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ABSTRACTS

8th International Conference on Pediatric Continuous Renal Replacement Therapy

16-18 July 2015, London, UK

The 8th International Conference on Pediatric Continuous Renal Replacement Therapy (PCRRT) was a great success. Over 420 participants from 49 countries attended nearly 50 lectures from international experts in the field of critical care nephrology. Additionally, 92 academic abstracts were accepted for presentation and are contained in this supplement. We thank the attendees, speakers and industry for this fantastic, successful meeting.

Akash Deep
Director Pediatric ICU,
Kings College Hospital,
London, UK

Timothy E. Bunchman
Founder and Director of PCRRT Foundation

O1 - COMPARISON OF CITRATE WITH HEPARIN FOR ANTICOAGULATION IN CONTINUOUS VENOVENOUS HAEMODIALYSIS IN PROSPECTIVE CROSS OVER DESIGN

T.Zaoral[1], M. Hladík[1], J. Zapletalová[2]
[1]*Pediatric intensive care unit, Department of Pediatrics, Faculty of Medicine, University Hospital Ostrava;* [2]*The Department of Medical Biophysics, Faculty of Medicine, University Hospital Olomouc*

Objective: Determine if there is a difference on circuit life in continuous venovenous haemodialysis in children between anticoagulation with heparin and citrate.
Design: Prospective "cross-over" trial.
Setting: Pediatric Intensive Care Unit, Department of Pediatrics, University Hospital Ostrava.
Material a methods: A prospective crossover study was conducted in 63children in age 0-18years since January 2009 till December 2014 . All children indicated for CVVHD were eligible to participate in the study. Each participant was eligible for a maximum of four circuits. The first circuit consisted of HACG, followed by CACG and than again HACG and CACG. Each of patient had maximum of 4circuits, 2x HACG and 2xCACG. The maximum lenght of one circuit was 72hours. A Transmembrane Pressure (TMP) TMP≥250mmHg determined end of circuit life.
Results: 34males (54%) and 29females (46%) were included in study, mean age 89,24±62,9months, mean weight 30.37±20,62kg. Total mean circuit life was 39,75±10,73, with heparin 35, ± 7,49hrs(CI: 34,2 – 37,5), citrate 43,8±11,92hrs(CI: 41,1 – 46,7). Median of circuite lifetime was significantly higher with citrate comparing to heparin (41,0hrs[CI: 37,6 - 44,4]) vs. (36,0hrs[CI: 35,4 -36,6]), respectively (p 0,0001). Mortality was 33,33% .
Conclusion: In our trial it was determined statistical significance between circuit life time and age (r=0,606), weight(r=0,763) and blood flow rate (0,697). Median of circuit life with citrate was significantly longer comparing to heparin(41 vs 36hrs, p<0,0001).
Keywords: citrate, heparin, continuous venovenous haemodialysis.

O2 - FEEDING MODALITY IS A BARRIER TO PROVIDING ADEQUATE PROTEIN TO PEDIATRIC PATIENTS RECEIVING CONTINUOUS RENAL REPLACEMENT THERAPY

M. R. W. Vega, MS, RD[1], M. Juarez, MPH, RD[1]; S. Swartz, MD[1], P. Srivaths, MD[1]; H. Currier, BSN, RN[1]; A. Akcan-Arikan, MD[1, 2]
Department of Pediatrics, Renal Section, Baylor CTexas Childr/Texas Children's Hospital, Houston, TX[1]; Department of Pediatrics, Critical Care Section, Baylor College of Medicine/Texas Children's Hospital, Houston, TX[2]

Introduction: Higher protein provision improves survival of patients (pts) receiving Continuous Renal Replacement Therapy (CRRT). Protein requirement is heightened in pediatric CRRT pts due to higher standard protein need for growth. Previous data shows inadequate protein provision for pts on CRRT at our institution with approximately 54% of patients meeting protein goals within 7days of CRRT initiation. We hypothesized feeding modality may be a determinant limiting protein provision.
Methods: Daily prospective monitoring of CRRT pts at our institution was performed over 10months in addition to thrice weekly bedside quality improvement rounds. Nutrition parameters monitored included prescription, delivery, modality and nutrition status. Treatment indications were clearance and fluid removal.
Results: 43 pts, mean age 8.9±6.9years, mean CRRT duration 15.2 ±15.5days. 18 patients were malnourished via anthropometrics. Average protein prescription and delivery was 2 and 1.8g/kg/d, respectively. 30 pts (69%) met goal protein prescription at least once during their treatment period, with average meeting protein goals 57% of their time on CRRT. Percentage of time meeting protein goals by feeding modality: 36% for TPN only, 42% for TPN+tube/oral feeds, 25% for tube/oral feeds only. The average percentage of time meeting protein needs decreased from 48% to 19% in pts (N=17) who weaned from a mixture of TPN+tube/oral feeds to full tube/oral feeds.
Conclusion: Protein provision continues lower than goal levels. Achievement of protein goals varied by delivery modality. Patients who do not receive parenteral nutrition support fail to meet appropriate protein prescription with those fed via tube/oral feeding only, receiving the lowest amounts of protein. Transition from parenteral to enteral feeds was identified as period of nutritional risk in pts receiving CRRT.

O3 - SMALLER CIRCUITS FOR SMALLER PATIENTS: IMPROVING RENAL SUPPORT WITH THE AQUADEX™ MACHINE.

David Askenazi MD, Daryl Ingram RN, Suzanne White RN, Monica Cramer MD, Santiago Borasino MD, Carl Coghill MD, Frank Tenney MD, Dan Feig MD and Sahar Fathallah-Shaykh MD.
Pediatric and Infant Center for Acute Nephrology (PICAN) Center for Acute Care Nephrology Children's of Alabama, University of Alabama at Birmingham, Birmingham, AL, United States

Background: Small children who receive CRRT are dialyzed differently, experience more complications and have worse outcomes. Aquadex™ machine can ultrafilter up to 500ml / hr and has the extracorporeal volume (ECV) of only 33ml, about 10% total blood volume (TBV) of 4kg infants.
Design/Methods: We adapted the Aquadex™ for CVVH by infusing 30cc/kg of Prismasol via an infusion pump at the proximal pigtail of the circuit (figure). This case series is a retrospective analysis of patients who received CVVH using Aquadex™ at Children's of Alabama from December 2013 through April 2015.
Results: 12 children received CVVH via Aquadex™ (9 had AKI, 3 had congenital renal failure with PD contra-indication). At initiation, median age was 30days (IQR=13, 38days) and weight was 3.4kg (IQR=3.0 – 4.3kg). The median duration of CVVH days was 14.5days (IQR=10, 22.8days). The 90-day survival was 7/12 (58%); Hospital survival was 6/12 (50%). Complications were rare (2 - transient hypothermia, 3 transient bleeding and 1 - right atrial thrombus around the catheter). Only 5/100 (5%) of circuit initiations were associated with interventions for blood pressure support. Overall, there was excellent electrolyte control, clearance of urea, and attainment of fluid goals. We used 100 circuits over 258days (mean number of days / circuit=2.6days). Of the 100 circuits, 12 were initiated for new start. Of the remaining 92 circuits, 53/92 (58%) for routine change after 72hours.
Conclusions: The Aquadex™ machine can provide 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.

O4 - EFFECT OF CONTINUOUS RENAL REPLACEMENT THERAPY ON OUTCOME IN PAEDIATRIC ACUTE LIVER FAILURE.

