6 166±44 vs 359±91 vs 30±14 pg/ml*). AMPK was activated in kidney tissue early after CLP and increased over time only in WT (2 vs 24 h, relative intensity 0.96 vs. 1.84 p<0.001)(Fig 1). Pretreatment with AICAR was associated with 1. AMPK activation only in WT (pThr 172: Relative intensity=0.936 vs. 0.192, p=0.001); and 2. A trend towards decreased levels of Cystatin C and IL-6 in WT (CysC 297±39 vs. 257±19 ng/ml; IL-6 166±44 vs 145±41 pg/ml) and KO (CysC 366±29 vs 321±12 ng/ml; IL-6 359±91 vs 250±45, pg/ml). Conclusion: AMPK was activated in kidney early after CLP, and this activation increased over time. The absence of AMPK activation in the KO mice was associated with higher levels of AKI and inflammatory markers suggesting that AMPK may play a protective role during sepsis. Attenuation of injury markers by AICAR in KO animals suggest that its protective effects cannot be fully explained by renal AMPK activation, and that other mechanisms may be at play.

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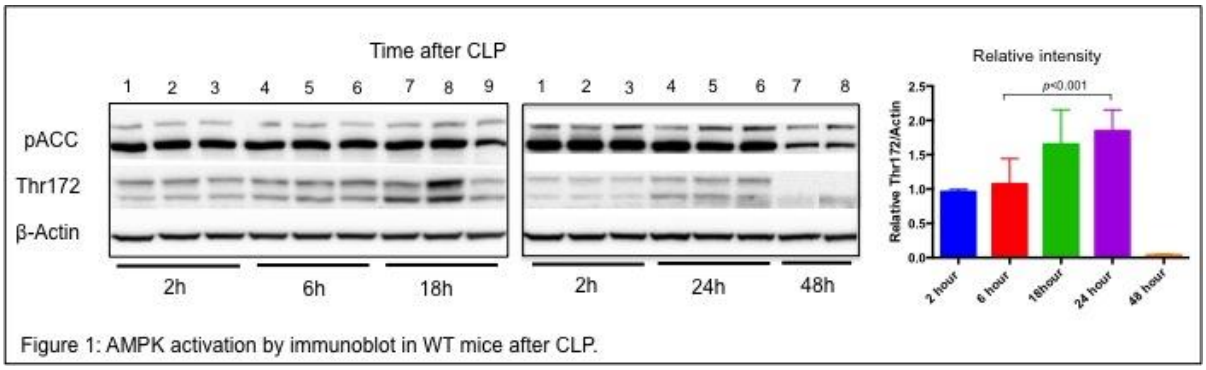

Figure 1: AMPK activation by immunoblot in WT mice after CLP.

55. Prediction Of Milrinone Pharmacokinetics Using Kidney Injury Biomarkers In Infants Following Cardiac Surgery

Katja M Gist[1], Stuart Goldstein [2], Georgia Charkoftaki[3], Michael Bennett[2], Michael Wempe[3], Sarah Faubel[4], Alexander Vinks[2], David Nelson[2], David S Cooper[2], Melanie Joy[3]

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Purpose: Cardiac surgery associated acute kidney injury (CS-AKI) is common. Milrinone is used to provide afterload reduction and lusitropy in children after cardiac surgery. Since serum creatinine (SCr) is a delayed marker of CS-AKI, timely dose adjustments are challenging. The purpose of this study was to evaluate milrinone pharmacokinetics (PK) is critically ill infants after cardiac surgery. We aimed to determine the relationship between pharmacokinetic parameters and biomarkers of kidney injury.

Methods: Prospective multi-center observational study. Baseline SCr and AKI biomarkers (NGAL, IL-18, L-FABP and KIM-1) were obtained prior to initiation of bypass and then sequentially for 24 hours. The peak concentration for each biomarker was used for the analysis. Milrinone concentrations were obtained at specific time intervals post cardiopulmonary bypass. Noncompartmental PK analysis was conducted using Phoenix WinNonlin (Certara). Univariate and multivariate regression were performed to evaluate the relationship between PK parameters and CS-AKI biomarkers.

Results: Twenty-six patients (<324 days) were included in the analysis. Pharmacokinetic parameters are summarized in Table 1. Milrinone clearance increased with age (r2 = 23%, p = 0.017) and decreased with peak SCr (r2 = 18%, p = 0.04). Half-life increased significantly with a rise in SCr (r2 = 52%, p = 0.0005). There was no significant relationship between KIM-1 or IL-18 and half-life or clearance, respectively. In the multiple regression analysis, the combination of peak SCr and KIM-1 significantly predicted half-life (r2 = 57%, p = 0.0012). Additionally, the combination of peak SCr and age significantly predicted clearance (r2 = 32%, p = 0.018).

Conclusion: Early results suggest that CS-AKI biomarkers (specifically KIM-1) when combined with peak SCr may be useful in predicting milrinone half-life in infants undergoing cardiac surgery and has the potential to be used for future clinical management. The additional of age, since it is related to the ontological maturation of the kidneys, to biomarkers may increase the prediction of PK parameters. Evaluation of other biomarkers, including NGAL, L-FABP and IL-18 are underway.

	Clearance (L/h)	Volume of Distribution (L)	Area under the curve (µg*h/L)	Half Life (h)
Mean (+ SD)	0.0004 +/- 0.0002	0.006 +/- 0.01	7261.02 +/- 7.559. 1	3.4 +/- 5.23
Median	0.0004	0.001	4391	2.05
Interquartile Range	0.0002 – 0.0006	0.0005 – 0.002	2644 – 9705.4	1.45 – 3.47

56. Protective Role of Soluble Fms-Tyrosine Kinase-1 (Sflt-1) Against Sepsis-Induced Acute Kidney Injury (AKI)

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Sepsis is the most common reason for admission to intensive care units and is frequently associated with AKI. There currently is no effective therapy to prevent or treat sepsis-induced AKI. We recently found that intra-renal levels of vascular endothelial growth factor (VEGF) are significantly elevated in rats with sepsis. While VEGF usually has beneficial actions, under certain circumstances it can promote inflammation. Consequently, increases in the intra-renal levels of VEGF during sepsis may contribute to the development of AKI. Thus, we tested whether administration of soluble fms-like tyrosine kinase-1 (Sflt-1; which decreases VEGF), attenuates the upregulation of pro-inflammatory factors during sepsis, and thus prevents the development of AKI.
Hypothesis; "Sepsis-induced VEGF upregulates pro-inflammatory and pro-oxidants factors such as TNF alpha and inducible nitric oxidase (i-NOS), and contributes to AKI". Sepsis was induced in male SD rats by cecal-ligation and puncture (CLP) after which they were followed in metabolic cages for 24hs. A high affinity soluble VEGF receptor, Sflt-1 (12μg/kg) was given SQ 6h after inducing sepsis. Rats were randomized in 4 groups; sham, sham + Sflt-1, CLP and CLP + Sflt-1. At the end of 24hs, blood was collected and rats were then sacrificed. Kidneys were harvested to evaluate the expression of i-NOS, IL-10, TNF alpha, Sflt-1 and VEGF using Elisa. We also evaluated renal function (plasma creatinine) and tubular injury (urine KIM-1).
Conclusion: CLP leads to AKI within 24h, as shown by increased plasma creatinine and u-KIM-1. CLP is associated with reduced renal expression of IL-10 and increased renal expression of i-NOS, TNF, Sflt-1 and VEGF. Administering Sflt-1 during sepsis attenuated the upregulation of i-NOS, VEGF and TNF, and decreased the severity of AKI. Our data suggest that a sepsis-induced increase in intrarenal VEGF modulate the expression of inflammatory factors and consequently is a determinant of renal injury.

	Creat mg/dl	u-KIM-1 pg/ml	TNF pg/ml	IL-10 pg/ml	i-NOS pg/ml	Sflt-1 pg/ml	VEGF pg/ml
Sham	0.5 ±0.07	134 ±5	18 ±0.8	242 ±9	1.8 ±0.3	31 ±4	371 ±9
Sham+Sflt-1	0.52 ±0.05	137 ±2	19 ±1	255 ±15	1.6 ±0.4	66 ±4 *	308 ±5 *
CLP	2.1 ±0.1 *	1915 ±52 *	264 ±8 *	131 ±10 *	13 ±0.5 *	337 ±9 *	777 ±14 *
CLP+Sflt-1	1.4 ±0.1 *#	1150 ±44 *#	125 ±6 *#	215 ±16 *#	6 ± 0.3 *#	495 ±15 *#	537 ±9 *#

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57. Fluid Overload and Elevated Cell Cycle Arrest Biomarkers Independently Predict Death of Renal Replacement Therapy Following Acute Kidney Injury

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INTRODUCTION
Fluid overload (FO) and acute kidney injury (AKI) are common and associated with adverse outcomes in critically ill patients. However, the modifying impact and interaction of FO and AKI on short and long term outcomes are poorly understood. In a multi-center prospective validation study (Sapphire), we recently described a urinary biomarker combination of tissue inhibitor of metalloproteinases 2 (TIMP2) and insulin-like growth factor binding protein 7 (IGFBP7) to risk stratify for AKI. In this analysis, we examined renal replacement

therapy (RRT) utilization and mortality over 9 months stratified by the presence of FO and/or AKI within 3 days and [TIMP-2]•[IGFBP7] concentrations on the first day of enrollment.

METHODS

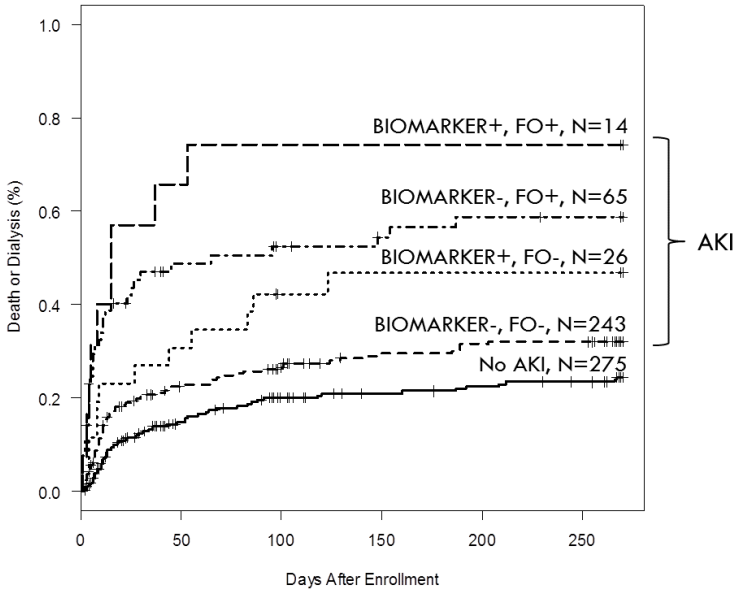
We stratified 623 ICU patients with complete data based on the presence or absence of KDIGO stage 1 through 3 AKI occurring within 3 days of enrollment. In those with AKI, we then further stratified by both presence or absence of 10% FO and the [TIMP-2]•[IGFBP7] value using a cutoff of 2.0 (ng/mL)^2/1000. Kaplan-Meier analysis was performed to examine the composite of death and/or RRT in the 9 months following enrollment (Figure 1). Hazard ratios (HR) for the composite endpoint were determined using a Cox proportional hazards model with patients without AKI as the reference group.

RESULTS

The group without AKI had the lowest rate of death and/or RRT (22%). In the group with AKI, fluid overload was associated with an increased rate of death and/or dialysis, but this risk was further informed by biomarkers, log rank p<0.001 (Figure 1). Among patients with AKI but no FO, the HR (95% confidence interval (CI)) for the composite endpoint was 1.4 (1.0-2.0), p=0.04, when [TIMP-2]•[IGFBP7] was not elevated and 2.3 (1.3-4.4), p=0.007, when [TIMP-2]•[IGFBP7] was elevated. Among patients with both AKI and FO, the HR (95% CI) for the composite endpoint was 3.7 (2.4-5.6), p<0.001, when [TIMP-2]•[IGFBP7] was not elevated and 5.5 (2.7-11.2), p<0.001, when [TIMP-2]•[IGFBP7] was elevated.

CONCLUSIONS

In patients with AKI, both fluid overload and high biomarker concentrations were associated with increased risk of death and/or RRT over 9 months. The presence of both fluid overload and [TIMP-2]•[IGFBP7] greater than 2.0 (ng/mL)^2/1000 in patients with AKI yielded the highest hazard for death and/or RRT, which was 5 times the hazard among patients without AKI.



58. Relevance of Urinary NGAL among Critically Ill Patients

Srinivas Samavedam[1], Ganshyam M Jagathkar[1], Pradeep R Pakanati[1], Rajasekara M Chakravarti[1], Shanti Naidu[1], Hina Mohiuddin[1]

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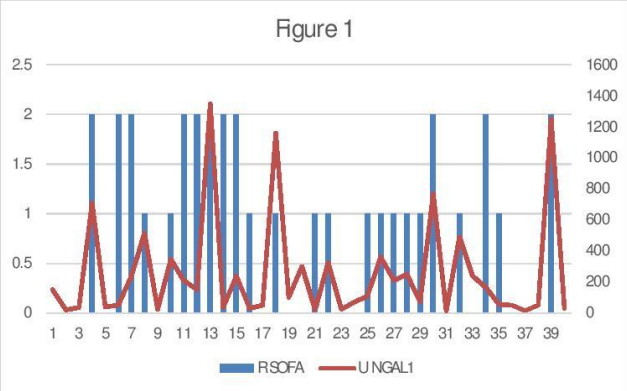
Background/Purpose: Acute Kidney Injury is not uncommon among critically ill patients. Surrogate markers have been used to identify patients who have renal injury or are at risk of injury. Search is on for identifying a reliable biomarker which can identify patients at risk of renal injury and predict outcomes of AKI. Neutrophil Gelatinase Associated Lipocalin is one such promsing Biomarker. This study aims to study the correlation of NGAL with severity of Kidney injury and predicting need for renal replacement therapy (RRT)
Methods: All patients admitted to the multi disciplinary ICU of a tertiary care centre were evaluate over a two month period from 1 August 2014 to 30 September 2014. Patients with established CKD were excluded. APACHE and SOFA scores were recorded on admission and at 48hours. Fluid balance, acid base status, oxygenation, hemodynamic status were recorded. NGAL values in urine were measured on day 0, day 2/or at diagnosis of AKI and at ICU discharge or point of cessation of RRT requirement.
Primary point of interest was to study association of admission NGAL with development of AKI. Influence of fluid balance on NGAL values was also recorded. Patients were apriori categorised into sepsis and non sepsis groups
Results: A total of 80 patients were enrolled into the study out a total of 141 admissions into the unit. 24 eligible patients did not consent to be part of the study.The mean APACHE of this cohort was 14.02 with a predicted mortality of 21%. The mean Renal SOFA scores were 0.81. NGAL correlates well with renal SOFA scores but not with APACHE. (Fig 1). The mean NGAL values were 258.25. NGAL value of more than 200 predicts the need for RRT(Fig 2). Persistent elevation of NGAL suggests progression from renal injury to failure and loss of function. Cumulative positive balance is associated with a early rise of NGAL. Negative balance with a late rise in NGAL
predicts need for RRT. No difference was noted among septic and non septic AKI.
Conclusions: Serial NGAL estimation is a good method of identifying patients at risk of AKI and in predicting need for RRT in general ICU population.