Claire Elizabeth MATTHEWS, *Akash DEEP (*corresponding author*)
King's College Hospital, Denmark Hill, London. UK

Introduction: Continuous renal replacement therapy (CRRT) has an important dual purpose in paediatric acute liver failure (PALF) for managing renal dysfunction and as a detoxification mechanism. However data on

indications, timing of initiation and beneficial effects on outcome is lacking.
We reviewed over a decade of experience at a tertiary liver centre to establish the effect of CRRT on outcome.
Methods: Analysis of all children admitted to the paediatric intensive care unit (PICU) with PALF between Jan 2003 - Dec 2013 was performed. The primary outcome was survival to hospital discharge with or without liver transplantation. For the children who underwent CRRT, daily markers of disease progression - arterial ammonia, lactate, percentage fluid overload, creatinine and mean arterial pressure were reviewed.
Results: Of 165 children admitted with PALF, 136 met the inclusion criteria and 37%(n=45/106) received CRRT prior to transplantation or recovery and the average time to start CRRT was 29hrs. Commonest indications included hepatic encephalopathy grade>2(n=25) and hyperammonaemia(n=20). The need for CRRT in itself was an independent risk factor for mortality (p=0.003). Of the children managed with CRRT 26 (58%) survived; 19 were successfully bridged to liver transplantation and 7 spontaneously recovered. Amongst the survivors, CRRT successfully reduced arterial ammonia (p=0.001) and lactate (p=0.012). This effect was best seen in the first 48hours after starting CRRT. A failure to reduce arterial ammonia within 24hours of commencing CRRT was a poor prognostic indicator (p=0.001). Serum ammonia levels at admission (>200 micromoles/litre) that failed to respond were significantly higher in the deceased as compared to those who survived.
Conclusion: CRRT can be used successfully in critically ill children with PALF to provide stability and prolong life. It should be considered at an early stage to help prevent further deterioration and buy time for potential spontaneous recovery or bridge to liver transplantation.

O5 - TEACHING PEDIATRIC PERITONEAL DIALYSIS THROUGH SERIOUS GAMING: FORMATIVE EVALUATION OF AN ONLINE VIRTUAL SIMULATOR

A.E. Olszewski, B.S.[a], D. Hames, M.D.[b], M. McCulloch, M.D.[c], D. Stein, M.D.[d], S. Su, M.D.[e], and T.A. Wolbrink, M.D., M.P.H.[a]
[a]Division of Critical Care Medicine, Department of Anesthesia, Perioperative and Pain Management, Children's Hospital Boston and the Department of Anesthesia, Harvard Medical School, Boston, MA, USA; [b] Department of Pediatrics, Boston Children's Hospital, Boston; [c]Departments of Nephrology and Paediatric Critical Care, Red Cross Children's Hospital, Cape Town; [d]Department of Nephrology, Boston Children's Hospital, Boston, [e] Department of Nephrology, Randall Children's Hospital, Portland

Introduction: Web-based tools provide effective, globally distributable medical education, including within nephrology (1). Serious gaming is an appealing web-based tool for teaching complex topics like peritoneal dialysis (PD), because it incorporates adult learning theory principles. Here we describe development and evaluation of a pediatric virtual peritoneal dialysis simulator (VPDS).
Methods: The VPDS, developed in twelve months, teaches all elements of caring for a child on PD (figure 1). We evaluated it over three weeks, with six subjects (medical students, pediatric residents, renal fellows, and critical care fellows) undergoing Think Aloud Protocol testing and system usability scale (SUS) surveys. Two plan-do-study-act (PDSA) cycles were performed, with feedback discussed and edits incorporated between cycles.
Results: Mean SUS scores for the first and second PDSA cycles were 75.8% and 94.9% respectively, indicating improvement in usability. Between cycles, the total bugs identified and user interface edits decreased (16 to 7, 70 to 26, respectively). The number of content edits was similar (13 and 10).

Using a 5-point Likert scale, average ratings were:

usefulness: 4.75
enjoyment: 4.17
interest in future use: 4.83
direction clarity: 4.33
feedback utility: 4.67

Open-ended feedback was positive, and cases were named the most useful aspect. The simulator will be deployed on OPENPediatrics, a free medical education website. Detailed analytics embedded in the platform will track usage and scoring.
Conclusion: Through a responsive iterative evaluation process, we improved the VPDS in a short period of time. Qualitative and quantitative feedback indicated high usability, interactivity, utility, and enjoyment. The VPDS has the potential to teach PD in an engaging, relevant and efficient manner globally. Ongoing work to investigate knowledge gains is still needed.

O6 - THE EFFECT OF TIMING OF INITITIATION OF CRRT ON PATIENTS REQUIRING EXTRA-CORPOREAL MEMBRANE OXYGENATION (ECMO)

A. Mansuri, MD,MRCPI, P. Anton-Martin, MD, V. Modem, MBBS and R. Quigley, MD

Introduction: Patients on ECMO often require Continuous Renal Replacement Therapy (CRRT). We have previously demonstrated that delay in initiation of CRRT in non-ECMO patients had a significant impact on survival (1). The objective of the present study was to determine the effect of the Timing of Initiation of CRRT in patients that are on ECMO.
Methods: Charts of patients admitted to the ICU at CMC Dallas from 2010 to 2014 were reviewed. Data collected included time of admission to the hospital, admission to the ICU, initiation of ECMO and initiation of CRRT. Additional data included the primary diagnosis, fluid overload and renal function.
Results: 65 patients had been treated with ECMO and CRRT. There were 33 survivors (S) and 32 nonsurvivors (NS) (50.7% survival rate). There was a significant correlation between the timing of initiation of CRRT and length of ECMO treatment ($p<0.001$, $r=0.64$). There did not appear to be an impact on overall mortality or on long term renal outcome.
Diagnoses with an increase risk of death included cardiac disease, congenital diaphragmatic hernia and pertussis.
In neonates treated with ECMO and CRRT, survivors had a lower estimated creatinine clearance at ECMO initiation and at CRRT initiation.
Conclusion: Decreasing the time between the initiation of ECMO and initiation of CRRT correlates with a shorter treatment with ECMO.
Reference: 1. Modem V, Thompson M, Gollhofer D, Dhar AV, Quigley R. Timing of continuous renal replacement therapy and mortality in critically ill children. Crit Care Med. 2014 Apr;42(4):943-53.

P 01 - THE EVOLUTION OF ACUTE KIDNEY INJURY (AKI) IN SEPTIC SHOCK

Hiremath Sagar, Akash Deep, Chulananada Goonasekera.
Department of Paediatric Anaesthesia, King's College Hospital, London

Introduction: AKI is being increasingly recognized in critically ill patients with sepsis contributing to nearly 50% of cases. Haemodynamic effects and immunological effects of sepsis are supposed to contribute to pathogenesis of sepsis associated AKI (S-AKI). In order to understand the clinical progression

of S-AKI in children with special emphasis on the role of haemodynamics, we conducted a prospective observational study in a cohort of children admitted with fluid-refractory septic shock to Paediatric Intensive Care Unit (PICU) and treated in accordance to the current ACCM guidelines.
Methods: All patients admitted to PICU with fluid refractory septic shock from September 2009 to February 2014 were included in the study. The hemodynamic parameters observed included Central Venous Pressure, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure, cardiac index, systemic vascular resistance index and central venous oxygen saturation. Haemodynamic parameters were recorded at 0, 6, 12, 18 and 24hours of admission. Serum creatinine and urine output were recorded daily till discharge or till 5days of PICU admission. Based on urine output and serum creatinine, diagnosis and staging of AKI were made using Acute Kidney Injury Network criteria.
Results: 59 patients were included in the study and divided into two groups; those with AKI and those without AKI. Patient characteristics were similar in both the groups except in serum creatinine which was higher in AKI group. 31 (52.5%) patients developed AKI. 9 (15.3%) patients died and all of them had AKI. Among the patients who had AKI, 13 patients (41.9%), 7 patients (22.5%) and 11 patients (35.4%) had AKI stage 1, 2 and 3 respectively. 87% of patients who had AKI, developed it within 48hours of admission to PICU. Haemodynamic parameters measured were not significantly different in two groups.
Conclusion: Septic AKI is common in critically ill children and also has high mortality. The manifestations of septic AKI often occur within first 48hours of admission, indicating that renal insult has occurred before admission to PICU. Systemic hemodynamics seems a less relevant factor in the development of in septic AKI.

P02 - A NON-RANDOMIZED MULTI-CENTER CLINICAL TRIAL OF CONTINUOUS RENAL REPLACEMENT THERAPIES (CRRT) IN PEDIATRIC PATIENTS ITH SEVERE SEPSIS

Lu Guo-ping[a], Qian Su-yun[b], Wang Ying[c], Zhang Yu-cai[d], Lu Xiu-lan[e], Zhang yu-xia[a], Yan Gang-feng[a] Hu Jing[a] , Ren-Hong[a]
[a]Children's Hospital of Fudan University; [b]ICU of Beijing Children's Hospital; [c]Shanghai Medical Center of Children, Shanghai Jiaotong University;[d]Shanghai children's hospital, Shanghai Jiaotong University;-[e]Children's Hospital of Hunan Province

Objective: There is uncertainty on the outcome of continuous renal replacement therapy (CRRT) for the treatment of patients with severe sepsis in Pediatric Intensive Care Unit (PICU). This clinical trial is to observe the effect of CRRT on pediatric patients with severe sepsis.
Methods: A prospective nonrandomized multicenter trial comparing two treatments in patients suffering from severe sepsis admitted to PICU, treated by CRRT (CVVHDF) or without CRRT. 128 severe sepsis patients were assigned non-randomly to the treatment group (80 cases) and control group(48 cases). 28-day survival rate, length of ICU and hospital, cost of ICU and hospital, respiratory function, heat function, plasma inflammation factors were observed.
Results: The changes in the account of WBC and CRP and PCT, PRISM score and heart rate were no statistically significant difference ($p>0.05$). Mean artery pressure of treatment group was higher than control group (75.34±0.87 vs. 67.97±0.83, $p<0.05$). 28-day survival rate in treatment group was higher than control group (73.77% vs. 52.23%, $p<0.05$). The length and cost of ICU in treatment group was higher than control group ($p<0.05$). But there were no statistically significant difference in length and cost of hospital between two groups ($p>0.05$).
Conclusions: These data suggest that there is no evidence to suggest that CRRT may reduce the cost and shorten the time of length of stay in PICU and hospital of the pediatric patients with severe sepsis, but it may be in favor of improving stability of hemodynamics and the prognosis.

P03 - HIGH-VOLUME HEMOFILTRATION IN CRITICALLY ILL PATIENTS WITH SECONDARY HEMOPHAGOCYTIC LYMPHOHISTIOCYTOSIS: A PROSPECTIVE STUDY IN PEDIATRIC INTENSIVE CARE UNIT

Zhang Yucai, Cui Yun, Wang Fei, Zhu Yan, Xu Liang, Rong Qunfan .
PICU, Shanghai Children's Hospital , Shanghai Jiao Tong University, Shanghai 200040, China

Objective: Hemophagocytic lymphohistiocytosis (HLH) is classified as primary (familial) or secondary. which is a highly fatal disease in childhood. High-volume hemofiltration (HVHF) has shown beneficial effects in severe sepsis and organ dysfunction syndrome (MODS) , an appealing strategy for improving hemodynamics and fluid balance. SHLH shares many pathophysiologic similarities with sepsis. Therefore, the aim of present study is to assess the effects of HVHF in children with SHLH.
Methods: A single-center prospective trial was performed in critically ill children with SHLH in pediatric intensive care unit (PICU) of Shanghai Children's Hospital ,Shanghai Jiao Tong University. 33 patients were randomized (17 to HVHF and 16 to traditional therapy with 2004-HLH guideline) from Jan. 2010 to Dec. 2014. HVHF was defined by a flow of ultrafiltrate at 50-70ml/kg.hr in our trial. HVHF was initiated in SHLH patients with high fever (T>39°C) , and at least combined one or more organ dysfunction. Clinical and biological variables were assessed before, 48hours and 72hours after initiation of HVHF therapy.
Results: The mortality rate was 42.4% (14/33) in patients with SHLH,and the mortality at 28days was not significantly different between two groups (HVHF: 5 deaths, 29.4% vs. traditional treatment group: 9 deaths, 56.3%, $X^2=2.431$, p=0.119). Children were on HVHF for a mean time of 60.2±42hours. HVHF was performed less than 72hours in four patients.After 48hours of HVHF therapy, a significant decrease of serum ferritin level ($p<0.001$), Aspartate aminotransferase (p=0.037), total bilirubin (p=0.041), and serum creatinine(p=0.006) were observed. After 72hours of HVHF therapy, a significant serum ferritin level($p<0.001$), Aspartate amino- transferase ($p<0.001$), total bilirubin(p=0.037), serum creatinine (p=0.004), and increase NK-cell activity (p=0.047). Furthermore, after HVHF performed for 48hours or 72hours significantly reduced blood TNFa level (91.5±44.7ng/L to 36.7±24.9ng/L, p=0.007) and also blood IL-6 level (46.9±21.1ng/L to27.7±14.5ng/L, $p<0.0001$). No HVHF related serious adverse events were observed in patients.
Conclusion: Our findings indicate that SHLH with MODS is life threatening with high mortality rate. HVHF was effective to improve biological variables of organ dysfunction and decrease cytokine levels(TNFa and IL-6). HVHF may be an potential adjunctive treatment in SHLH in children.
New advanced technology project by Shanghai City Hospital Development Center(SHDC12014116)

P04 - SAFE HAEMOFILTRATION PROVIDED TO AN UNDERWEIGHT 3KG INFANT FOR 12 MONTHS ON PICU: A CASE REPORT

J. Jim. Q. Mok. *Great Ormond Street Children's Hospital. 24 Great Ormond Street. London WC1N 3JH*

Introduction: Continuous Renal Replacement therapy (CRRT) in infants less than 5kg is very challenging. To date no data relating to long-term CRRT outcomes in PICU has been reported to our knowledge.
Case summary: A term baby girl was admitted to PICU on day 2 of life with neuroblastoma stage IV, gross hepatosplenomegaly and respiratory insufficiency. Chemotherapy and hepatic artery embolization were performed. Fluid overload related to sepsis

and SIRS resulted in commencement of CRRT in the form of Continuous Veno-Venous Haemofiltration (CVVH) at 2weeks of age. CVVH was chosen as organomegaly and respiratory insufficiency precluded peritoneal dialysis. Later the patient had an abdominal Denver shunt inserted for recurring ascites which contraindicated peritoneal dialysis.
Intolerance of enteral feeds led to severe failure to thrive despite parenteral nutrition. She weighed 3kgs at 11months. She was intubated and ventilated from the 1st day of life and after failed extubations, a tracheostomy was formed for long term ventilation.
The patient remained on PICU for a year. She had persistent renal failure and hypertension due to tumour encasing the renal arteries. She received 54 episodes of CRRT totalling 2929hours of CVVH using the Aquarius machine. A 6.5fr Gambro vascath inserted in the femoral vessels was utilised. There were 6 vascath changes in 12months. Filtering episodes varied from 2hours to 3months. Recurrent episodes of fluid overload and eventually chronic renal failure prevented weaning off CVVH. The use of well trained nursing staff and medical teams ensured the highest standard CRRT therapy.
Conclusion: This case study demonstrates that CRRT can be provided safely for a prolonged period in small infants weighing less than 3kg with no sedation and limited risk of line infection when using competent and experienced CRRT trained staff.