59. Urine proteomic profile that is associated 60-day survival in acute kidney injury patients treated with CRRT

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Background: Acute kidney injury (AKI) often leads to chronic kidney disease and death. Early detection of patients at risk of death may facilitate prevention and treatment of renal disease. We aimed to develop a urine protein file specific to AKI patients in intensive care unit that could predict death 60 days after occurrence of AKI by using unbiased proteomics approach.
Methods: Patients with acute kidney injury were selected from ATN-BioMaRK study repository. Four patients who did not survive to day 28 were matched for age, gender, and baseline creatinine with individuals who survived to day 60. The proteome profile of urinary exosomes in the two groups was measured using liquid chromatography labeled by iTRAQ. Protein expression change magnitudes were compared and individual proteins with significant differences in expression between groups were evaluated for their biomarker potential.
Results: A total of 45 proteins were significantly associated with 60-day mortality in AKI patients. Increases of 25 proteins were associated with mortality, including activators of the local innate immune response and of the complement system, regulators of coagulation, protease inhibitors, components of the renin-angiotensin system, connective tissue components, and proteins associated with dysregulation of cell cycle, cell proliferation, differentiation and apoptosis. Increases of 20 proteins were associated with survival, including antioxidant enzymes, cell growth promoters, leukotriene activity regulators, regulators of cytoskeleton dynamics and architecture, proteins that mineralize extracellular matrix, iron storage proteins, calcium-binding proteins, proteins that modulate cell-cell and cell-matrix interactions, and aminopeptidases.
Conclusion: A urinary proteome profile was developed that is associated with long-term death of AKI patients suggesting underlying pathologies. Further studies should be designed to validate the results and hopefully facilitate both diagnosis and treatment strategies.

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60. Flow Mediated Dilation and Acute Kidney Injury Prediction in Vascular Surgeries

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Background: Among the pathophysiologic mechanisms involved in the development of Acute Kidney Injury (AKI), endothelial dysfunction (ED) and abnormal vascular reactivity may play important roles in the association of AKI and cardiovascular acute events. The endothelium is an important regulator of arterial elasticity, and assessment of Flow Mediated Dilation (FMD) is a tool to evaluate ED in coronary artery disease. We hypothesized that the Flow Mediated Dilation (FMD) could be a marker to predict AKI in patients undergoing vascular surgeries.

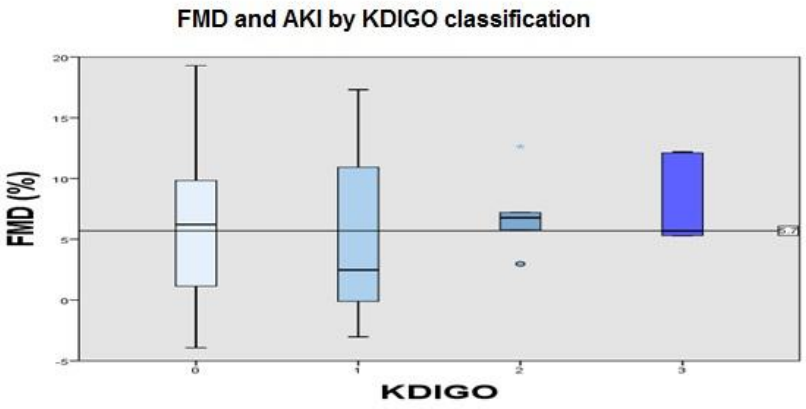
Methods: We analyzed data from a prospective cohort of 96 patients. All patients had been submitted to major vascular surgery and FMD had been assessed. The measurement of FMD was made with an ultrasound evaluation of the brachial artery that follows a brief compressive ischemia of the forearm. AKI was classified by KDIGO SCR criteria.

Results: 43.6 percent of the patients were classified as CKD stage II and 37.2 percent were CKD stage III based on the MDRD. 14 percent were diabetic and 95 percent had hypertension. 33 (35 percent) were submitted to

endovascular procedures. The main procedure was aortic aneurysm correction (61 percent). During the first 7 days after the procedure, 31 patients developed AKI and 18 had cardiovascular acute events. The incidence of cardiovascular events increased with the severity of AKI. The median FMD was 5,7 percent, and was not different in patients that developed AKI or cardiovascular events.

Conclusions: Even though there is a logical pathophysiologic association between markers of endothelial function and AKI, FMD was not a predictor of AKI or cardiovascular events in this cohort of CKD patients. The high incidence of hypertension and CKD, associated with a very low mean of FMD, could be a determinant for the low discrimination. Further studies should include CKD patients in order to establish if the Endothelial Dysfunction markers could be predictors of AKI in this high-risk population.

	Total (n=96)	No AKI (n = 65)	AKI (n = 31)	p
Age (years)	66,1 +- 9,3	65,6 +- 9,3	67,3 +- 9,2	0,4
Baseline MDRD (ml/min/1,73m²)	70,3 +- 22,9	72,6 +- 23,1	65,6 +- 22,1	0,157
Gender (male)	69 (72%)	49 (75%)	20 (65%)	
DM	14 (15%)	7 (11%)	7 (22%)	0,136
Hypertension	91 (95%)	60 (92%)	31 (100%)	0,171
Tabagism	83 (86%)	59 (90%)	24 (77%)	0,054
Duration of the surgery (min)	276,9 +- 126,3	263,5 +- 112,6	305 +- 149,2	0,133
Blood transfusion in the surgery	46 (48%)	27 (41%)	19 (61%)	0,083
Hemodynamic instability in the surgery	25 (26%)	11 (17%)	14 (45%)	0,006
ICU length of stay (days)	3,65 +- 6,6	2,55 + 4,4	5,94 + 9,5	0,02
Cardiovascular events	18 (19%)	11 (17%)	7 (22%)	0,4



61. NGAL and Urine Biochemistry for Early Detection of Acute Kidney Injury

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Background: Early AKI diagnosis with biomarkers of injury is promising advance for improving AKI outcomes. Association of clinical risk factors, urinary indices with these biomarkers could help to improve their performance in the clinical practice. We hypothesized that urinary neutrophil gelatinase-associated lipocalin (NGAL) in association with urinary biochemistry could be a tool to improve early AKI detection in high-risk critical ill patients.

Methods: We performed a prospective study between Jan 2012 and July 2013. We recruited patients admitted in intensive care unit (ICU) with high risk for AKI. Urinary NGAL (Test PETIA Bioporto) and urine biochemistry were measured serially every 12 hours during the first two days of ICU stay. Urinary indices including strong ion difference (SIDu), potassium gradient transtubular (TTKG) and fractional excretion of sodium (FENa) were evaluated during this period.

Results: Of the 272 screened patients, 46 met the inclusion criteria. During the observation period, first 7 days of ICU stay, 30(62.5%) patients met KDIGO criteria for AKI. Urinary NGAL was higher at all points in AKI group. Urinary NGAL value with best sensibility and specificity to predict the development of AKI was 175 ng/ml (area under ROC curve = 0.738 - IC 95% 0,586-0.890 p=0.011). In patients developing AKI by sCr criteria, urinary NGAL would provide an earlier diagnosis in 10 patients (38%). Four (18%) patients with urinary NGAL levels above the cutoff did not developed AKI during the observation period. FENa was <1% in AKI and non-AKI groups. The progression of urinary SID was similar in both groups. In patients that developed AKI TTKG was not statically significantly higher.

Conclusions: Urinary NGAL was an earlier predictor of AKI in high risk patients. The association of urinary biochemistry did not improve the prediction ability of NGAL in this cohort. Further studies incorporating this indices should confirm their role in early diagnosis of AKI.

	NGALu basal	NGALu 12h	NGALu 24h	NGALu 36h	NGALu 48h
No AKI	54 (21-148)	38 (22-144)	39 (21-187)	49 (12- 201)	90 (21-222)
AKI	260 (75-2649)	147 (69,7-505)	95 (54-301)	101 (52-510)	123 (57-245)

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62. An In Vitro System for Investigation of Sepsis-Induced Acute Kidney Injury: Identification of IGFBP7 Expression in Isolated Human Proximal Tubule Epithelial Cells

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Purpose: IGFBP7 has recently been discovered as an early biomarker for Acute Kidney Injury (AKI), but little information is available regarding its role, if any, in the pathogenesis of this disease. To investigate AKI mechanisms, we have established and characterized a primary cell culture model of isolated human primary proximal tubule epithelial cells. Methods: Human kidney samples were obtained from the Center for Organ Recovery and Education (CORE). Cortex tissue was isolated and dissociated with collagenase and sieving. The resultant slurry was cultured until viable cells reached confluence. Proximal tubule epithelial cells (PTECs) were

immunoaffinity-isolated with an antibody against the proximal tubule specific protein CD13 (Aminopeptidase N) using the Dyanbead pan-mouse IgG system. After culture on transwell permeable supports in varying media, CD13+ PTECs and CD13- cells were characterized by immunoblot and immunofluorescence for expression of the proximal tubule markers CD13, Gamma-glutamyl transpeptidase (GGT), and Aquaporin 1(AQP1), and for the distal tubule markers E-cadherin and the sodium chloride co-transporter (NCC). IGFBP7 expression was assessed from the media of cultured cells by immunoblot analysis. Summary: CD13 isolation resulted in cells that were positive for CD13, GGT, and AQP1, yet negative for E-cadherin and NCC, providing evidence from multiple markers that these cells are of proximal tubule origin. Immunoblot analysis of the media from CD13+ cells demonstrates that indeed IGFBP7 is produced by these cells. We have also identified that IGFBP7 is preferentially expressed in the CD13+ PTECs compared to the CD13- cells, suggesting that PTECs may be a primary source of IGFBP7 expression in the kidney. Lastly, we identified the ability to modulate IGFBP7 expression by adjusting serum, insulin, and glucose concentrations, where decreasing serum or insulin decreased IGFBP7 expression, and decreasing glucose increased IGFBP7 expression. Conclusion: We have successfully developed a viable human cell culture model system for cellular and molecular analysis of AKI, in which we can isolate PTECs at high purity. Using this system, we confirmed that the early biomarker IGFBP7 is produced by PTECs. This system and knowledge will now allow for investigation of the potential role of IGFBP7 in the molecular etiology of AKI.

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63. Syndecan-1 In Decompensated Heart Failure: Association With Renal Function And Mortality

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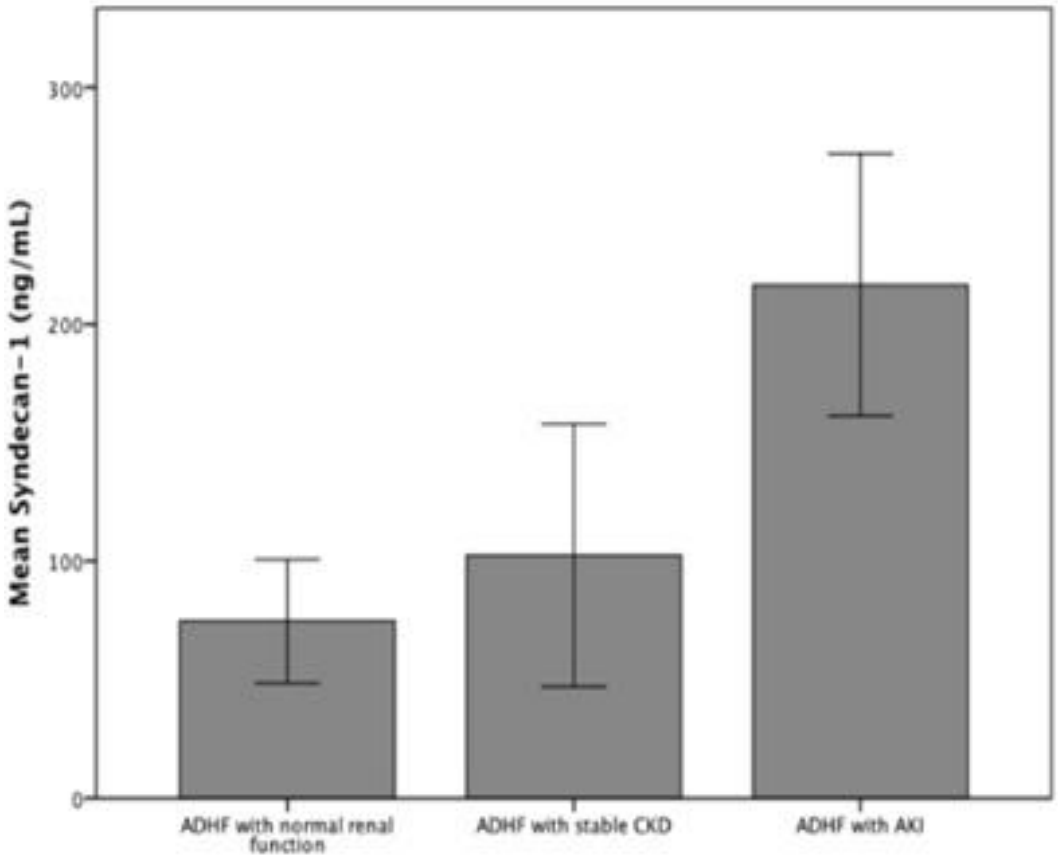
PURPOSE: Investigate endothelial glycocalyx damage in patients admitted in the emergency department because decompensated HF; its association with acute and chronic kidney disease; and its capacity to predict mortality
METHODS: Prospective study with consecutive patients admitted because acute decompensated HF (ADHF) patients in a reference center. The following parameters were collected in the emergency department (ED): age, sex, New York Heart Association (NYHA) functional class, previous history of diabetes mellitus, arterial hypertension and drug prescription. Additionally, syndecan-1 (a biomarker of glycocalyx damage) was measured at ED. During the hospital stay, patients were evaluated daily and AKI or worsening renal function (WRF) were recorded according KDIGO criteria
RESULTS: We enrolled 201 patients (54% male). The mean age was 64.2 ± 13.5 years and the calculated ejection fraction was 39.4 ± 13.3% at admission. Including all patients, 80 (39.8%) had CKD and 62 patients (37.8%) developed AKI/WRF during hospital stay. Majority of patients had AKI stage 1 (n=52) and only 2 had AKI stage 3. Another group of 14 patients were admitted with AKI in the ED but recovery renal function in less than 72h. From patients with CKD, 43 patients had stable renal function during hospital stay. Hospital mortality was 5.5%. In comparison to a healthy control group, ADHF patients had higher syndecam-1 at ED (133.7±95.0 vs. 18.3±9.2, $p<0.001$). This increment was greater in those patients with higher pre-admission NYHA classification (class III/IV). Although syndecan-1 it was high in AKI/WRF patients ($p<0.01$ vs. others), there was no difference between patients with stable CKD and those with normal renal function ($p=0.61$) -figure 1. The AUC for AKI/WRF prediction was 0.741 (95%CI 0.669-0.812, $p<0.001$). The results improved with higher grades of severity (AKIN ≥ 2 grade) - AUC 0.840 (95%CI 0.733-0.948, $p<0.001$). After adjustment for age, gender, admission serum sodium, ejection fraction and AKI severity, syndecan-1 concentration remained associated with hospital mortality. It also had a good discriminative ability to predict hospital mortality (AUC 0.788 95%CI 0.673-0.903, $p<0.001$).
CONCLUSIONS: In ADHF patients, syndecan - 1 measured at ED is an effective biomarker to predict AKI/WRF and hospital mortality

Figure on following page


Mean Syndecan-1 (ng/mL)
300
200
100
0
ADHF with normal renal function
ADHF with stable CKD
ADHF with AKI

64. Smaller Circuits for Smaller Patients: Improving Renal Support with the Aquadex™ Machine

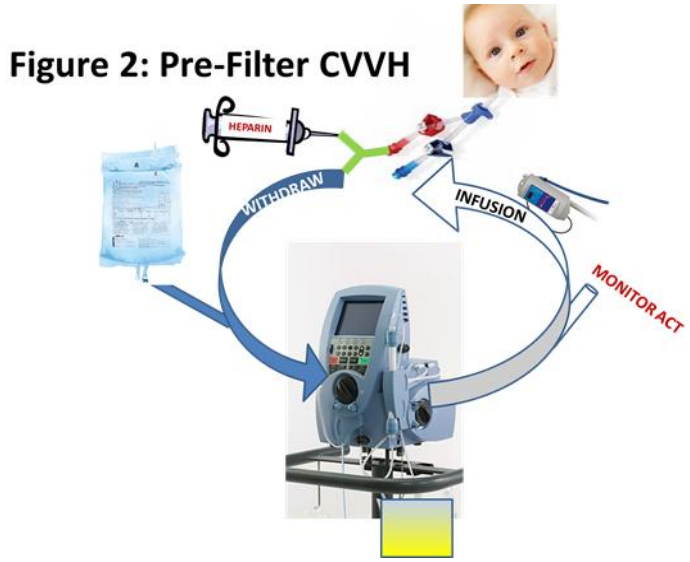
David Askenazi [1], Daryl Ingram [1], Suzanne White [1], Monica Cramer [1], Crystal Rutledge [1], Santiago Borasino [1], Frank Tenney [1], Dan Feig [1], Sahar Fathallah-Shaykh [1]

[1]*University of Alabama at Birmingham*

Background: Continuous veno-venous hemofiltration (CVVH) is used for critically ill children; however small children are dialyzed differently, experience more complications and worse outcomes. Aquadex™, designed to provide outpatient SCUF, can ultrafilter up to 500 ml / hr and has the extracorporeal volume (ECV) of only 33 ml, about 10% total blood volume (TBV) of 4 kg infants.
Objective: To determine the feasibility and complications of using Aquadex™ in small children, for both slow continuous ultrafiltration (SCUF), and CVVH.