P05 - ACUTE KIDNEY INJURY IN CRITICALLY ILL CHILDREN: A PROSPECTIVE ANALYSIS OF RISK FACTORS.

R. Pozzato[1], A. Amigoni[1], M. Parolin[2], A. Pettenazzo[1], L. Murer[2], E. Vidal[2]
[1]Pediatric Intensive Care Unit, University-Hospital of Padova, Italy; [2]Nephrology, Dialysis and Transplant Unit, Department of Pediatrics, University-Hospital of Padova, Italy

Introduction: Children admitted to pediatric intensive care unit (PICU) are at risk of acute kidney injury (AKI). Few studies have focused on the identification of factors potentially associated with the development of this condition. The aim of our study was to identify risk factors of AKI in a large sample of critically ill children.
Methods: All patients admitted to our PICU (age between 0-16 years) over a 6-months period (January-June 2014) were prospectively enrolled. AKI was defined according to KDIGO criteria. A comparison between patients with and without AKI was carried out, and the risk factors playing a significant role in the manifestation of AKI were analyzed. These factors were first evaluated by univariate analysis; a multivariate analysis by stepwise regression was then performed using odds ratio (OR) with 95% confidence interval (CI).
Results: There were 79 cases included in this study, with the incidence rate of AKI being 31.6%. In 19 out of 25 AKI cases, a stage 1 AKI was diagnosed, whereas in 6 patients CRRT was required (stage 3 AKI). Patients with and without AKI were comparable as far as gender, age, body weight and non-renal comorbidities. In the AKI group, PIM3 score was significantly higher than for non-AKI group (0.038vs.0.019;p=0.05) The most common PICU admission diagnoses in AKI cases were cardiac disease (28%), respiratory failure (24%) and infections (12%). In univariate analysis, risk factors for AKI resulted to be inotrope exposure (OR 2.57;95%CI 1.01-6.84;p=0.05), hypotension (OR 3.58;95%CI1.29-9.98;p=0.012), MODS (OR 4.08;95%CI1.23-13.55;p=0.016) and thrombocytopenia (OR 7.14;95%CI1.66-30.8;p=0.04). Overall, hypotension was the only independent risk factor for AKI in a multiple logistic regression model (p=0.0047). The mortality rate was estimated to be higher in AKI patients compared with non-AKI cases (12% vs. 1.8%; p=0.05).
Conclusions: The *incidence of AKI* in *critically ill* children is *high*, and this is associated with *high* mortality. In the PICU setting, AKI represents a marker of illness severity and it is mainly associated with hypotension.

P06 - SIMULATION BASED TRAINING IN CRRT: OPTIMISING NURSE CONFIDENCE AND SKILL ACQUISITION THROUGH REAL TIME SCENARIO BASED TEACHING

K. McInnis (*Children's Hospital at Westmead*), P. Valdes (*Children's Hospital at Westmead*), I. Wolfberger (*Kim Oates Simulation Centre Australia*)

Introduction: The opportunity for nurses to progress to expert CRRT user is limited by frequency of therapy delivery within the PICU. Prismaflex training consisted of theory and didactic teaching, however anxiety around knowledge and practice gaps persisted. We implemented a novel simulation based course aimed at reducing anxiety, enhancing knowledge, practicing technical skills and building confidence in a realistic environment without associated patient risks.
Methods: Eight nurses participated in a pilot course comprising three hours of theory, a one hour hands on Prismaflex workshop with blood prime demonstration and four hours of scenario based training. Pre-learning, an online tutorial and an assessment were undertaken. A high fidelity, longitudinal simulation was designed to incorporate key patient events through five scenarios: treatment initiation and device set up, identification and management of haemodynamic instability, recirculation for transport, troubleshooting of alarms and cessation of therapy. Participants were divided into two concurrent simulations allowing all participants direct involvement. Debriefing post scenarios facilitated critical reflection, consolidation of skills and allowed re-enforcement and adjustment of existing policy.
Results: Pre- course assessment demonstrated a strong knowledge base. Post program evaluations were positive, identifying enhanced understanding, decreased anxiety and comfort with device interaction. All participants perceived realistic hands-on experience was beneficial and expressed increased levels of confidence. All participants received dedicated supported time managing CRRT patients following the course, with persisting confidence and competence at the bedside,
Conclusion: CRRT management is an advanced nursing skill associated with anxiety for the novice user. Incorporating simulation into CRRT training decreases anxiety, enhances nurse confidence and may benefit understanding and skill acquisition and transfer to the real world setting.

P07 - ATYPICAL HEMOLYTIC UREMIC SYNDROME (aHUS): TIME TO END-STAGE RENAL DISEASE (ESRD) IN PATIENTS RECEIVING SUPPORTIVE CARE ONLY (SCO) AND ECULIZUMAB

J.F. Kincaid,[1*] S. Johnson,[2] E. Harvey,[1] C.L. Bedrosian[1]
[1]Alexion Pharmaceuticals, Inc., Cheshire, CT, USA; [2] Medicus Economics, LLC, Boston, MA, USA

Introduction: Prior to the availability of eculizumab, up to 67% of aHUS patients developed end-stage renal disease or died at 3years after onset.[1] As eculizumab has stabilized renal function or reversed renal damage in clinical trials, we have compared time to ESRD in aHUS patients receiving SCO with those receiving eculizumab.
Methods: In this post-hoc analysis, using patients' initial eGFR data from two aHUS clinical trials, the relationship of pre-treatment CKD stage (1: eGFR >90; 2: eGFR 60-89; 3: eGFR 30-59; 4: eGFR 15-29mL/min/1.73m^2) and time to ESRD (eGFR <15mL/min/1.73m^2) was estimated using Kaplan-Meier and Cox proportional hazards analyses. The analysis did not assess if renal failure was acute or chronic.
Results: Data from 23 (pre-treatment) and 26 (on-treatment) patients were included. Pre-treatment, 17%, 48%, and 35% of patients were CKD 2, 3, and 4, respectively. For patients receiving SCO, median time to ESRD was 618days. For patients receiving eculizumab, a Cox proportional hazards

model showed the risk of ESRD progression was 0.11 (95% CI [0.03–0.42]; P=0.001), an 89% reduction compared with SCO. For patients receiving SCO, lower CKD stage was associated with longer time to ESRD, with median values of 939 (P=0.134), 618 (P<0.01), and 231 (P<0.050) days for CKD 2, 3 and 4, respectively. Over three years, none of the patients receiving eculizumab with CKD 2 or 3 prior to start of eculizumab progressed to ESRD, while 27% with CKD 4 progressed to ESRD.

Conclusions: Progression to ESRD appears to be rapid in aHUS patients on SCO. In contrast, eculizumab eliminates or significantly reduces the rate of progression to ESRD. Therefore, initiating eculizumab treatment early, prior to reaching CKD stage 4, may avoid progression to ESRD in aHUS patients.

Reference: 1. Noris M, et al. CAJSN 2010;5:1844–59.