Design/Methods: Retrospective analysis subjects on Aquadex™ at Children's of Alabama from August 2013 through August 2014.

Results: We identified 10 children (5 SCUF and 5 CVVH) on Aquadex™. For SCUF, median age was 33.7 months (range 6.4-227) and median weight was 26.1 kg (range 6.3 – 33.6). For CVVH, the median age at initiation was 13 days (range 4 – 25 days) and median weight was 3.9 kg (range 2.8-5.1). Subjects were cared for in the CICU (3), PICU (3), NICU (3) and dialysis unit (1). Heparin was used for 9/10 subjects. When ECV was > 10% of TBV, circuits were primed with blood (n=10) or albumin (n=1), otherwise they were primed with saline (N=40). Only 8/51 (15%) circuits were restarted for clotting, all others were either initial start, or maintenance restart after 72 hours. Blood flow for all procedures was 40 ml/min. Around the time of initiation, no interventions were necessary to support blood pressure. In CVVH mode (see figure) Prismasol™ 2K/3.5 Ca with additives was infused pre-filter at 30 cc/kg/hr provided steady reduction in blood urea nitrogen and serum creatinine, while maintaining fluid goals and electrolytes balance. Transient complications occurred (hypothermia in 2, bleeding in 1, and hyponatremia in 1).
Conclusions: The Aquadex™ machine can improve renal support to small critically ill patients with minimal hemodynamic instability during initiation, less blood exposure, smaller vascular access and excellent control of fluid, toxins and electrolytes.



65. Continuous Renal Replacement Therapy for Hyperammonemia caused by Ornithine Transcarbamylase Deficiency

Masaaki Nunomura[1], Yoshinari Yukitake[2], Junichi Arai[2], Toshihiro Muraji[3], Yasuyuki Miyamoto[2]

[1]Department of Clinical Engineering, Ibaraki Children's Hospital, [2]Department of Neonatology, [3]Department of Pediatric Surgery

Background
Ornithine transcarbamylase (OTC) deficiency is one of the most severe inborn errors of metabolism, which causes hyperammonemia; in cases of OTC deficiency with neonatal onset, the mortality rate is over 90%. In the management of hyperammonemia, a rapid decrease of ammonia level is a crucial prognostic factor. Although continuous renal replacement therapy (CRRT) is widely used in newborns, the method is not standardized, and there is lack of newborn-specific equipment. We have been performing aggressive CRRT in the neonatal intensive care unit (NICU) using a mode of continuous veno-venous hemodiafiltration to manage hyperammonemia caused by OTC deficiency. Herein, we report our CRRT method for hyperammonemia in newborns with OTC deficiency.
Method
Our experiences of CRRT are summarized as follows.
1 For vascular access, a 6 Fr catheter was inserted into the right internal jugular vein by cut-down or puncture method to secure the blood flow rate.
2 The circuit was primed with blood, which was previously dialyzed to decrease the potassium level.
3 In order to focus on high efficiency, we selected a purification membrane ≧0.3 m2, combining peritoneal dialysis.
4 To prevent an initial drop in blood pressure, we administered a catecholamine before commencing CRRT to prevent decrease in myocardial contractile force, as shown on echocardiography.
5 To prevent complications such as intracranial or gastrointestinal bleeding, we discontinued CRRT as soon as possible when the ammonia level decreased to ≤300 μg/dL.
Results
We used CRRT hyperammonemia caused by OTC deficiency in 5 cases in our NICU; the mortality rate was 40%. We did not observe any complications. The average CRRT time was 20 h (range, 5–49 h). In 1 case, CRRT was restarted because the ammonia level increased to >400 μg/dL. However, dialysis efficiency was adequate because the ammonia level stabilized without restarting CRRT in the 3 surviving cases.
Discussion
Our method of CRRT for newborns can significantly decrease ammonia level within 24 h. By priming with blood and concomitantly administering a catecholamine infusion, any initial drop in blood pressure was prevented.
Conclusion
Our CRRT method can improve the prognosis of patients with hyperammonemia caused by OTC deficiency.

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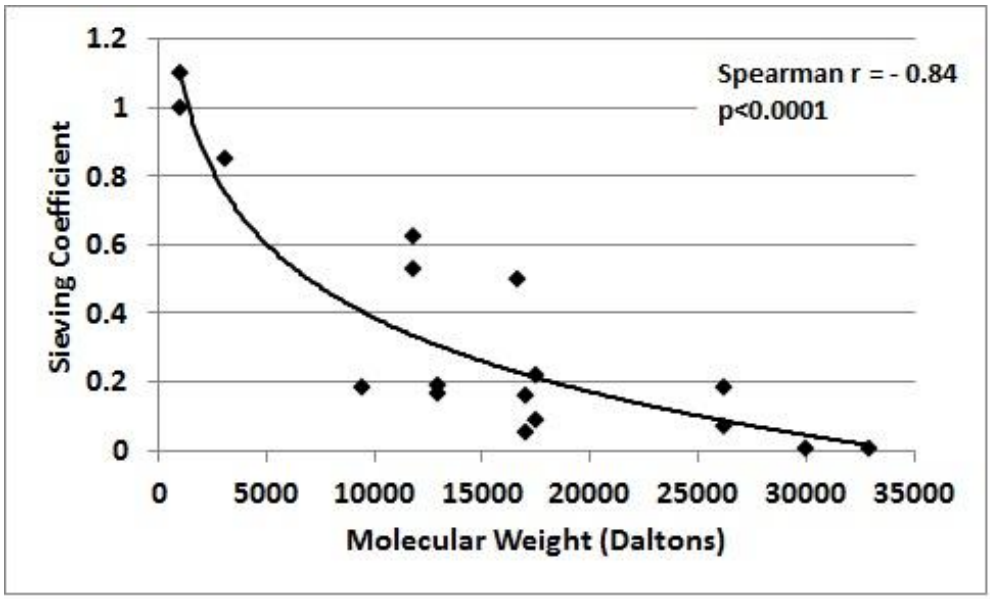
66. Peptide and Protein Sieving During Hemofiltration With Various Filter Membranes

John S Baird[1], Thyyar M Ravindranath[1]

[1]Columbia University

Solute clearance during hemofiltration depends in part on solute molecular weight (MW) and solute-membrane interactions. For a particular membrane, the sieving coefficient (SC; the concentration of solute in the ultrafiltrate compared to plasma) and the extraction ratio (ER; the arterial minus the venous [solute] divided by the arterial [solute]) help characterize solute-membrane interactions.
Objective: The relationship between the SC or ER and the MW of peptides and proteins during hemofiltration has not been explored sufficiently. A strong correlation may offer an opportunity to predict peptide or protein

behavior during hemofiltration.
Methods: A search for studies which present the SC and/or ER for peptides and proteins during human (in vivo) hemofiltration was performed. To avoid confounding from solute-membrane interactions associated with early membrane adsorption, data for the first 3 filter-life hours of a new membrane were excluded.
Results: Studies (n=18) of the SC and/or ER for β2 microglobulin, brain natriuretic peptide, carperitide, IL-1β, IL-1ra, IL-2r, IL-6, IL-8, IL-10, myoglobin, parathyroid hormone, procalcitonin, TNFα, soluble TNFR-1, soluble TNFR-II, and vasopressin were identified, using polyacrylonitrile, polysulfone, and polyamide filter membranes. The SC correlated with MW for polyacrylonitrile filter membranes (Spearman r = -0.84; $p<0.0001$; Figure) but not for polysulfone filter membranes ($p=0.06$); data were insufficient to evaluate polyamide filter membranes, and insufficient to evaluate the ER with any filter membrane.
Conclusions: Allowing for early membrane adsorption, the SC correlated with the MW of peptides and proteins during hemofiltration with polyacrylonitrile filter membranes. As convective (or ultrafiltration) clearance is the product of ultrafiltration rate and SC, these results may help predict peptide and protein clearance during hemofiltration with polyacrylonitrile filter membranes when empiric data is not available.



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67. Accelerated CRRT Circuit Exchange During Pediatric ECMO Therapy: An Alternative Technique to Reduce Transfusion Requirements

Dawn Eding RN BSN[1], Douglas Degraaf RN BSN[1], Jamie Newberg RN ADN[1], Richard Hackbarth MD[1]

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Background: Implementation of Continuous Renal Replacement Therapy (CRRT) in pediatric patients requiring Extracorporeal Membrane Oxygenation (ECMO) therapy may be necessary for fluid management and solute clearance. Blood priming of the CRRT and ECMO circuits is often needed due to the large extracorporeal volume in relation to the child's total blood volume. Depending on the duration of the ECMO therapy, multiple CRRT circuit changes may be necessary due to clotting or age of the circuit. Blood priming for CRRT or discarding the blood in the old circuit exposes the patient to additional blood products. Furthermore, there are adverse consequences to blood transfusions and circuit blood priming. We have previously reported a circuit blood exchange technique used with transition from hemodialysis to CRRT, and with elective CRRT circuit changes in

non-ECMO patients. This technique has been modified and allows the accelerated transfer of blood from the old to a new CRRT circuit while on ECMO.

Methods: This procedure involves blood priming of the initial CRRT circuit prior to connecting to ECMO. Subsequent circuits are then primed with a transfer of the CRRT circuit blood to a new saline primed circuit. The current CRRT machine is suspended and is disconnected from the ECMO system. A buretrol is then connected to the return line of the current circuit. A saline rinse back is performed with the circuit blood being transferred to this buretrol. The buretrol is then connected to the access line of the new machine and is used to prime this circuit. The access and return lines are then connected to the ECMO system and CRRT is resumed.

Results: This procedure has been performed on 5 patients for a total of 14 exchanges. The patients range in age from 9 to 211 days old (mean 62.6), with weights from 2.86 to 5.41 kilograms (mean 3.75). All exchanges utilized AN69 membranes. No pulmonary instability or changes to the patient's hemodynamic state were noted during any of the circuit exchanges.

Conclusions: ECMO/CRRT patients often have significant transfusion requirements. Alternative circuit priming techniques such as this CRRT exchange reduces the need for blood transfusion. Additional advantages include minimization of CRRT downtime and avoidance of hemodynamic instability seen with blood priming of AN69 membranes. This technique has been a safe and effective alternative for CRRT circuit changes in this patient population.

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68. Renal Replacement Therapy With Regional Citrate Anticoagulation in Post-Operative Liver Transplantation

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[1]*Clinica Nefrologica, DIMED, Università degli Studi di Padova*

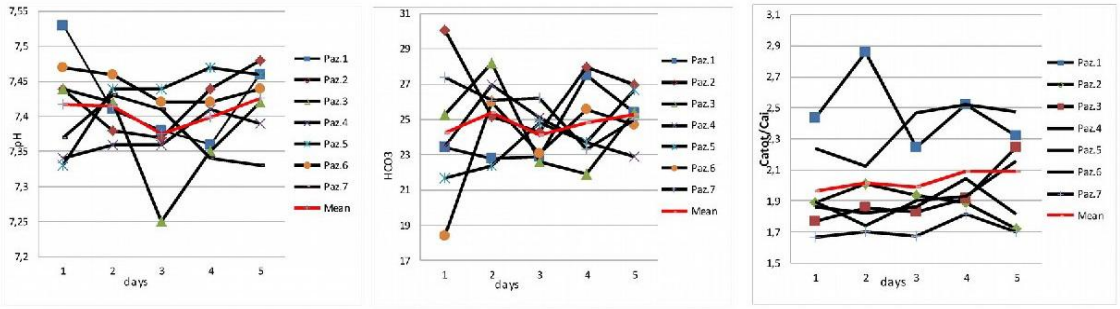
Background: anticoagulation carries benefits and side effects in the management of extracorporeal circuits. Heparin has been extensively used despite the associated risk of bleeding. Patients needing continuous renal replacement therapy (CRRT) and waiting for orthotopic liver transplantation (OLT), or immediately following OLT, are exposed to high risk of bleeding and present some reduction of antithrombin, fibrinogen, platelets, and coagulation factors, like V and VIII, that can make heparin utilization useless or harmful. These patients are affected by systemic inflammatory response syndrome, and heparin could worsen the inflammatory state. Regional citrate anticoagulation (RCA) offers a valid alternative, despite not being recommended in patients with impaired liver function. The aim of this study is to assess safety and efficacy of RCA in post-operative liver transplantation.

Methods: we treated seven patients (3 male, 4 female) who received OLT and developed post-operative oligo-anuric acute kidney injury, probably due to post-ischemic acute tubular necrosis. They were all treated with CRRT performed as continuous venovenous hemodiafiltration with RCA; data regarding blood pressure, heart rate, total/ionized calcium ratio, arterial pH, bicarbonate, lactate, kidney and liver function blood tests, fluid balance, and vasoactive drugs dosing, were collected.

Results: the patients of a mean age of 61+/-10 years and a Model of End Stage Liver Disease score of 17.6+/-6.5 were treated with mean CRRT duration of 10,7 days (range 5-20 days), whereas mean circuit life was 53.1+/-18.6 hours. Mean citrate dose was 2.86+/-0.18 mmol/liter of blood, using bags with a citrate concentration of 18 mmol/l in predilution. The total/ionized calcium ratio was always under 2.5, with the exception of only one case, which presented a spike of 2.9 lasting no more than 24 hours. All patients presented recovery of renal function at

the end of the treatment.

Conclusion: despite the general contraindication of citrate anticoagulation for CRRT in impaired liver function/liver transplantation, we did not observed complications related either to haemorrhagic risk or to acid-base status, or to calcium and electrolytic balance. In accordance with other authors, we think that muscular metabolism and the monitoring of total/ionized calcium ratio can guarantee an effective and safe treatment.



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69. Regional Citrate Anticoagulation for Continuous Renal Replacement Therapy in the Era of Calcium Shortages

Kera E Luckritz[1], Katie S Plomaritas[1], Erin Fraser[1], David T Selewski[1], David B Kershaw[1], Michael Heung[1]

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Purpose
Continuous renal replacement therapy (CRRT) is an important tool in the management of critically ill children. Regional citrate anti-coagulation (RCA) has emerged as a first-line option to maintain CRRT circuit patency, but application of such protocols has been challenged by the shortage of calcium chloride solution. To address this shortage, we developed a modified RCA protocol which utilized calcium containing post-filter replacement fluid. Modification entailed maximizing the post-filter calcium delivery while not exceeding a 25% filtration fraction. Any remaining calcium balance was given via separate infusion.
Methods
A retrospective review of patients receiving CRRT with post-filter calcium containing replacement fluid was performed from an existing quality database. Analysis was performed using SAS 9.3 (Carey, NC).
Results
Twenty-two patient's ages 4.9-19.7 years received CRRT utilizing the adapted RCA protocol from April 2013 through March 2014. Indications included acute kidney injury (AKI) (95%), fluid overload (100%), metabolic acidosis (23%) and electrolyte disturbances (5%). Five patients were also on ECMO with systemic anti-coagulation so their citrate infusion was not titrated. There were 98 filters with a mean filter life of 49 hours (0.4-119.8). This is not difference from our observed filter life with the standard RCA protocol (46.8 hours). There were only 41 unplanned filter changes and of those 19 were due to clotting (19.4%). Only two circuits were complicated by citrate lock. There were no other adverse events reported.
Conclusions
There were no adverse events and no change in filter life. With the adapted protocol we observed a 49% reduction in calcium chloride requirement.

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70. Continuous Renal Replacement Therapy in a Neurocritical Care Unit

Michael Armahizer[1], Sathish Sanna[1], Rachel Hauslader[1], Taghi Ryder[1], Jennifer Miller[1], Brigid Blaber[1], Mary Ann Bautista[1], Neeraj Badjatia[1], Paul McCarthy[1]

[1]*University of Maryland Medical Center*

Introduction

Continuous renal replacement therapies (CRRT) are preferred to intermittent therapies in patients with hemodynamic instability or acute neurologic injury.
Since February 2013 our Neurocritical Care Unit has had a CRRT program managed by our neurocritical team.

Since the inception of our program we have maintained a registry for the purposes of quality improvement and to help identify potential areas for future study

Methods

We have reviewed our registry and report the findings. We have also informally surveyed staff to identify any areas of concern or suggestions to improve practice.

Results

From February 2013 through December 2014 thirty-five patients have undergone CRRT. Admission diagnoses have included subarachnoid hemorrhage, cerebral vascular accident, intracerebral hemorrhage, status epilepticus, subdural hematoma, Guillain-Barre Syndrome, traumatic brain injury and anoxic injury. Indications for CRRT have included acute kidney injury, end-stage renal disease, CHF/volume overload, hyperkalemia, and acidosis. The majority of patients have been managed with CVVH and no anticoagulation. A significant number of patients on CRRT in our unit are receiving antibiotics and or antiepileptic drugs. Early in our program we experienced an excessive amount of early filter clotting which has significantly reduced with improved practice.

Our neurointensivists are satisfied with the CRRT program. Nursing, pharmacy and advanced level practioners have been satisfied with the CRRT program and feel it as contributed to the quality of care in our unit. Trends show an increase in the acuity of our patient population and an increased need for CRRT.

Conclusions

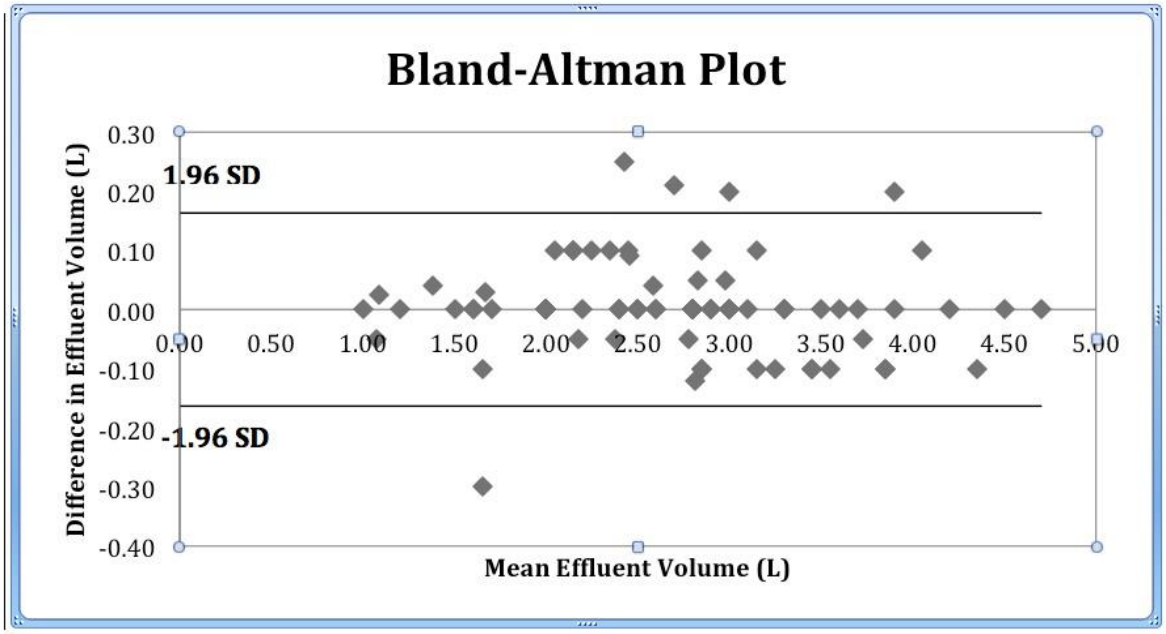
Our neurocritical care team has successfully managed CRRT on a variety of patients with neurologic diagnosis. A significant number of patients on CRRT are receiving antibiotics and/or antiepileptic drugs and we plan to do pharmacokinetics studies with these drug classes. Our filter clotting problems have improved do to several practice improvements. We also try to arrange therapy down time for imaging and other tests in conjunction with scheduled filter changes. Although we usually use no anticoagulation, we have put in place heparin and citrate protocols and our nurses have gained experience and are more confortable with the therapy. We plan to implement filter-based plasma exchange in 2015 and will continue to our registry.

71. Validation of the NxStage System One Volumetric Method for Measurement of Effluent Volume During Ultrafiltration -- a Hospital QA Project

Kathleen Cagan[1], Xingxing Cheng[1], Susan Murphy[1], Marlys Ludlow[1], Robert Isom[1]

[1]*Stanford Healthcare*

Critically ill patients with acute kidney injury or end-stage renal disease requiring renal replacement therapy (RRT) are often fluid overloaded, depending on the need for fluid resuscitation in the course of their illness. Fluid overload may manifest with pulmonary edema, pleural effusions, or diffuse congestion with anasarca, and may hinder progress during weaning from mechanical ventilation, or participation in physical therapy. For such patients, the optimal RRT modality for mobilizing fluid quickly yet safely is not known. In our institution, we commonly employ a strategy of daily RRT with intermittent hemodialysis sessions (including ultrafiltration (UF)) alternating on non-dialysis days with a session of UF alone, with the goal of rendering the patient clinically euvolemic with time. The NxStage System One device ("NxStage") was originally developed for use in home hemodialysis. NxStage uses a proprietary voulmetric balance chamber system for measuring and reporting effluent volume in real-time. We could find no published reports documenting the accuracy of NxStage's reported effluent volume at the end of an intermittent UF session, when compared with a criterion standard of physically collecting and directly measuring the effluent volume. As part of an internal QA project, we therefore measured total effluent volumes in 75 consecutive UF treatments, and compared the nurse-recorded volume at the end of a treatment session against that reported by the machine. When the measured effluent volumes were compared with machine reported volumes, the line of identity had a slope of 1.0 with an R-squared value of 0.99. In a Bland-Altman Plot, we found that the 95% limits of agreement between the two methods of fluid measurement ranged from -0.16L to 0.16L with no bias at higher or lower UF volumes. We conclude that the volumetric system employed by NxStage for effluent volume measurement is highly accurate and allows the clinician to rely on machine-reported effluenet volumes with a high degree of confidence.



RRT APPLICATIONS AND TARGETED INTERVENTION

72. Risk factors for acute kidney injury requiring continuous renal replacement therapy after off-pump coronary surgery

Youhei M Tsuchiya[1], Isao M sukamoto[1], Yusuke M Watanabe[1], Keita M Sueyoshi[1], Hirokazu M Okada[1]

[1]*Saitama Medical University*

Background:
Recently, off-pump coronary artery bypass (OPCABG) grafting without cardiopulmonary bypass has become a less stressful surgical procedure for coronary artery bypass grafting (CABG). Many reports have discussed the risk factors involved associated with on-pump coronary artery bypass grafting and acute kidney injury (AKI) requiring continuous renal replacement therapy (CRRT). However, only a few papers have evaluated the risk factors for AKI requiring CRRT after OPCABG.
Aim: The purpose of this study was to assess the risk factors for AKI requiring CRRT after OPCAB.
Methods: An observational study of 237 consecutive non dialysis patients who underwent isolated CABG using OPCABG was conducted from September 2010 to June 2012. AKI was defined as proposed by the Acute Kidney Injury Network. Variables with P<0.05 in bivariate analysis collected from pre-, intra- and postoperative data were tested in the multivariate and proportional hazards regression analyses for risk factors of AKI requiring CRRT after OPCABG.
Results: Among 237 subjects, 33 patients needed CRRT due to AKI. The risk factors that were independently associated with AKI requiring CRRT were: pre-estimated glomerular filtration rate (GFR) (less than 60 ml/min/1.73 m2), pre-serum albumin level (less than 3.5 g/dl), pre-hemoglobin level (less than 12 g/dL), intra-urine volume (less than 600 mL), use of intra aortic balloon pump (IABP), and post-PaO2/FiO2 (P/F) (less than 300).
Conclusion: In conclusion, it is possible that the risk of developing AKI requiring CRRT after OPCABG depended on the levels of GFR, serum albumin and hemoglobin before surgery, on the levels of urine volume and use of IABP during surgery and the levels of P/F after surgery.

73. Effect Of Renal Rehabilitation On Quality Of Life Among Dialysis Patients

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[1]*Sultan Qaboos University*

Purpose: To optimize health, improve quality of life among dialysis patients and to develop an information booklet on “Coping with ESRD”. Methods: A randomized controlled trial was used. Approval for this study was obtained from the institutional ethics committee. The convenience sample was 150 patients with ESRD receiving dialysis. The intervention group received renal rehabilitation. Knowledge and quality of life were measured using a knowledge questionnaire and the RAND health-related kidney disease quality of life questionnaire at baseline, one month and two months post intervention with reinforcement on the same topics at each visit. The control group received usual care. Results: There was a statistically significant improvement in the mean scores for knowledge about end-stage renal disease (ESRD) among the intervention group compared to the control group (p<0.001). The mean scores of the QoL sub-scales were statistically significant (p <0.001). The sub-scale scores of Energy Fatigue among the intervention group and control group were not statistically different. The mean scores for the KD QoL sub-scales among the intervention group compared to the control group were statistically

significant ($p<0.01$). Implications: Early education about renal disease, its treatments, and the potential to live long and productively can aid in overall adjustment and decision making for people on dialysis. Conclusion: Education was shown to be a positive predictor of physical and mental health for people on hemodialysis. Patients who are encouraged to learn about their treatment have better outcomes and improved quality of life.

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74. Experience in CRRT using PRISMA Monitor in the ICU of a University Hospital in Northeast Mexico

Lilia M Rizo[1], Giovanna Arteaga[1], José Guadalupe Martínez[1], Cruz Valdez[1], Concepción Sánchez[1], Elisa Guerrero[1], Ricardo Moreno[1], Ivan Hernández[1]

[1]*Hospital Universitario "José Eleuterio González"*

Introduction: The AKI appears in 5-25% of patients in ICU, of which 6% will require RRT. If the AKI is associated with MODS mortality will be 50% and if RRT is required this will be 80%. Sepsis and Acute tubular perfussion are causes of AKI. The CRRT is an option for hemodynamically unstable patients and those whom can not handle the volume or metabolic disorders. The hemodialysis (HD) in critical patients is a common practice, however, the use of continous therapy with hemodiafiltration modality requires a special characteristics. Objective: Describe the experience using PRISMA monitor in our center. Material and Methods: Retrospective, descriptive, observational study,All patients who were given CRRT with PRISMA our center from March 2013 to November 2014. Data analysis was performed using Excel and SPSS programs. There is no conflict of interest and was conducted according to the ethics committee of our hospital. Results: CRRT was applied in an active way to 18 patients, 15 males (83%) and 3 females (17%), the average age was 43.9 years (Min. 17 Max. 78). 14 presented AKIN III, 4 where known with CKD. The most common cause of AKI was septic shock (83.3%). The oliguric AKI was the most common form of presentation in 86% of the patients. The average days of stay on ICU 17.5 days (SD 16.5). The average days of arrival and development of AKI is 2.6 days (SD 2.9). APACHE II and SOFA admission average was 30.5 (SD 6.5) and 13.6 (of 3.9) respectively. It was possible to stop CRRT in 5 of 18 patients (27.7 %), 2 patients continued with HD. There was a patient with combined therapy PRISMA-MARS. Only 3 out of 18 patients (20%) survived the hospital stay. In the comparative analysis of the groups: survivors versus non survivors there were non statistically significant differences in the SOFA and APACHE II scores or in the days of stay in the ICU with a IC of 95%. As for the prescription, blood flow measured in ml/min, extraction measured in ml/hr, the dialysate, the reinjection and total UF, showed no statistically significant differences with a IC of 95%. Discussion and Conclusions: According to the results, our experience is similar to that reported in the literature with high mortality in patients with AKI and MODS, despite improvement in renal function. With the methodology used and the present number of patients, it´s not possible to point out a good or bad prediction factor on the clinical characteristics of the patients or the therapeutic prescription.

VARIABLE	AVERAGING
FILTER	M100
SOLUTION	PRISMASATE
BLOOD FLOW (ml/min)	118 (DE 20.7)
EXTRACTION (ml/hr)	108 (DE 23.4)
TOTAL UF (ml/ TotalTime)	5598 (DE 8906)
DIALYZING FLUX (ml/hr)	868 (DE 199)
REINJECTION FLUX (ml/hr)	962 (DE 80.6)
TOTAL HOURS	52.46 (DE 78)
DYALISIS DOSE (ml/kg/hr)	39.8 (DE 13.19)

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75. Graft protection in renal transplant patients by investigation the angiotensin I-converting enzyme insertion/deletion and kinin B2 receptor + 9/-9 polymorphisms

CARLOS AMORIM[1], MARINA CRISTELLI[1], NIELS CAMARA[1], HÉLIO SILVA FILHO[1], JOSE MEDINA PESTANA[1], RONALDO ARAUJO[1]

[1]*UNIFESP*

Introduction: We know that this group analyzed, especially the individual DD ACE genotype (more ACE activity) showed higher loss frequency graft, IF / TA, acute rejection and higher serum creatinine levels (data already published, Amorim et al, 2013). However, other parameters of great clinical importance were analyzed at that time. Objective: The objective of the analysis was to determine the influence of insertion / deletion polymorphisms of ACE and / or + 9 / -9 B2 kinin receptor on the incidence of biopsy-proven acute rejection, IF / TA (in biopsies on clinical indication, Banff 1997 - 2005 update), graft loss and patient death. Methodology: Between 25/05/1988 and 28/10/2006, 260 of 4380 kidney transplant patients from the Hospital Kidney of São Paulo were randomly included in this study. Retrospectively, was verified the clinical course of these patients since the transplant until 21/06/2011. Results: Among the patients, 66% used some class of antihypertensive medication, and 34% were taking ACE inhibitors. In the chi-square analysis of these two groups was found that only 19% of subjects had lost the graft by noting that the transplanted group with the DD genotype did not show any episode of graft loss when used ACE inhibitors (p = 0.006). However, it was not possible to demonstrate a significant association between the use of ACE inhibitor and the occurrence of acute rejection, IF / TA or graft loss in both groups of polymorphisms insertion / deletion ACE in a multivariate analysis, probably by the number reduced episodes. Continuing the analysis of multiple variables, the ACE polymorphism was not related, independently, to any of the outcomes. The presence of heterozygous polymorphism + 9 / -9 kinin B2 receptor was a protective factor for finding IF / TA in univariate analysis (p= 0,002) and in multivariate analysis (p= 0,03). Polymorphism -9/-9 kinin B2 receptor was protective for IF / TA in univariate (p= 0,02) analysis but not in multivariate analysis. Conclusion: Even understanding the need for further studies to elucidate this relationship can to be concluded that the increase of the incidence the -9 allele in level of protection clinical the transplantation can be identified for the first time in the literature an renoprotection by increasing the B2 receptor expression and subsequent bigger action of kinins for transplanted patients with even more relevance than just the reduction of ACE activity levels, as previously reported in literature.