P08 - ATYPICAL HEMOLYTIC UREMIC SYNDROME (aHUS): ONE-YEAR UPDATE ON THE INHIBITION OF THROMBOTIC MICROANGIOPATHY (TMA) AND IMPROVED RENAL FUNCTION (RF) IN PEDIATRIC PATIENTS TREATED WITH ECULIZUMAB

J.F. Kincaid,[1*] L.A. Greenbaum,[2] M. Fila,[3] G. Ardissino,[4] S.I. Al-Akash,[5] K. Lieberman,[6] S. Maringhini,[7] L. Rees,[8] J. Van de Walle,[9] M. Ogawa,[1] C.L. Bedrosian,[1] C. Licht[10]

[1]Alexion Pharmaceuticals, Inc., Cheshire, CT, USA; [2]Emory University, Atlanta, GA, USA; [3]Pediatric Nephrology Unit, CHU Robert Debré Université Paris VII, Paris, France; [4]Fondazione IRCCS Ca' Granda, Ospedale Maggiore Policlinico Via della Commenda, Milano, Italy; [5]Driscoll Children's Kidney Center and Renal Transplantation, Driscoll Children's Hospital, Corpus Christi, TX, USA; [6]Hackensack University Medical Center, Hackensack, NJ, USA; [7]Ospedale dei Bambini G. Di Cristina, Palermo, Italy; [8]Gt Ormond St Hospital for Children NHS Trust, London, United Kingdom; [9]University Hospital Gent, Gent, Belgium; [10]The Hospital for Sick Children, Toronto, ON, Canada

Introduction: Pre-eculizumab, despite intensive management with plasma exchange/plasma infusion, over 50% of patients require dialysis, develop permanent kidney damage or die within a year of diagnosis. We now report one-year data from a prospective, open-label, single-arm, Phase 2 trial of eculizumab in pediatric patients with aHUS.

Methods: Patients <18years were enrolled and treated with eculizumab (dosed to ensure complete and sustained terminal complement inhibition [>80% inhibition in ≥95% patients]). Primary endpoint: proportion of patients achieving complete TMA response (defined as hematologic normalization, platelet count ≥150x10^9/L and LDH≤ULN), and improvement of RF (≥25% decrease in serum creatinine [SCr] from baseline, confirmed by >2 consecutive measurements ≥4weeks apart) by 26weeks.

Results: Twenty two patients (aged 1month to 17years) were enrolled with a median time from current manifestation to enrollment of 0.20months (range 0.03–4.26). Nineteen completed the initial 26week treatment period and at one-year, median treatment duration was 12.6 (range 0.0–24.5) months. At week 26, 14 patients (64%) achieved complete TMA response, increasing to 15 (68%) at one year. Significantly increased platelet levels and estimated glomerular filtration rate at week 26 (p<0.0001 for both) were maintained or improved at one year (p=0.0002 and p=0.0005, respectively), with SCr decreasing ≥25% from baseline in 16 patients (73%) at both time points. Nine of 11 patients (82%) on dialysis at baseline discontinued dialysis, and remained dialysis-free at one year; no patients not on dialysis at baseline required dialysis at one year. Eculizumab was well tolerated and there were no meningococcal infections or deaths.

Conclusions: This one-year update analysis demonstrates the continued efficacy and safety of ongoing eculizumab therapy in pediatric aHUS patients. Significantly improved RF highlights the benefits of long-term eculizumab treatment, in contrast to the natural history of the disease.

P09 - PUSHING BOUNDARIES AND MANAGING COMPLEXITY – THE CHALLENGES OF NURSING CHILDREN LESS THAN 5kg UNDERGOING CONTINUOUS RENAL-REPLACEMENT THERAPY (CRRT) IN THE ICU.

Hutton. G, Makewell. E.

Great Ormond Street Hospital, Paediatric Intensive Care Unit (PICU).

Introduction: Undertaking CRRT in small children and neonates is fraught with difficulties. Ensuring a safe, effective service requires innovation, strategic planning and skilled practitioners.

Aim: To explore the complexities of managing children under 5kgs on CRRT, and show how through innovative training, adaptations to existing practice and protocols, a safe progressive service has evolved.

Challenges: The vast majority of CRRT equipment in use today was originally designed for the adult services, while paediatric protocols are usually aimed at children of 10kgs and over. Over the past decade our unit has seen an increasing demand for CRRT in children under 10kgs. Reviewing data from our unit for the past 2years 41 patients <10kgs received CRRT, 28 were <5kgs and 10<3kgs. Managing CRRT in patients under 5kgs is challenging both practically and from a governance standpoint, as protocols, guidelines and practice may need to be adapted idiosyncratically.

Vascular access, temperature regulation, fluid and electrolyte shifts, coagulation and the practical consequences of adapting existing practices and guidelines often on an individualised basis are just a few of the challenges we have faced in providing this service.

Conclusion: The complexities of managing CRRT in this group of patients requires input from every level of the ICU team. As frontline users however, nurses have taken ownership of the service, concentrating the expertise on the shop-floor, adapting practice and guidelines where needed and standardising the process involved. This ensures that while boundaries are pushed the evolution of the service is both safe and progressive.

P10 - SINGLE PASS ALBUMIN DIALYSIS: A CASE REPORT

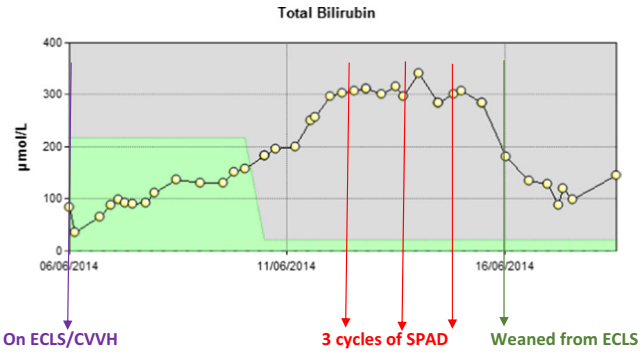
R. Phillips, M. Farley, D. Smith, P. Nayak

Paediatric Intensive Care Unit, Birmingham Children's Hospital, UK.

Introduction: Birmingham Children's Hospital (BCH), Paediatric Intensive Care Unit (PICU) is a 30 bedded tertiary referral centre. Continuous renal replacement therapy (CRRT) is delivered to a variety of critically ill children, on average between 50-60 patients per year.

Case Summary: The patient was delivered at 38weeks by Caesarean section. Within an hour of delivery she developed severe respiratory failure requiring mechanical ventilation. A diagnosis of persistent pulmonary hypertension of the new born (PPHN) was made. In the following twenty four hours she developed multiple tension pneumothoraces, shock and hypoxia and was referred for on-going treatment at our centre.

Veno-arterial (VA) Extracorporeal Life Support (ECLS) was started for severe respiratory failure. Continous Venovenous Haemofiltration (CVVH) was also initiated via the ECLS circuit for management of acidosis and fluid balance. During the ECLS course, her bilirubin began to rise. Her total bilirubin at its peak increased to 341 μmols. On day 7 of ECLS, the patient received a Single Pass Albumin Dialysis (SPAD) with the aim to reduce the bilirubin.



Hyperbilirubinemia can occur in critically ill children receiving CRRT and /or ECLS in PICU. SPAD is an intermittent veno-venous albumin haemodialysis where human albumin solution (HAS) is mixed with a dialysate solution.[1] This solution runs counter-current to the patient's blood flow across a dialysate membrane. The albumin within the dialysate removes protein bound toxins via diffusion. The bilirubin reduced following 3cycles of SPAD. She weaned successfully from ECLS and CVVH, and discharged back to the referring centre.