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76. RENOPROTECTION OF ACE INHIBITORS AGAINST GRAFT LOSS: INFLUENCE OF POLYMORPHISMS ANGIOTENSIN I CONVERTING ENZYME AND KININ B2 RECEPTOR

CARLOS AMORIM[1], MARINA CRISTELLI[1], NIELS CAMARA[1], HÉLIO SILVA FILHO[1], JOSE MEDINA PESTANA[1], RONALDO ARAUJO[1]

[1]*UNIFESP*

There is a consensus in the scientific literature that supports the importance of the kallikrein kinin and renin angiotensin systems in renal physiology, but few studies have investigated their importance after renal transplantation. The aim of this study was to investigate the clinical effects of the insertion/deletion polymorphism in the angiotensin I-converting enzyme (ACE) gene and the +9/-9 polymorphism in the kinin B2 receptor (B2R) gene in kidney-transplanted patients (n = 215 ACE, n = 203 B2R) compared with 443 healthy individuals. Demographic results showed that there is a higher frequency of the D allele (high plasma ACE activity) and + 9 allele (lower B2R expression) in transplant patients compared with control individuals (p= 0.027 and p= 0.007 respectively, Analyses by $\chi 2$). We also observed a higher frequency of these alleles in patients who had an elevated level of plasma creatinine. Furthermore, individuals with the DD genotype had a higher chronic allograft dysfunction (p= 0.005) and graft loss (p= 0.037) compared with the II patient genotype, which showed no loss of graft (survival analysis determined using Kaplan-Meier). In the analysis of prescription medication,

66% of transplant recipients were treated with some kind of anti-hypertensive and 34% were treated with ACE inhibitors. Comparing these two groups verified that only 19% of subjects experienced graft loss noting that the group transplanted with the DD genotype, with worse prognosis in all analyzes, did not show any episode of graft loss when used the ACE inhibitors ($p= 0.0065$, Analyses by $\chi 2$). However, it was not possible to demonstrate a significant association between the use of ACE inhibitor and the occurrence of acute rejection, IF / TA or graft loss in both groups of polymorphisms insertion / deletion ACE in a multivariate analysis, probably by the number reduced of episodes. Taken together, our date suggest that the genotyping of these individuals for ACE polymorphism and the use of ACE inhibitors could be clinically relevant.

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77. A Predictive Model for Successful Conversion of Continuous Renal Replacement Therapy to Intermittent Hemodialysis

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Introduction: Continuous renal replacement therapy (CRRT) is preferred modality of renal replacement therapy (RRT) in critical ill patients with acute kidney injury (AKI). However, it has several disadvantage such as high cost and risk of continuous anticoagulation. Therefore, initial application of CRRT and subsequent conversion to intermittent hemodialysis (IHD) could be practical measure. However, there has been no standard criteria for optimal timing of conversion to IHD in patients receiving CRRT. The aim of this study was to develop a predictive model for successful conversion of CRRT to IHD.

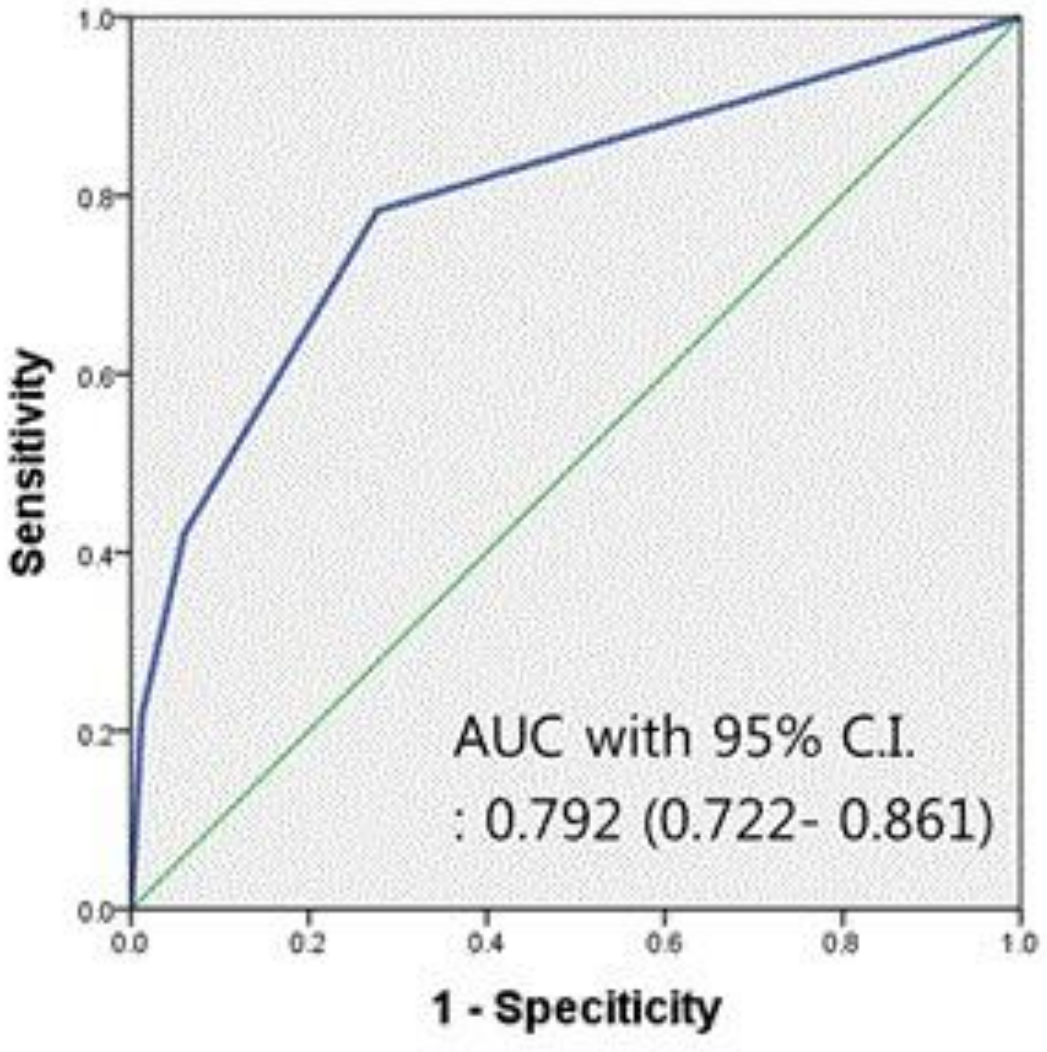
Materials and methods: This case-control study was conducted by retrospective review of electric medical records. We identified 513 adult patients who received CRRT at least 24 hours and and then IHD subsequently in intensive care units between April 2009 and February 2014. Failure in conversion to IHD was defined when CRRT was re-applied within 72 hours after discontinuation of CRRT, and 83 (16 %) out of 513 patients corresponded failure criteria: failure group. Equal number of patients were selected randomly from remaining 430 patients: success group.

Results: Prevalence of comorbid diseases and contributing factors to acute kidney injury were not different between two groups. Multivariate regression analysis demonstrated that cardiovascular (CV) sequential organ failure assessment (SOFA) score and nervous SOFA score at CRRT stop day were only two independent predictors of conversion failure as shown in Table. The risk of failure was discriminated between score 0,1 and score 2-4 for both CV and nervous SOFA. CV SOFA score 2-4 was associated with 13 fold increased Odds ratio for failure (95% C.I. 4.62 - 38.27, Ref 0-1) and nervous SOFA score 2-4 was associated with 5.4 fold increased Odds ratio for failure (95% C.I. 2.56 - 11.42, Ref 0-1) . Final prediction model included CV SOFA and nervous SOFA weighting CV SOFA (≥ 2) as 2 points and nervous SOFA (≥ 2) as 1 point. Thus risk score ranged from 0 to 3 points (0 point 47 %, 1 point 29 %, 2 point 13 %, 3 point 11 %). The performance of this model was acceptable with area under the receiver operating characteristic curve of 0.792 (95% C.I. 0.772 – 0.861).

Conclusions: The prediction model might provide an objective criteria for conversion to IHD in patients receiving CRRT and contribute to establish cost-effetive protocol of RRT for AKI in critical ill patients.

Table and figure on following page

Variables	Odds Ratio (95% CI)	P-value
CV SOFA score 0 (ref.)		
1	1.01 (0.28-3.68)	0.989
2	15.31 (3.05-76.89)	0.001
3	11.61 (2.31-58.33)	0.003
4	9.20 (0.96-87.99)	0.054
Neuro. SOFA score 0 (ref.)		
1	1.62 (0.51-5.17)	0.419
2	5.09 (1.89-13.71)	0.001
3	7.26 (2.36-22.36)	0.001
4	6.77 (1.51-30.24)	0.012



78. Continuous Renal Replacement Therapy to Treat Severe Metformin Induced Lactic Acidosis

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Background: Chronic metformin ingestion rarely causes lactic acidosis, but the risk is increased in chronic kidney disease. We present a case of severe lactic acidosis in a patient with diabetes treated with metformin, complicated by acute on chronic renal failure. The patient responded to continuous renal replacement therapy after developing marked hypotension on conventional hemodialysis.
Case summary: 54 year old African American male with hypertension, insulin dependent diabetes mellitus, chronic kidney disease (serum creatinine 1.5mg/dL), and bilateral above the knee amputations presented to the emergency department with 3 day history of lethargy and pruritis. The patient was taking insulin, simvastatin, and metformin (500mg bid). Initial laboratory evaluation revealed leukocytosis (11,000/mm3), severe renal failure (BUN 89, creatinine 10.2mg/dL), potassium 6.2mmol/L, anion gap of 24, and glucose 198mg/dL. Lactate was 11mmol/L with arterial blood gas of pH 6.5 and CO2 <5. Without a clear source of infection, suspicion was raised for metformin associated lactic acidosis (MALA).
The patient required emergent hemodialysis due to profound metabolic acidosis and ekg changes. Marked hypotension ensued within minutes on conventional hemodialysis and required dual vasopressor support. After 3.5 hours of hemodialysis, lactate was 17.5, and continuous venovenous hemodialysis (CVVHD) was initiated for ongoing clearance of lactatemia and metformin. Dialysate ran at 30ml/kg/hr with bicarbonate 35meq/L, and vasopressor support was weaned. Lactate reduced to 3.2mmol/L after 24 hours of CVVHD. Ultrafiltration increased to 250ml/hour on the second day of CVVHD and was transitioned off after four days. Two additional intermittent conventional hemodialysis sessions were required. Creatinine was 2.3mg/dL upon discharge and 1.4 2 weeks later. Figures 2 provides lactate trend. Metformin level was 38mcg/mL (therapeutic level 1-2) upon admission and 8.6mcg/mL after 10 hours of continuous replacement therapy.
Discussion: Our patient had findings consistent with MALA. Continuous renal replacement therapy effectively cleared both lactate and metformin.
Conclusion: Early initiation of continuous renal replacement therapy should be considered in the setting of suspected severe metformin associated lactic acidosis.

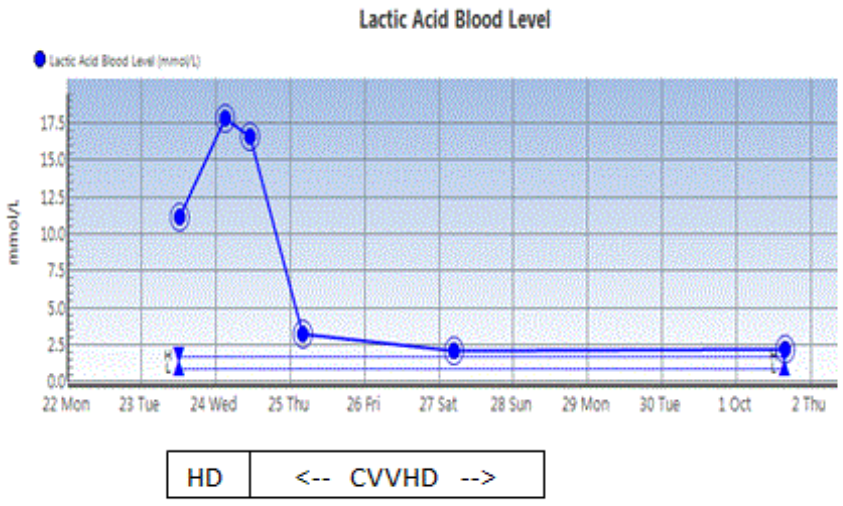

Figure 2: Lactate Trend on Conventional Hemodialysis (HD) and Continuous venovenous hemodialysis (CVVHD)

79. Severe Lupus flare presenting with Acute Renal Failure, Diffuse Alveolar Hemorrhage and Respiratory failure successfully managed with Extracorporeal Membrane Oxygenation (ECMO), Continuous Veno-venous

Naveed S Anwar[1], Kevin Finkel[1]

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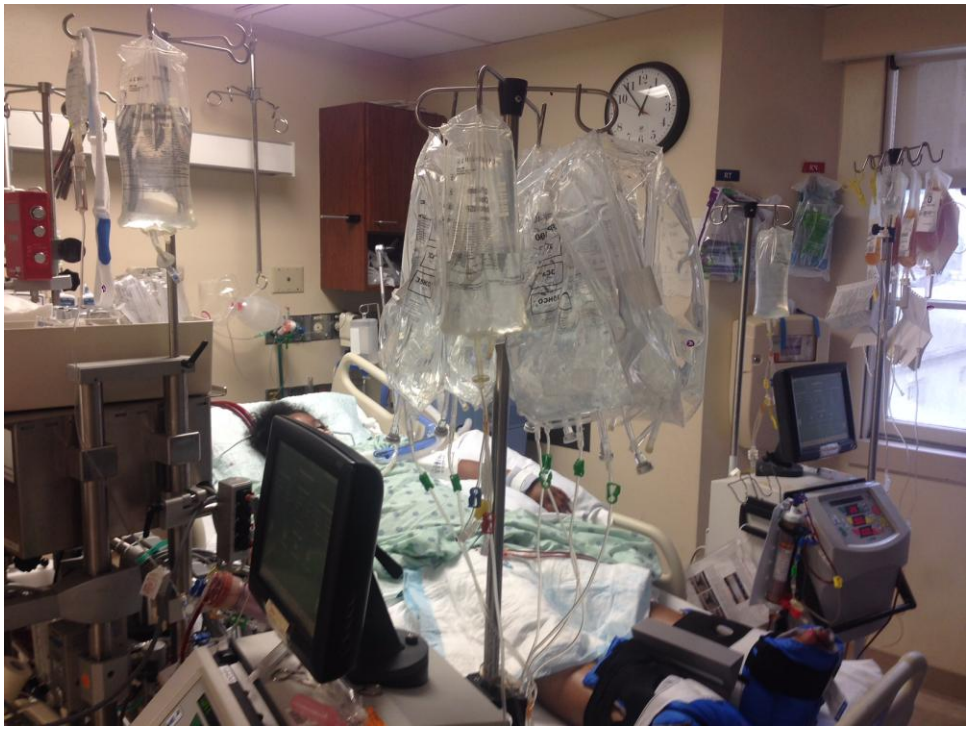
Patient is a 35 year-old African-American woman who was first diagnosed with systemic lupus erythematous (SLE) in 2006 complicated since with arthritis, Raynaud's, pleural & pericardial effusions. She underwent a renal biopsy about a year prior to presentation for proteinuria, which revealed class IV lupus nephritis. She has since been on Plaquenil, Cellcept and Cytoxan. She presented with complaints of weight gain, swelling and dyspnea. On presentation, labs showed acute renal failure (ARF) with an elevated serum creatinine of 3.6 mg/dl up from her baseline of 1.2 mg/dl. Her condition rapidly deteriorated as she developed hypoxic respiratory failure, hyperkalemia and acidemia. She was intubated and chest x-ray (CXR) showed bilateral diffuse pulmonary infiltrates. She was placed on veno-venous extra-corporeal membrane oxygenation (VV-ECMO) and this was achieved via a double lumen cannula in the right internal jugular vein. Given oliguric ARF and positive fluid balance, she was also placed on continuous veno-venous hemofiltration using the NxStage machine via the venous drain cannula on the ECMO circuit. A bronchoscopy was performed and the lavage findings were consistent with diffuse alveolar hemorrhage (DAH). She was initiated on pulse steroids and later received a dose of Cytoxan. She was also placed on daily plasmapheresis, with 1.5% plasma volume exchanges with 4000 ml of fresh frozen plasma (FFP), using a semi-permeable membrane. A total of five sessions were performed. By the end of these and with completion of pulse steroids, there was significant radiographic improvement, ECMO was discontinued and she was extubated. She was also transitioned off CVVH. She was eventually discharged from the hospital but remained dialysis dependent. This case well illustrates renal replacement therapy (RRT) applications and aggressive targeted interventions for a complex and serious medical condition, lupus flare with DAH. The evidence for TPE in severe SLE is category II and grade 2C evidence per the 2013 guidelines on the use of therapeutic apheresis in clinical practice. DAH is a rare life-threatening complication seen in patients with SLE. In once case series of 122 Colombian SLE patients, 5.7% presented with this condition. Plasmapheresis was employed in four patients and three survived. Our case describes a unique clinical scenario in which a multi-disciplinary effort with the use of targeted, timely interventions led to a successful outcome.



80. Monitoring Therapeutic Plasma Exchange in Pediatric Intensive Care Unit Patients with Sepsis

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Background: Sepsis and subsequent dysregulation in inflammatory mediators and regulatory compounds is associated with multiorgan system failure (MOSF). Mortality associated with sepsis and MOSF is greater than 50% in the pediatric intensive care unit (PICU). Therapeutic plasma exchange (TPE) has been studied as a method to remove these mediators and replace regulatory compounds. According to the World Apheresis Association, 2.5% of apheresis procedures from 2003-2007 were performed in patients less than 16 years old. Adverse events in pediatric patients were rare, but those who received TPE had the most complications. This study describes safety related to TPE in a large pediatric cohort.
Methods: This is a retrospective single center cohort study of PICU patients treated with TPE from January 2013 through September 2014. TPE was performed using membrane filtration with the Gambro Prismaflex® machine and the TPE 2000 filter with fresh frozen plasma and albumin as replacement fluid. Continuous Renal Replacement Therapy (CRRT) was performed using the same machine with filter sets based on patient size. Patients' clinical status and labs were recorded at initiation, during, and post TPE. Results are reported as means with standard deviation. Comparison analysis was performed with chi square analysis. All analyses were performed using SAS 9.3 (Carey, North Carolina).
Results: Eighteen patients received a total of 83 TPE sessions. All patients required CRRT at the time of TPE and 67% (12) required extracorporal membrane oxygenation (ECMO). The mean age was 8.4 years (5 d-18.5y). Indications for TPE included MOSF in 17 patients (94%), and hyperbilirubinemia in 1 (6%). On average, each patient received 4.3 sessions per course (1-9) and 1.1 courses per patient (1-2). Adverse events were reported in 7 patients (39%) and 12 (15%) sessions. The most common event, per patient and session, was low ionized calcium (3(17%), 7(8%)), followed by mechanical issues (3(17%), 3(4%)), hypotension (1(6%), 1(1%)), and clotted filter (1(6%), 1(1%)). Survival to PICU discharge was 67% (12) and 6 months post discharge 44% (8).
Conclusion: Pediatric TPE is challenging. Our findings suggest that, when performed at a specialized center, TPE for MOSF associated with sepsis is not associated with an excess of complications in this critically ill population. Further studies are necessary to determine whether this therapy will improve patient outcome.

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81. The Use of Peritoneal Dialysis in Heart Failure: A Systematic Review

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Background:
Heart failure (HF) is one of the most significant causes of morbidity, hospitalisations and mortality. Ultrafiltration (UF) and peritoneal dialysis (PD) are increasingly employed as therapeutic options in HF. A systematic review was performed to assess clinical outcomes when PD is used in the management of HF.

Methods:
We searched MEDLINE, Web of Science and Cochrane Central Register of Controlled Trials from 1966 to May 2014 to identify studies on patients in HF who treated with PD, excluding studies in patients with end-stage kidney disease. The primary endpoint of interest was all-cause mortality at the end of study protocol. Secondary endpoints included frequency and length of hospitalisations and degree of symptomatic improvement based on the New York Heart Association (NYHA) Functional Classification.

Results:
A total of 29 studies (n=723) were identified from 1277 citations. PD was the only mode of therapy in 25 studies,

while 4 studies had a comparator group treated with extracorporeal UF (PD: n=19; EBP: n=40). No randomised studies were identified.

All studies included patients with NYHA 3-4 with the exception of 1 study which also treated patients in NYHA 2. Survival of patients with HF treated with PD was highly variable (0-100%) due to a wide range of follow-up duration (36d –10 years). For studies with follow-up period above 6 months, the overall mortality was 42.4%.

Of the 4 studies which treated patients with PD or UF, only 3 reported mortality data. Mortality was 42.1% with PD and 45.0% with UF. No significant difference in mortality was seen between PD and EBP (OR 0.80; 95% CI: 0.24 – 2.69).

Typically, treatment with PD resulted in a subjective improvement in symptoms in patients who were diuretic resistant, and a reduction in NYHA grade by at least 1 grade.

Ten studies reported hospitalisation frequencies and/or length of stay. With the exception of 1 study which showed no reduction in hospitalisations, the remaining studies reported a favourable reduction with hospitalisation frequencies or length of stay after PD was introduced.

Conclusions:
Observational studies indicate that patients with HF may have fewer symptoms, less hospital admissions and shorter hospitalizations when treated with PD compared to diuretic therapy alone. However there is a paucity of good-quality evidence to allow comparison with other modalities of UF. PD may be considered as an adjunctive treatment in HF resistant to diuretics.

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82. Blood Product Administration is Not Associated with Unscheduled Filter Change in Pediatric Continuous Renal Replacement Therapy

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Purpose: Continuous renal replacement therapy (CRRT) filter loss with clotting can lead to adverse outcomes due to inadequate dialysis delivery, blood loss and increased exposure to packed red blood cells (pRBCs) for patients (pts) who require a blood prime. Recently, plasma transfusions have been reported to be associated with filter loss in pediatric liver failure pts on CRRT anticoagulated with prostacyclin and heparin. We hypothesized that there would be a correlation between blood product transfusions and unscheduled filter loss in CRRT pts receiving regional citrate anticoagulation (RCA).

Methods: A retrospective, single center, cohort study of pediatric CRRT pts from July 1, 2013 to July 30, 2014. Indications for CRRT initiation included electrolyte abnormalities, fluid overload, acute kidney injury, and hyperammonemia. Children who were on CRRT for liver dysfunction as well as receiving modified CRRT through extracorporeal membrane oxygenator circuits were excluded. All pts received continuous venovenous hemodiafiltration with prefilter hemodilution using RCA, minimum clearance was 2000 ml/1.73m2/hr. Blood products included pRBCs, platelets, fresh frozen plasma, and cryoprecipitate. The primary outcome was CRRT filter loss within 2 hours of blood product administration.

Results: There were 28 pts with 126 filter changes. 89 filters (70%) were changed electively. Median filter life was 67.6 hours (IQR 37.7-75.5 hours). Two pts with known tenuous access had 17 and 7 filter losses due to access-related clotting, respectively. Pts received a total of 470 blood products while on CRRT. 13 products were given within the 2 hours preceding filter change. Only 2 filter losses occurred in the 2 hour window following blood product administration, in both cases the products administered were platelets. However, there were a total

of 270 instances of platelet transfusion. There was no correlation found between blood product administration and filter loss in the patients studied (p=0.85).

Conclusions: Blood product administration was not associated with filter loss in pediatric CRRT pts on RCA. Access problems were most commonly observed in association with unscheduled filter loss. More investigation is needed to identify other modifiable risk factors for filter loss to minimize treatment interruptions.

83. Assessment of the Compatibility of the Improved 5L ACCUSOL CLEAR-FLEX Product Design With the Prismaflex® System

Damien Valkeners[1], Sebastien Molly[1], Benoit Moreaux[1]

[1]*Nikkiso Belgium*

The ACCUSOL CLEAR-FLEX technology provides a 5L container suitable for CRRT solution by using a peel-sealing technology. This container has two compartments to hold respectively a pH 9.0 concentrate of bicarbonate solution and a pH 2.0 electrolyte concentrate solution. The ACCUSOL product design has been recently improved. To the first long peel-seal dividing the bag in two chambers to separate the active ingredients, a second short peel-seal isolating the access system from the solution has been added. The sequential opening of the two peel-seals has been validated to ensure firstly the opening of the long peel-seal allowing instant mixing of the concentrates to constitute the ACCUSOL solution, and then secondly the opening of the short seal allowing infusion of the mixed solution into the patient. In addition, both access system and hanger hole have been changed from an off-centered to a centered position. The aim of this study was to assess the compatibility of the improved 5L ACCUSOL product with the PrismaFlex® system.
CVVH and CVVHD therapy simulations have been performed using the therapy parameters presented in Table 1 and using saline bag to mimic the patient. For CVVHD therapy, a total of 20 Accusol bags were used, whilst for CVVH therapy a total of 40 Accusol bags were used, 20 for pre-dilution and 20 for post-dilution. The middle hook of the Prismaflex® system scales was always used to hang the different Accusol bags.
The following parameters have been monitored in order to assess the compatibility of the improved Accusol product with the Prismaflex® system:
-"Replacement bag/replacement bag 2 empty" message shall be displayed before each bag is fully empty and air is potentially injected into the circuit;
-No "Air in blood" alarm shall occur during the therapy simulation;
-No "Replacement/replacement 2 weight" alarms shall occur during the therapy simulation.
For all the bags used to perform both CVVH and CVVHD therapy simulations, the top of the access system was still immersed in the solution at each "Replacement bag/replacement bag 2 empty" message, ensuring that no air enters into the system. In addition, all the bags were found to be stable on the Prismaflex® system scales as no balance alarms were triggered during the simulations.
These results highlight that the improved 5L ACCUSOL CLEAR-FLEX product can be used safely in combination with Prismaflex® CRRT device.

Therapy Parameters	CVVHD	CVVH
Dialysate flow rate (L/h)	8	-
Pre-pump flow rate (mL/h)	-	700
Post-pump flow rate (mL/h)	-	1800
Blood flow rate (mL/min)	450	200
Ultrafiltration rate (mL/h)	100	100

84. Understanding Acute Kidney Injury (AKI), One Patient At A Time

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Purpose of the Study:
AKI is an important disease. It is poorly understood in individual patients, and still has no specific therapy despite years of research. New approaches and tools are needed. The goal of this study was to develop an AKI monitoring device for individual patients. It will relate patient parameters and the processes of care in the Intensive Care Unit (ICU) to urinary biomarker trends. The device is a DAta and SAmple BAnker for urine (DASABA-U). It will collect and preserve refrigerated hourly urine samples and obtain (via wireless) de-identified patient data from the Electronic Medical Record. Device software will match numbered samples with drug doses, physiologic data and clinical events, and store patient characteristics. Samples and data are analyzed off-line for urinary biomarkers and clinical profiles.

Methods:
A prototype DASABA-U was built using off-the-shelf (OTC) components to control cost. An embedded system with a single board computer (SBC) was used as a controller. Miniature roller pumps drove the microfluidics. Samples were partitioned using immiscible fluorocarbon spacers dispensed and controlled by monitoring conductance measurements, within Teflon ® tubing. Bubble detection was optical in the infra-red. Refrigeration was accomplished with a Peltier thermoelectric cooler using highly efficient insulation and thermal management. An analog sensor with accuracy +/- 0.5 degrees Centigrade was used for temperature regulation.

Results and Conclusion:
RESULTS: The DASABA-U ran entirely unmanned, except for sample removal every 12 hours. The 1 Gigahertz SBC processor coordinated system components and managed power with pulse wave modulation (PWM). Fluorocarbon partitions separated 60 microliter samples each hour, with no cross-contamination. The refrigerator unit was the size of a coffee mug and weighed 500 grams. Wireless OTS plug-ins and multi-gigabyte storage for EMR operations are widely available and inexpensive – these were not incorporated into the phase one prototype.
CONCLUSION: An autonomous DASABA-U with OTS and reusable components will minimize device acquisition cost, labor cost and cost per sample, making it possible to collect data and matching samples in many patients with only modest resources. A battery powered, compact, light-weight design adds to practicality. This technology could improve the process of care in ICUs, enhance clinical trials and help to gather data for a national AKI registry.

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85. Extracorporeal carbon-dioxide removal by zero bicarbonate dialysate: a novel lung protection strategy

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[1]*Mayo Clinic Arizona,* [2]*University of Pittsburgh Medical Center, Pittsburgh,* [3]*National University, Singapore,* [4]*University of Pittsburgh*

Background
Extracorporeal carbon dioxide (CO2) removal (ECCOR) may enable lung protective ventilation (LPV) in Acute Respiratory Distress Syndrome (ARDS) by lowering minute ventilation and preventing severe respiratory acidosis due to hypercarbia. ECCOR may also avoid intubation and mechanical ventilation in primary hypercarbic respiratory failure as in acute COPD (chronic obstructive pulmonary disease). ECCOR in the form of continuous hemodialysis offers an alternative, more available, strategy compared to mechanical artificial lung technologies.

Objective
Our objective was to assess feasibility of ECCOR using a novel zero bicarbonate dialysate solution in an in vitro

bovine blood model and in vivo murine model of hypercarbic respiratory failure.

Methods
An in-vitro model of hypercarbic bovine blood was designed to test a dialysate solution created to remove bicarbonate. The zero bicarbonate dialysate solution was developed using the Stewart equation and designed to control the strong ion difference rather than replacing bicarbonate. This was tested for its feasibility of carbon-dioxide (CO_2) removal at different dialysate flow rates.
Subsequently, 5 Sprague-Dawley rats were anesthetized and hypoventilated for hypercarbia under deep anesthesia. We cannulated the femoral and internal jugular veins and a continuous blood flow (2ml/min)) circuit was created using a pump and an M10 dialysis filter (surface area, 0.04 m-sq; Gambro, Lyon, France) with the dialysate flows of 5 ml/min. Respiratory dialysis (RD) was commenced when the $PaCO_2$ reached around 75 mm Hg. This was stopped after an hour and blood gases were monitored subsequently for an additional hour.

Results
Total CO_2 removal was 30-48% of production using dialysate flows in the intermittent hemodialysis flow rate and 1.4-3% in the continuous renal replacement flow rates. In the rats, at baseline, the $PaCO_2$ was 75 ± 5.4 mm Hg and reached 58 ± 2.1 mm Hg after one hour of RD. When dialysis was stopped the $PaCO_2$ continued to rise steadily and reached 88 ± 4.9 mm Hg. pH was 7.19 ± 0.03 prior to initiation of RD and improved to 7.3 ± 0.04 after one hour; again dropping to 7.09 ± 0.06 at the end of an hour off RD.

Conclusions
Respiratory Dialysis is feasible in a bench model of hypercarbic respiratory acidosis using bovine blood and also in a small animal model of hypercarbic respiratory failure. It enables ECCOR using a zero bicarbonate dialysate with acceptable control of arterial blood pH.