Conclusion: The use of SPAD will be considered in future patients presenting with hyperbillirubinemia.

Reference: 1 Boonsririrat U. Tiranathanagul K, et al (2009) Effective bilirubin reduction by single-pass albumin dialysis in liver failure. ***Artificial Organs***. Vol 33, issue 8, pp 648-653

P11 - PROMPT CORRECTION OF HYPERLACTEMIA BY CRRT IMPROVES PATIENT SURVIVAL

Wky Chan, Kk Sit, Wf Hui. Department of Paediatrics, Queen Elizabeth Hospital, Hong Kong SAR

Introduction: Mild lactic acidosis related to tissue hypoxia is common in PICU setting. Isolated severe lactic acidosis however is uncommon and warrant prompt correction to avoid cellular dysfunction.

Methods: We retrospectively reviewed our patients in the past 5years (January 2009 to December 2014) who had severe lactic acidosis resistant to conventional treatment with hyperlactaemia as the primary indication for CRRT. Patients with type A lactic acidosis or other indications for CRRT were excluded.

Results: During this period, 38 CRRT treatments were carried out. Eleven therapies were performed for non-renal / non-Multiple Organ Failure patients. Seven patients suffered from inborn error of metabolism. Among them three had hyperammoniaemia as the indication for CRRT and lactate level was mildly elevated only. Among this group, four treatments were carried out for severe metabolic acidosis and hyperlactaemia. These patients suffered from Glycogen storage disease type 1, holocarboxylase deficiency and multiple carboxylase deficiency. Two treatments were performed in a patient who suffered from Hemophagocytic lymphohistiocytosis (HLH) with severe hyperlactaemia and metabolic acidosis. Two therapies were carried out for drug intoxication by methotrexate and Deferasirox. Hence, six CRRTs were performed solely to correct severe hyperlactaemia and metabolic acidosis. The median duration of therapy was 25.3hours, pre-CRRT urea 3.8mmol/L (range: 1.4-11.3mol/L), pre- CRRT creatinine 47.5 umol/L (range: 39-58 umol/L), pre-CRRT lactate was 14.4mmol/L (range: 10.926.7mmol/L), pre-CRRT base excess was – 14.1 (range -23.5 to -3.3), post- CRRT lactate dropped to 2.75mmol/L (range: 2.2-4.3mmol/L), post-CRRT base excess improved to -1.9 (range: -3.1 -0.4). All patients survived without major complications from the therapies.

Conclusion: There were many causes for severe lactic acidosis. Prompt treatment with CRRT improved cardiovascular function and survival while await definitive diagnosis.

P12 - SEQUENTIAL USE OF HEMOPERFUSION AND SINGLE PASS ALBUMIN DIALYSIS (SPAD) CAN SAFELY REVERSE METHOTREXATE NEPHROTOXICITY

Wky Chan, Wf Hui
Department of Paediatrics, Queen Elizabeth Hospital, Hong Kong SAR

Introduction: High dose methotrexate therapy (HDMTX) is a common chemotherapy in children with high grade malignancy like osteosarcoma. The treatment of HDMTX requires careful monitoring of drug level with leucovorin rescue therapy. We reported an 11-year old child whose 24-hour post HDMTX serum level was 651.8 umol/L (recommended level <20 umol/L) with progressive renal and liver failure.

Case summary: An 11-year old girl with left hip osteosarcoma was treated with HDMTX according to the Hong Kong Paediatric Haematology Oncology Study Group Chemotherapy protocol (HKPSOSG Osteosarcoma 2009). She was pre-hydrated with fluid at 3L/m^2/hour and urine alkalinization with bicarbonate infusion to keep urine pH>7. She received folinic acid bolus for rescue according to protocol. Five hours after commencement of HDMTX, she developed septic shock. Her serum creatinine increased from baseline of 41 umol/L to 289 umol/L and progressively elevated ALT to >1000 iu/L. She was treated with Leucovorin infusion, but serum MTX remained at high level of 651.8 umol/L at 24hour after therapy. Since carboxypeptidase was not available, she was treated with SPAD with albumin dialysate at 44g/L using the usual CRRT machine. The blood flow rate was 100-130ml/min, replacement fluid at 1000ml/hr, dialysate solution at 1500ml/hr. Two sessions of charcoal filter hemoperfusin were added to SPAD. The MTX clearance was up to 70ml/kg/hr at the commencement of therapy. Sequential use of hemoperfusion and SPAD was shown to lower MTX faster than Leucovorin alone. The urine methotrexate clearance increased dramatically 140hours later. The serum creatinine normalized at day 14 of treatment.

Conclusion: Sequential use of hemoperfusion and SPAD is a practical and safe procedure to treat methotrexate toxicity.

P13 - THE USE OF CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN NEONATES WITH SYSTEMIC HERPES: AN ETHICAL DILLEMA. A SINGLE CENTRES EXPERIENCE.

D Smith. R Phillips. M Farley. P Nayak
Paediatric Intensive Care, Birmingham Children's Hospital. UK

Introduction: Disseminated herpes with central nervous system involvement is rare in neonates. A mixed 30 bedded PICU in a tertiary children's hospital treats only 1-2 cases per year. Herpes Simplex presents with seizures, a severe coagulopathy, liver dysfunction and pulmonary involvement and critical care support includes CRRT. CRRT is normally initiated to correct metabolic acidosis and manage fluid overload. Most of these neonates are put onto CRRT prior to a definitive diagnosis however, in this centre's experience; intervention was felt to be futile. When a diagnosis of herpes simplex returns treatment is on-going with minimal if any improvement in the neonates condition.

Method: A retrospective analysis looking at patient diagnosis and outcome was undertaken of this centre's CRRT database from 2009-2014. The neonatal period for the purpose of this review is up to 28days.

Result: Nine neonates with a definitive diagnosis of systemic herpes had CRRT as part of their management. All had severe metabolic acidosis with cardiovascular instability requiring inotropes and fluid resuscitation.

89% presented with seizures in the emergency department, all of whom died within 48hours of diagnosis. The one survivor without central nervous involvement, went on to receive a liver transplant.
Conclusions: Neonates with central nervous system herpes in this review are shown to have a very high mortality, despite advanced critical care support including CRRT. Due to the small number of patients seen by an individual hospital, limited conclusions can be drawn. The author recommends that, due to the low incidence of this disease, multi centre data is collated to elucidate the national picture for treatment and survival. The author also recognises there is a need for prompt diagnosis and maternal screening.

P14 - CONTINOUS VENOVENOUS HAEMOFILTRATION (CVVH) IN PATIENTS WITH ONCOLOGICAL DISORDERS – A RECENT SINGLE CENTRES EXPERIENCE

L. Bennett , D. Smith, R. Phillips, M. Farley, P. Nayak
Paediatric Intensive Care Unit (PICU), Birmingham Children's Hospital (BCH). UK.