86. Withdrawn

87. Postoperative Fluid Overload Predicts Short-term Outcome of Renal Replacement Therapy for Acute Kidney Injury after Cardiac Surgery

Jiarui Xu[1], Xiaoqiang Ding[1], Bo Shen[1], Zhonghua Liu[1], Jianzhou Zou[1], Yi Fang[1], Lan Liu[1], Chunsheng Wang[1], Jie Teng[1]

[1]Zhongshan Hospital, Shanghai Medical College, Fudan University, [2]Zhongshan Hospital, Shanghai Medical College, Fudan University

Objective: To analyze the predictive value of postoperative percent fluid overload (PFO) of renal replacement therapy (RRT) for acute kidney injury (AKI) patients after cardiac surgery.
Methods: We collected data of three hundred patients who underwent RRT due to AKI after cardiac surgery from 2005 January to 2012 April for retrospective analyses. Receiver operating characteristic (ROC) curve was used to compare predictive values of cumulative PFO at different periods after surgery (PFO before and after RRT initiation, PFO within 24h and PFO during the whole ICU stay) for 90-day mortality.
Results: A total of 280 patients were enrolled, including 200 males and 80 females with a mean age of 56 ± 14 (18-83) years. The mean length of hospital stay was 36±35 (range 3-210) days. The average ICU stay was 20 ± 24(range 3-173) days. The 90-day mortality was 65% (n=182). The cumulative PFO before RRT initiation was 7.9±7.1% and the median PFO was 6.1%. The cumulative PFO before and after RRT initiation in ICU was higher in death group than in survival group (8.8±7.6 vs 6.1±5.6%, $P < 0.01$; -0.5 [-5.6, 5.1] vs 6.9 [2.2, 14.6], $P < 0.001$). The cumulative PFO during whole ICU stay was 14.3±15.8% and the median PFO was 10.7%. The areas under the ROC curves to predict the 90-day mortality by PFO at 24h, cumulative PFO before and after RRT initiation, and PFO during the whole ICU stay postoperatively were 0.625, 0.627, 0.731, 0.752, respectively. PFO during the whole ICU stay ≥7.2% was determined as the cut-off point for prediction of 90-day mortality with a sensitivity of 77% and a specificity of 64%. Kaplan–Meier survival estimates showed a significant difference in survival among patients with cumulative PFO>7.2% and PFO<7.2% after cardiac surgery (Log-rank $P<0.01$).
Conclusions: Our data showed postoperative PFO during the whole ICU stay≥ 7.2% would have an adverse effect on 90-day short-term outcome, which may providing some suggestion in volume control of AKI-RRT patients after cardiac surgery.
Key words: cardiac surgery; acute kidney injury; renal replacement therapy; fluid overload; short-term outcome

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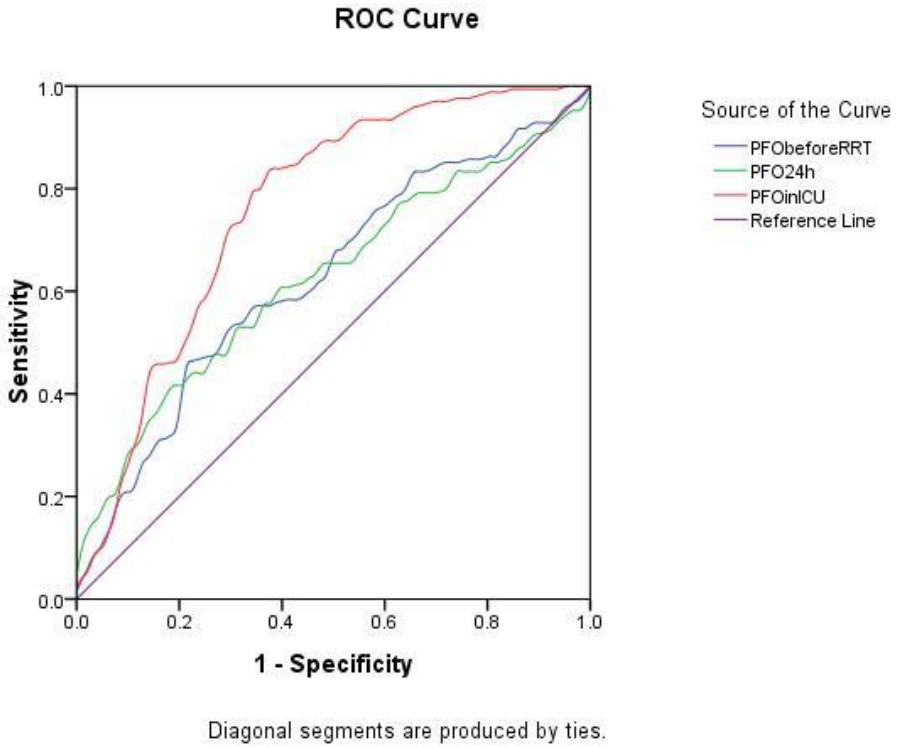

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88. Timing of Continuous Renal Replacement Therapies in Acute Kidney Injury Patients After Cardiac Surgery

PAOLA CARDENAS[1], JOAN SABATER[1], GABRIEL J MORENO[1], VICENTE F CORRAL[1], RAQUEL S CONTRERAS[1], NESTOR D TOAPANTA[1], VICTOR D GUMUCIO[1], ALAIN J PINSEAU[1], XOSE L PEREZ[1]

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Cardiac surgery-associated acute kidney injury (CSA-AKI) is a common postoperative complication. Depending on the definition used, the incidence of CSA-AKI is reported to range from 1 to 30%. CSA-AKI requiring continuous renal replacement therapy (CRRT) occurs in 1.2–3.0% of cardiac surgery cohorts and is independently associated with mortality.
Objectives: We studied mortality differences between CRRT and nonCRRT patients, and Timing effect (Early vs Late CRRT initiation respect to ICU admission) using non-CRRT as control group.
Methods: Observational prospective cohort study of 2100 undergoing different types of CS from 2006 to 2011 in a tertiary university hospital. 87 patients developed AKIN 2-3 stage within the first 24h of immediate postsurgical ICU admission, whereas 30 patients received CRRT during their ICU stay. All those patients with CKD 4-5 were excluded. We classified patients in early group (<48 h) and late group (>48 h) based on time from ICU admission to CRRT.
Results: Baseline patients characteristics were: Mean age (years) 65±10; APACHE II 20±8; SOFA 10±3; UO (ml) 6h before CRRT 161±225; Creatinine at CRRT initiation (umol/L) 298,20±98. Mortality at 90 days in patients with AKIN 2-3 the first 24h of ICU admission was 37,9%. The mortality in patients with AKIN 2-3 that required CRRT was 63,3%, compared with 24,6% in patients that did not require CRRT. Timing analysis was performed (Early vs Late) using non CRRT as control group: Mean age in years (60±8 vs 70±7) vs 66±10; SOFA (11±3 vs 11±3) vs 10±3; APACHE (22±6 vs 23±7) vs 19±8; Creatinine at ICU admission (umol/L) (55±14 vs 66 ±17) vs 59±8; UO 24h at ICU admission (ml/k/h) (0,3±0,2 vs 0,7±0,5) vs 0,8±0,4; Urine output 6h previous to CRRT (0,2 ±0,2 vs 0,5 ± 0,6)*. *p<0,05.

Conclusions: Higher mortality in those AKIN 2-3 whom needed CRRT vs non-CRRT (63.3% vs 24.6%). Timing analysis revealed no survival differences between those patients who were early initiated on CRRT (<48h respect to ICU admission) and those who were initiated later (60.0% VS 66.7%). Urine output 6h previous to CRRT was significative higher in the late group respect to the early group (0.54ml/kg/h vs 0.18 ml/gh/h) introducing some concerns about CRRT indication on this Late group. CRRT initiation in advanced AKIN patients (AKIN 2-3) who still present preserved UO >0.5ml/k/h should be discouraged, these patients present higher mortality compared to non-CRRT patients.

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89. Vancomycin Clearance in an Infant Receiving Extracorporeal Liver Support and Continuous RenalReplacement Therapy

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We report a case of an 8-month-old full-term male with biliary atresia and failed Kasai procedure, who was transferred to our institution for liver transplant evaluation and was treated with vancomycin. His post-operative course had been complicated by intestinal perforation, peritonitis, severe liver failure, pulmonary and gastrointestinal hemorrhage, cardiac insufficiency, and respiratory failure. On hospital day 2 at our institution, he was initiated on continuous veno-venous hemodiafiltration (CVVHDF) with pre-filter replacement for 30% fluid overload and acute kidney injury. On hospital day 4, he was started on plasmapheresis for refractory coagulopathy. On day 6, he became increasingly hyperammonemic (215 µmol/L) and his CVVHDF diffusive clearance was increased from 2000 to 8000 ml/1.73m2/h. Despite this intervention, his ammonia levels remained elevated at 140 µmol/L and the patient developed severe encephalopathy. On day 7, extracorporeal liver support (ELS) with molecular adsorbent recirculating system (MARS) therapy was initiated for hepatic encephalopathy. The patient underwent 27 MARS treatments, averaging 8 hours in duration, from days 7 to 62 until successful liver transplantation. Clearance prescribed during ELS varied between 2000 to 4000 ml/1.73m2/h. During the hospitalization, the patient had multiple episodes of sepsis. He received one 14-day course and 4 shorter courses of vancomycin. Multiple vancomycin levels were drawn to assess need for dose adjustments with his extracorporeal therapies. Vancomycin levels were found to be lower during MARS therapy than during CVVHDF alone, indicating increased clearance with MARS (see table). The patient required 15-18 mg/kg/dose of vancomycin administered every 8 hours of to maintain trough levels of 5-10 mg/L, which is higher than standard empiric dosing recommendations for vancomycin therapy in CVVHDF. Vancomycin binds to serum albumin, and MARS is known to increase clearance of other protein-bound medications. There are currently no reports of vancomycin dosing requirements for adult or pediatric patients receiving MARS. This case demonstrates that higher empiric doses may be necessary for treatment for patients receiving MARS. It is important for centers using MARS to develop a standard protocol for vancomycin monitoring to accurately calculate pharmacokinetic variables and to provide optimal dosing.

	CVVHDF only		MARS	
Vancomycin Level	Number of Levels	Median time after dose	Number of Levels	Median time after dose
< 5 mg/L	0	--	2	7.25 hours (IQR 7.1-7.4)
5 – 14.9 mg/L	22	7 hours (IQR 6.1-7.5)	3	3.75 hours (IQR 3.5-4.25)
≥ 15 mg/L	6	4.9 hours (IQR 4.1-5.5)	0	--

90. Dialysis Hypotension in Hospitalized Patients: Effect on Ultrafiltration and Clearance

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Background: Intradialytic hypotension (IDH) is a common complication in outpatient hemodialysis (HD), but its incidence is not well studied in the acute setting. We aim to characterize the frequency of IDH among hospitalized ESRD and AKI patients, as well as ascertain the rate of achievement of prescribed ultrafiltration (UF) goals.

Methods: We conducted a retrospective review of all intermittent HD treatments performed on inpatients in an academic center from December 2013-March 2014. IDH was defined as the systolic or diastolic blood pressure threshold prespecified by the nephrologist at which a supportive intervention (e.g. saline, decreased UF) should occur. Characteristics of sessions with and without IDH were compared.

Results: A total of 755 HD sessions (ESRD 62%, AKI 38%) were performed in 173 inpatients, with a median of 3 (IQR 1, 5) sessions/patient, and a median of 3h/session. Prescribed UF per session was 3 (IQR 2, 3) L or 9.6 (IQR 4.2, 10.7) ml/kg/hr. Achieved UF per session was 2 (IQR 1, 3) L or 7.3 (IQR 4.2, 10.7) ml/kg/hr. Prescribed UF goals were achieved in 39% of sessions; the median achieved/prescribed UF (APUF) ratio was 0.86 (IQR 0.67, 1.00). IDH complicated 251 (33.2%) sessions; IDH occurred more commonly in sessions in the ICU, and in AKI patients. The APUF ratio was significantly lower in sessions with IDH. There was no difference in prescribed UF, blood flow, dialysate flow, Kt/V, prescribed or actual duration of HD between the two groups (Table).

Conclusions: Intradialytic hypotension is common among hospitalized patients, and more commonly encountered in those with AKI. This adversely affects the ability to achieve prescribed UF goals, but does not appear to reduce Kt/V.

	IDH (n=251)	No IDH (n=504)
ICU, n(%)**	78 (31)	79 (16)
AKI patients, n(%)*	115 (46)	174 (34)
Actual HD duration (min)	210 [185,210]	210 [210,210]
Prescribed UF, ml/kg/h	8.9 [5.7,12.6]	9.7 [6.2, 13.3]
Achieved UF, ml/kg/h**	6.0 [3.5,8.3]	8.2 [5.2,11.5]
Achieved/prescribed UF ratio**	0.7 [0.48, 0.90]	0.95 [0.75,1.0]
Kt/V	1.2 [0.9, 1.6]	1.3 [1.0, 1.5]
* $p<0.05$; ** $p<0.001$.	Data presented as median [IQR]	

NURSING ISSUES

91. Reducing Hemodynamic Instability: Circuit to Patient Patient to Circuit Priming

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Priming renal replacement therapy circuits can cause hemodynamic instability when the patient is disconnected from the old circuit. Circuit to patient patient to circuit priming significantly reduces off-pump time and the risk of hemodynamic instability is reduced as the pump continues to run at the current flow settings.
There are several different methods that can be utilized when changing a circuit; setting up a separate machine, circuit to circuit, and circuit to patient patient to circuit. The first method reduces off pump time but often requires blood from the blood bank to minimize instability. The second method reduces blood product use but off pump time is significantly increased, and the third method, reduces blood product use and significantly reduces off pump time.
Our success rate with circuit to circuit priming was dismal, resulting in increased use of blood priming to decrease the risk of hemodynamic instability with circuit changes. However, when we changed to the circuit to patient patient to circuit priming, we decreased the risk of hemodynamic instability by reducing the off-pump time to less than 5 minutes and we eliminated the use of blood products and the inherent issues with continued blood exposure.

92. Vancomycin dosing in patients on Continuous Veno-Veno Hemodiafiltration

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Vancomycin is frequently used to treat life-threatening infections caused by methicillin-resistant Staphylococcus aureus (MRSA) in critically ill patients in the intensive care unit (ICU). Limited data suggest that initial vancomycin trough levels of 15-20 mcg/ml were associated with significantly lower failure rates in the treatment of MRSA bacteremia. Despite the recognized importance of early appropriate antimicrobial therapy, there are no clear guidelines exist regarding dosing of vancomycin in patients receiving CVVHDF. Moreover, it is suspected that the common vancomycin dosing strategies often produce sub-therapeutic vancomycin levels during CVVHDF. The objective of this study was to evaluate adequacy of vancomycin dosing in patients on CVVHDF in different ICU settings. Data were collected retrospectively on patients on CVVHDF receiving IV vancomycin as a quality improvement project. CVVHDF was performed using M100 set with AN69 hemofilter with Prismaflex CRRT System. Prismasate BGK 4/2.5 was delivered at 500-1000 ml/hour as dialysate. Prismasol BGK 2/0 or 4/0 was infused at 1500-2000 ml/hour as replacement fluid. Minimum effluent rate of 20-25 ml/kg/hour was achieved in each patient. Data (mean + SD) were analyzed on 11 patients (mean age 63 + 13 years, 4F, 7M) who received a total of 36 doses of vancomycin while on CVVHDF. Indication for vancomycin use was MRSA sepsis in 3, pneumonia in 2 and empiric in 6 of 11 patients. The mean number of days of CVVHDF was 4.7 + 2.4 days. Twenty four doses of vancomycin were 1 gram each. The mean vancomycin dose was 980 mg (range 500 to 1300 mg), with the majority of the doses fell below 15mg/kg per dose. The timing to checking vancomycin levels was randomly chosen. Vancomycin levels were checked 41 times in 9 patients. In two patients, no vancomycin level was done. The mean frequency of vancomycin levels being checked was 4.7 + 2.7 times. Mean number of

hours to vancomycin level were 23.2 + 11.4 hours after the dose was given. Mean vancomycin level was 17.3 + 5.9 mcg/ml in the entire population. Nineteen out of 41 (46 %) vancomycin levels were <15 mcg/ml, 34% of the levels were between 15-20 mcg/ml while 19% were >20 mcg/ml (mean in this group was 23.3 + 2.2 mcg/ml). Thirty four percent of the levels were within the current recommendations of 15–20 mcg/ml. Data suggest that vancomycin dosing was sub-therapeutic in patients on CVVHDF and improvement in vancomycin dosing is needed in these patients.