Introduction: Birmingham Children's Hospital has a large and busy oncology department. They manage children and young adults with a range of solid tumours and leukaemia's. Whilst the survival for these children following admission to PICU in multi-organ failure has increased over the last 10years but they remain a challenging group. As with the general PICU population, the degree of multi-organ failure is systematically related to prognosis; mortality exceeds 70% if three or more organs are involved.
Method: There was a retrospective analysis of the Continuous Renal Replacement Therapy (CRRT) database from our PICU from 2011-2014. In this time almost 200 children will have received CRRT and between 15% - 20% will have an oncology diagnosis. We grouped the children into solid tumours and post haematopoietic stem cell transplant (HSCT). Our usual treatment modality was continuous veno-venous haemofiltration with 100% of replacement/substitution fluid being delivered as predilution. We examined the demographics, diagnosis and timing of initiating CRRT in children admitted from the oncology unit. We looked to see if a useful predictor of likely outcome could be made using this information.
Result: We saw that those admitted with a medical diagnosis as opposed to a surgical diagnosis had a poorer outcome. We noted that the most common reason for presenting for admission to PICU was for management of respiratory failure. The most frequent reasons for initiating CRRT was management of fluid overload and metabolic acidosis. We reviewed the timing of starting CRRT to the% fluid overload and then to outcome. This group would frequently require us to progress to more aggressive CRRT modalities to allow us to achieve adequate solute management.
Conclusion: Whilst the results in this relatively small group were not conclusive , it could be seen that the information gained would certainly inform the physician in counselling the families prior to PICU admission.

P15 - AN INNOVATION TO IMPROVE THE DELIVERY OF CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN A LARGE AND BUSY PAEDIATRIC INTENSIVE CARE UNIT (PICU) . THE CVVH NURSE CHAMPIONS!

M. Parker , D. Smith , M. Farley , P. Nayak
Paediatric Intensive Care Unit (PICU), Birmingham Children's Hospital (BCH). UK

Background: Birmingham Children's Hospital (BCH) has a large 31 bedded Paediatric Intensive Care Unit (PICU) managing a range of critically ill infants and children. Approximately 1400 patients are admitted to BCH PICU each year. Between 45-65 of these patients will require Continuous Renal Replacement Therapy (CRRT). Historically the delivery of this treatment was overseen by a senior nurse who also managed the PICU. In 2013, 64 patients received CRRT or a combination of CRRT/TPE, a total of 378days of treatment was delivered. When a child requires this complex treatment it increases the stress of the bedside nurse. The role of CRRT champion was developed to improve the delivery of consistent, safe CRRT.
Method: The CRRT nurses are experienced PICU nurses, who are given an intensive two day package of theory and clinical practise in 'lining and priming', trouble shooting and managing fluid and solute removal. During their preceptorship they will be mentored by a more experienced CRRT nurse. This will include the completion of competency documents, wet labs and an individual practical assessment.
There is a CRRT or 'filter' nurse allocated each shift. They will not have their own patient. In the event of their being no patient on CRRT they will be a general resource nurse for PICU. When there are patients on CRRT they will support and advise the bedside nurse on the delivery of the CRRT.
Results: This innovation has produced a motivated, knowledgeable and proficient team who ensure treatment is delivered accurately, consistently and with minimum 'circuit down time'. We can demonstrate that it has led to longer circuit life due to improved monitoring of activated clotting times (ACTs),fewer events where the vascular access has been lost and fluid removal is demonstrably more accurate. This has also lead to a reduction in stress and anxiety in the bedside nurse who now has access to a skilled and knowledgeable resource.
Conclusions: We have seen that there have been many advantages to changing how we manage the CRRT patients. Treatment parameters are delivered more reliably and user satisfaction has improved.

P16 - MANAGING THE PAEDIATRIC CARDIAC SURGICAL ECPR PATIENT COMBINING THE USE OF ECLS WITH CRRT. ONE CENTRES EXPERIENCE.

R. Treston, R. Phillps, D. Smith, M . Farley, L .Edwards, P. Nayak
Paediatric Intensive Care Unit (PICU), Birmingham Children's Hospital (BCH). UK.

Introduction: The PICU at Birmingham Children's Hospital is a 31 bedded multidisciplinary unit. It manages patients with a range of medical and surgical conditions, including trauma, renal, liver and gut transplants, oncology and congenital cardiac surgery. There are approximately 1500 admissions to PICU per year; of those 30% are admitted post cardiac surgery.
According to Symons et al (2013) patients who require Extracorporeal Life Support (ECLS) for life-threatening cardiac conditions are at an increased risk of Acute Kidney Injury (AKI). The Extracorporeal Life Support Organisation (ELSO) summary 2014 suggests that 41% of infants requiring ECLS will also require Continuous Renal Replacement Therapy (CRRT). CRRT is an extracorporeal blood purification therapy designed to substitute renal function by the controlled removal of both plasma and water. It is the modality of choice especially in the haemodynamically unstable patient.
Method: Clinical data collected on ECPR patients who received integrated CRRT whilst on ECLS was reviewed for the past 2years with consideration for:-

- Patient demographics
- Timeframe in which CRRT was added
- Fluid balance was recorded hourly for the first 48hours following the initiation of CRRT
- Rate of lactate clearance once on CRRT
- Review of ability to start IV nutrition

Results: 8 patients were reviewed within the 2year period with age ranging between 9days to 5years and a medium weight of 5.7kg. All patients received the combined use of both treatments. 7 of these had CRRT initiated within the first 4hours of ECLS being commenced. Fluid balance was managed and normal electrolyte and acid based balance achieved.
Conclusion: In conclusion fluid overload and AKI can complicate the clinical course of ECLS patients. Our centre believes that CRRT added in a timely manner to the ECLS circuit supports safe, effective fluid removal and solute clearance in these complex patients.

P17 - MANAGING THE PAEDIATRIC CARDIAC SURGICAL ECPR PATIENT COMBINING THE USE OF ECLS WITH CRRT. ONE CENTRES EXPERIENCE.

R. Treston, R. Phillps, D. Smith, M . Farley, L .Edwards, P. Nayak
Paediatric Intensive Care Unit (PICU), Birmingham Children's Hospital.(BCH). UK.

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Conclusion: In conclusion fluid overload and AKI can complicate the clinical course of ECLS patients. Our centre believes that CRRT added in a timely manner to the ECLS circuit supports safe, effective fluid removal and solute clearance in these complex patients.

P18 - CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN THE POST OPERATIVE CARDIAC INFANT ON EXTRACORPOREAL LIFE SUPPORT (ECLS) ONE CENTRE'S EXPERIENCE

S. Nellissery, M. Farley. L. Edwards, P. Nayak
Paediatric Intensive Care Unit, Birmingham Children's Hospital. UK

Introduction: The Paediatric Intensive Care Unit (PICU) at Birmingham Children's Hospital (BCH) is a large 30 bedded tertiary referral centre with approximately 1500 admissions per year. Up to 30% of these admissions will be following cardiopulmonary bypass surgery. The ELSO (Extracorporeal Life Support Organisation) Summary 2014 suggests that 41% of infants requiring Extracorporeal Life Support (ECLS) will also require continuous renal replacement therapy (CRRT) . CRRT involves the use of an extracorporeal circuit with a highly permeable membrane filter to facilitate the controlled removal of both plasma water and solutes.
Method: An analysis of the fluid balance, acid base and lactate of the 12 infants requiring ECLS and CRRT in PICU for the last 2years was undertaken. This group were matched to a similar group in the previous 2years who did not receive CRRT
The patient groups reviewed were all post-operative cardiac infants requiring ECLS semi electively for low cardiac output state (LCOS) or for failure to wean from cardio pulmonary bypass. No extracorporeal cardiopulmonary life-support (ECPR) infants were included in this review.
Results: It was seen that the addition of CRRT permitted a predetermined volume of plasma water to be reliably removed each hour and a rapid correction of acid base was possible. We also looked at the factors influencing how many mls/kg could be removed each hour. It was seen that the removal of fluid allowed the infusion of blood, blood products and IV feeding. The fluid balance at the end of 48 was compared between the two groups. It was also noted that in this time frame the application of CRRT with ECLS had increased from 48% to 90%
Conclusion: Looking only at the first 48hours of combined ECLS/CRRT therapy we have reviewed how the above goals were achieved in this patients group and what – if any - impact it has had on survival.