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93. Clinical Pathway For Postoperative Organ Transplants

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Transplantation medicine is one of the most challenging and complex areas of modern medicine. Some of the key areas for medical management are the problems of transplant rejection, during which the body has an immune response to the transplanted organ, possibly leading to transplant failure and the need to immediately remove the organ from the recipient. When possible, transplant rejection can be reduced through serotyping to determine the most appropriate donor-recipient match and through the use of immunosuppressant drugs. Postoperative care actually begins before the surgery in terms of education, discharge planning, nutrition, pulmonary rehabilitation, and patient/family education. This also allows for expectations to be managed. A multidisciplinary approach is the key, and collaborative team meetings are essential to ensuring that all team members are "on the same page." .The following clinical pathway map and guidelines with the aim to decrease alteration in clinical practice and are intended for those healthcare professionals who look after organ transplant patients. They are also intended to be useful to both medical and surgical trainees as well as nurse specialists and other associated healthcare professionals involved in the care of organ transplant patients. This pathway is general pathway include the general guidelines that can be applicable for all types of organ transplant with special considerations to each organ.

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94. Advancing Healthcare for Patients Through the Use of Continuous Renal Replacement Therapy (CRRT) as the Standard of Care for Acute Kidney Injury, Reducing Mortality and Morbidity Rates, Length of Stay

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Kidney disease has been a prominent cause of death for many years. Kidney disease has been in the top ten leading causes of death in the United States. From 1980 to 2005, the incidence of renal disease as primary hospital discharge diagnosis quadrupled; approximately 10 million hospitalizations had kidney disease listed. This increase is most likely due to significant increases in sepsis, diabetes, and hypertension cases, which are major risk factors comorbidities for kidney disease. Sepsis, surgery, and dehydration are the most common causes of acute kidney injury (AKI) and it must be noted that hospitalizations for sepsis (as principal diagnosis) more than doubled from 2000-2008.
The goal is to explore the concept of continuous renal replacement therapy (CRRT) and to identify necessary application and development in an attempt to demonstrate the importance of CRRT in critically ill patients diagnosed with AKI. This practice is already performed in many intensive care units across the United States and the world with documented benefits. As nurses, the aim for optimal health and treatment outcomes is natural, and in order to provide this for the patients, the proper interventions need to be in place. CRRT is a better option for

those who are hemodynamically unstable and unable to endure intermittent hemodialysis (IHD) in the critical care setting.
Implementation of CRRT into any intensive care unit necessitates a demanding process including a valid needs assessment and the need for new and adequate clinical competence among staff. But overall, as patient conditions become more acute and chronic illness becomes more prevalent, the use of CRRT should be available for AKI in those who are too unstable for intermittent hemodialysis. Addressing acute renal injury early through the use of the RIFLE classification system will assist in early implementation and greater outcomes for those who have CRRT available.
Understanding the value of CRRT is realizing that implementation can reduce length of stay, morbidity, mortality, and cost (both present and future) for those diagnosed with AKI in the intensive care setting. Creating this understanding throughout the healthcare industry and especially within hospitals in underserved areas will give all AKI patients a greater chance for survival and less chance of needing chronic dialysis.

*References available upon request

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95. Implementation of a CRRT Program: A University and Community Hospital Collaboration

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Introduction
In July 2013 Meritus Medical Center instituted an intensivist model for the medical/surgical intensive care unit with physician staffing from the University of Maryland. Analysis showed that at least once a month a patient was transferred to another hospital for continuous renal replacement therapy (CRRT) or had difficulty tolerating intermittent hemodysislys. A proposal to bring CRRT to our unit was made and administration agreed to support a program. Although enthused about bringing a CRRT program to our unit, staff had concerns due to limited previous exposure to CRRT, education and training, and if the unit would have enough cases to justify a program.

Methods
A comprehensive plan was developed to educate, train and implement CRRT in our unit. Our intensivists with backgrounds in CRRT gave introductory lectures to nursing and a core group of 8 nurses went to the University of Maryland Medical Center to shadow nurses managing patients receiving CRRT. Our nurses completed an on-line course and received on-site training by our equipment supplier. Our nurses have also established “CRRT Buddies” at the University who have volunteered to be available for questions. Our first patient was placed on CRRT in May 2014.

Results
Since the implementation of our program we are averaging one to two patients a month on CRRT. Indications for therapy have included acute kidney injury, volume overload, acidosis, and end-stage renal disease with hypotension. Currently 8 nurses are trained to provide therapy and an additional 8 nurses are to begin training. All future training will occur on site. Continuing education will include in-service exams and yearly refresher training. Nursing has reported continued support of the CRRT program.

Conclusions
Our unit has successfully implemented at CRRT program. We are currently managing one to two patients a month and have used the therapy for a variety of indications. All future nurse training will occur on our campus. A patient registry has been established for purposes of quality management.

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96. Continuous Renal Replacement Therapy (CRRT) Dashboard: Implementation of a Continuous Quality Improvement Program

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Background:
Quality improvement is a dynamic, interdisciplinary process that strives to achieve the best outcomes for the patients and families. The importance of measuring and monitoring healthcare quality is no longer in doubt. Under the healthcare umbrella, smaller quality improvement project focusing on specific diseases or programs have implemented, identifying and addressing their unique needs. Programs such as dialysis and cystic fibrosis have embraced quality improvement strategies, yet acute care nephrology lags behind. This project aimed to identify and measure indicators unique to Continuous Renal Replacement Therapy Programs that may influence the delivered care and patient outcomes.
Methods and Results:
We used a Continuous Quality Improvement (CQI) platform to identify the data metrics unique to the delivery of CRRT in the pediatric population. We implemented a CQI program collecting identified data metrics from February 2013 to present. The data was organized, assessed and disseminated to the multidisciplinary teams quarterly through a CRRT Dashboard framework. Filter life is 47.7 hours, unplanned filter change is 35%, and attainment of daily fluid balance goal is 71%.
Summary:
CQI programs are associated with improving delivery of care and patient outcomes. Applying the CQI program strategies to a CRRT program allows programs to review the unique characteristics associated CRRT programs, discussing the performance data. The next steps are benchmarking with other institutions. Our institution is in the early stages of implementation and determining our baseline data, yet now have a format for identifying challenges in the delivery of care as well as reviewing patient characteristics and outcomes. Implementation of CQI strategies are essential in the assessment of quality of a CRRT program.

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97. A Pediatric Continuous Renal Replacement Therapy (CRRT) simulation curriculum improves technical and teamwork skills of personnel caring for critically ill children

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Background
Treatment of acute kidney injury (AKI) in critically ill pediatric patients with continuous renal replacement therapy (CRRT) is highly invasive, technical, and complex. However, optimal CRRT delivery relies on an expert staff to maintain prescribed therapy, troubleshoot technical issues, and ensure patient safety, methodology to educate and achieve benchmarks of standards of care for CRRT provision do not exist. Simulation-based education, associated with positive effects on procedural, cognitive skills, teamwork and communication, is understudied for CRRT training.
Objective
Test the hypothesis that a simulation-based curriculum can improve the technical and teamwork skills associated with optimal delivery of CRRT
Design/Methods
A simulation-based curriculum of CRRT delivery was developed to study and impart provider comfort, teamwork, and technical proficiency for care of children receiving CRRT. The determination and evaluation of optimal standards metrics representative of improvements in the CRRT delivery model were measured during the study period. Eligible participants included pediatric CRRT critical care nurses, nephrology nurses, nephrology attendings, nephrology fellows, and critical care fellows. Comfort was assessed using a 5-point Likert scale tool

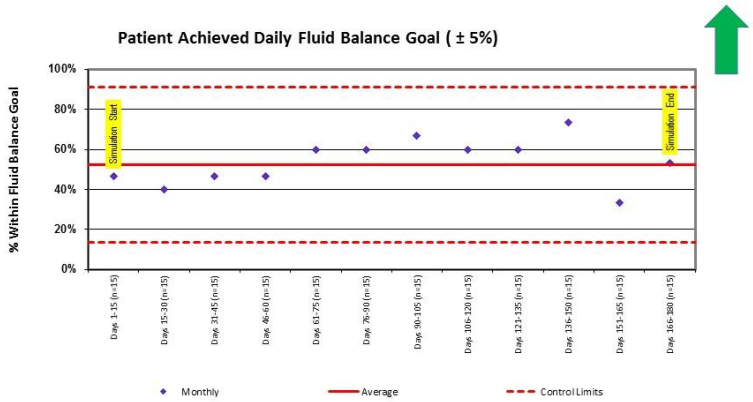
pre and post simulation. Technical proficiency was assessed measuring objective changes in CRRT circuit life, unplanned filter changes, and attainment of daily target fluid goal within 5%

Results

59 of the 67 (88%) eligible staff participated in the simulation course. Participants reported higher comfort level with managing catheter alarms, scale alarms, and requesting help from peers (P = <0.001, P = <0.001, P = 0.004 respectively) post simulation. During the study period, there was an increase in the percentage of patients who achieved ± 5% of the target fluid goal (NS, see figure).

Conclusion

We developed a CRRT simulation curriculum and demonstrate the ability to achieve a high rate of participation, a correlative increase in the comfort providing the complex care associated with this modality, and a suggested improvement with technical proficiency. Derivation of causality on clinical outcomes requires broader study. In summary, we suggest simulation-based training is a vital and necessary piece of developing an optimal care delivery model for CRRT in the critically ill pediatric patient.



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98. Optimizing Cost Savings & Nursing Efficiency Through Automated Urine Output

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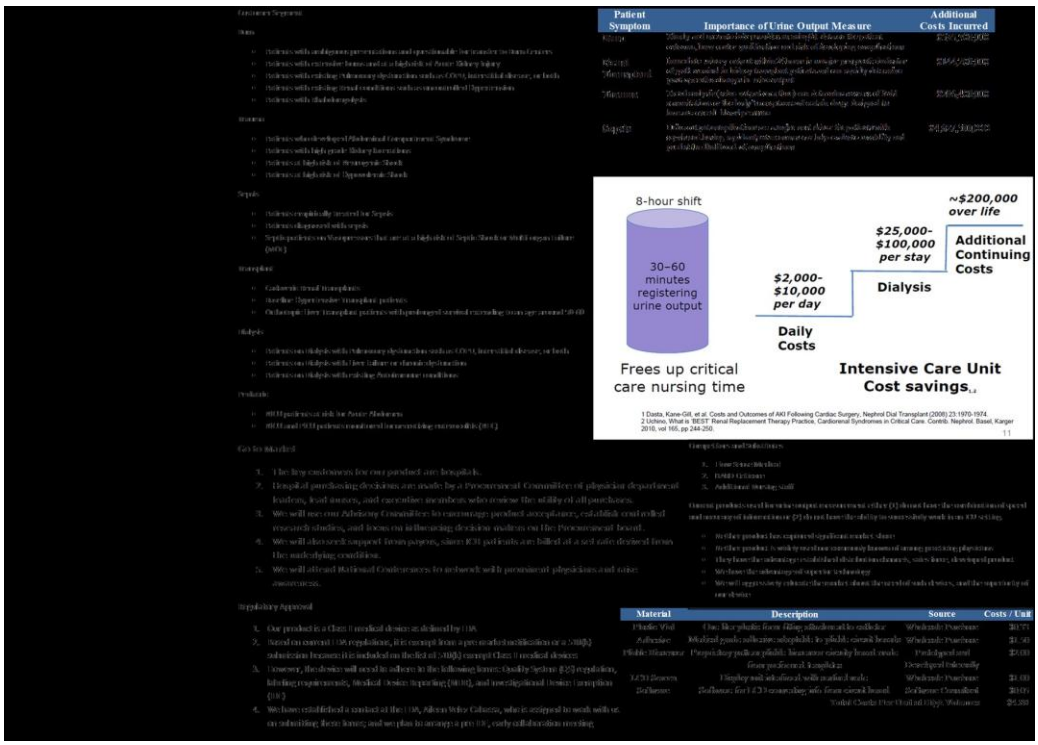
In-hospital acquired Acute Kidney Injury (AKI) is a major cause of increased morbidity and mortality among acute care patients. Per current standard of care, AKI most commonly presents as an increase in Blood Urea Nitrogen (BUN), an increase in Creatinine (Cr), or a decrease in Urine Output (U/O). However, until recently, there was no set guidelines for evaluating AKI that would enable physicians to make meaningful clinical decisions. In 2002, at the Vicenza conference, the impetus was set to create a standardized definition to evaluate AKI; and in 2004, the RIFLE criteria came. The RIFLE (Risk, Injury, Failure, Loss, ESRD) criteria evaluates Glomerular Filtration Rate (GFR), Cr, and urine output over a set time interval that delineates a risk profile for subsequent kidney dysfunction among patients who develops AKI. Ensuing studies demonstrated that patient costs and mortality directly correlates with staging per the RIFLE criteria. At the first stage, Risk, the in-hospital mortality rate was 8.8%; at the second stage, Injury, the in-hospital mortality rate was 11.4%; and the third stage, Failure, the in-hospital mortality was 26.3%. An increase in Creatinine, a component used in staging RIFLE, was found to be an independent mortality factor that resulted in a seven fold increase of mortality rate with an absolute increase of just 0.5 from baseline. Such studies precipitated the notion that AKI was a costly, significant, and independent factor of in-hospital mortality; from which the impetus grew to develop a method of early detection of AKI. Creatinine was initially evaluated as a potential marker, but serum creatinine does not change acutely in the event of a kidney injury or functional change; rather it changes only once the kidneys reach a steady state function after the acute phase of the initial insult. Creatinine clearance in the urine has been evaluated, and has shown a better ability to detect AKI earlier, but it too is susceptible to damning time delays. Therefore, urine

output is the most readily available, non-invasive vital to detect AKI. We are developing a device that works at all orientations within the chaotic ICU environment to automate urine output measurements, data transfer, and interpretation of data. The overarching integration of all data through a unified platform – one that combines measurement and interpretation – allows nurses to optimize care management.



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99. Normalizing Blood for Blood Prime: Reducing hemodynamic instability

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Renal replacement therapy (RRT) is not customarily used on stable patients. Pediatric patients in shock are rarely stable, often requiring "full-court press" intensive care management including: vasopressor support, fluid resuscitation, and ventilator support. RRT is a treatment that when used early in the treatment plan can help ensure positive patient outcomes.

Using RRT, fluids and medications can be safely given in adequate amounts to achieve desired results. However, the act of initiating this life saving treatment can cause undesired effects such as hemodynamic instability. Utilizing a blood prime has helped reduced this instability. Using "blood normalization" in conjunction with blood prime has been the most efficient way of attaining stability.

Blood normalization is a procedure where a competency validated CRRT nurse will use a specific recipe, based on the filter to be primed, to add 5% albumin, heparin, sodium bicarbonate, and calcium to the red blood cells received from the blood bank. This procedure reduces the risk of hemodynamic instability by creating a priming agent which more closely mirrors the normal physiologic state of circulating blood.

Because of the success with the blood normalization process for priming the RRT circuits, this process is utilized with the apheresis patients.

Incorporating blood normalization and blood priming has been a learning experience for physicians and nurses alike, and after utilizing these processes the task was mastered and the team is confident that the patients will continue to be hemodynamically stable during the CRRT initiation process.