P19 - THE EFFECT OF AUGMENTED RENAL CLEARANCE ON VANCOMYCIN TROUGH LEVELS IN A PEDIATRIC INTENSIVE CARE UNIT

Yo Han Ahn[1], Jongyoon Kim[2], Bongjin Lee[1], Jiun Park[2], Yoon Sook Cho[2], Kwi Suk Kim[2], Hyang Sook Kim[2], Ju-Yeun Lee[2], June Dong Park[1], Hee Gyung Kang[1], Il-Soo Ha[1]
[1]Department of Pediatrics, Seoul National University Children's Hospital, Seoul, Korea. [2]Department of Pharmacy, Seoul National University Hospital, Seoul, Korea

Introduction: Pharmacokinetic variables of critically ill children have not been fully investigated yet. Augmented renal clearance (ARC) was recently reported in adult intensive care unit (ICU) patients, describing the sub-therapeutic level of vancomycin in this population. In this study we investigate the relationship between sub-therapeutic vancomycin concentrations and ARC in pediatric ICU patients.
Methods: Medical records of pediatric ICU patients who were treated with vancomycin along with trough level monitoring of vancomycin at Seoul National University Children's Hospital between 2009 and 2014 were reviewed retrospectively. The risk factors for the sub-therapeutic level of vancomycin were statistically analyzed. Patients with estimated glomerular filtration rate (eGFR) larger than 138ml/min/1.73m^2 were grouped as ARC group, while those with eGFR 138ml/min/1.73m^2 were classified as control group. Cut off value was derived from ROC curve of vancomycin trough level and eGFR .
Results: A total of 79 subjects were included in the study (median age 8 (IQR 3-12) years). Median daily vancomycin dose was 41mg/kg/day and trough level was 6.5μg/mL. Age, gender, body weight, and daily vancomycin dose were not different between ARC group and control group. Median trough level of vancomycin was statistically significantly lower in the ARC group than that in the control group (7.9μg/mL versus 6.1μg/mL, P =0.006). Univariable linear regression analysis showed that daily vancomycin dose, dosing interval, and the reciprocal of eGFR were significantly associated with trough level of vancomycin. Multivariate

regression analysis revealed that the reciprocal of eGFR was the only significant factor (P <0.001, R^2=0.213).
Conclusion: These results demonstrate that ARC has clinical impact in pediatric ICU settings. Therefore when therapeutic level is not achieved, clinicians need to consider not only dose elevation, but also dosing interval modification or alternative drug choice, especially in critically ill children.

P20 - USE OF HAEMOFILTER WITH CYTOKINE REMOVAL AND ENDOTOXIN ADSORPTION CAPACITY CAN SUCCESSFULLY REDUCE INOTROPIC USE IN GRAM-NEGATIVE SEPTICAEMIA

W.F. Hui, W.K.Y. Chan
Department of Paediatrics, Queen Elizabeth Hospital, Hong Kong SAR

Introduction: The experience of using blood purification technique in management of sepsis among paediatric and adolescent population remains limited. We reported a case of septicaemia treated with continuous renal replacement therapy (CRRT) using a haemofilter with enhanced cytokine removal and endotoxin adsorption capacity.
Case summary: An 18-year-old male receiving treatment for acute lymphoblastic leukaemia was admitted to the Paediatric Intensive Care Unit due to septic shock and neutropenia. His condition deteriorated rapidly despite multiple inotropes and required intubation for cardiopulmonary support. Vancomycin, meropenem and acyclovir were empirically commenced. He soon developed acute kidney injury (worst stage: Stage 2 by KDIGO criteria) and disseminated intravascular coagulopathy (DIC). His blood culture performed on admission isolated Klebsiella pneumoniae. Intravenous immunoglobulin (IVIG) and CRRT using an oXiris™ filter (Gambro product) designed for cytokines and endotoxin adsorption were started 35hours and 39hours after admission respectively. We used continuous veno-venous haemofiltration (CVVH) with blood flow rate given at 3.1ml/kg/minute and replacement flow rate given at 40.7ml/kg/hour (50% pre-dilution). Three sessions of CRRT (using three oXiris filters) for 44hours were given. There was dramatic reduction in the dose of inotropics used. Adrenaline infusion of 0.12mcg/kg/min at CRRT initiation was able to be taken off 1.5hours after starting first session of therapy. Noradrenaline infusion was reduced from 0.5mcg/kg/min to 0.07mcg/kg/min and dopamine infusion was reduced from 20mcg/kg/min to 6.8mcg/kg/min during oXiris™ treatment. Two days after stopping CRRT, the patient was successfully extubated and weaned off inotropics.
Conclusion: The concomitant use of haemofilter with endotoxin adsorption capacity and IVIG can successfully reduce inotropic use patients with septicaemic shock.

P21 - CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) in PAEDIATRIC ONCOLOGY PATIENTS

W.F. Hui, W.K.Y. Chan
Department of Paediatrics, Queen Elizabeth Hospital, Hong Kong SAR

Introduction: Oncology patients are at increased risk of developing acute kidney injury requiring CRRT. Yet, the role of CRRT has been expanding beyond acute renal support in oncology practice.
Methods: We retrospectively reviewed our oncology patients having received CRRT during their courses of treatment from 1998 to 2014. Patients under or equal to 18years of age were included.
Results: Altogether 7 patients received 10 episodes of CRRT during the period, accounting for about 10% of all patients required CRRT. 54% were male and the median age was 11.8 (range: 0.2-18.8) years. Removal of drugs / metabolites or electrolytes imbalance was the main reason for CRRT initiation (50%), which included tumour lysis syndrome (two episodes), lactic acidosis in haemophagocytic lymphohistiocytosis (two episodes) and methotrexate nephrotoxicity (one episode). Other indications included acute renal support as part of multi-organ failure (40%) and renal tumour (10%). The median duration of CRRT was 40.3hours (inter-quartile range: 19.7, 58.0), and continuous venous-venous haemofiltration / haemodiafiltreation accounted for 70% of CRRT modality. Of note, three episodes employed oXiris™ filter for gram-negative septicaemia and one episode employed single-pass albumin dialysis coupled with charcoal haemoperfusion for removal of methotrexate. The median blood flow, replacement fluid and dialysate rate were 2.9ml/kg/min (2.4, 3.6), 29.7ml/kg/hour (14.3, 32.4) and 20.3ml/kg/hour (13.8, 37.5) respectively. The mortality was 40% in the cohort and all subjects weaned off dialysis. 80% were left with normal renal function, but 16.7% of survivors had impaired renal function upon termination of CRRT. Specifically CRRT successfully corrected the lactic acidosis and removed the methotrexate in respective cases. No major CRRT-related complication was reported.
Conclusion: CRRT remains an important and safe therapy in managing various conditions among oncology patients.

P22 - BILITY OF AN AUTOMATED EXTRACORPOREAL RENAL REPLACEMENT THERAPY SYSTEM WITH AN ULTRA-SMALL VOLUME CIRCUIT FOR NEONATES IN VITRO

S. Nishimi, K. Ishikawa, M. Sasaki, H. Furukawa, A. Takada, S. Chida.
Department of Pediatrics, School of Medicine, Iwate Medical University, 19-1 Uchimaru, Morioka, Iwate 020-8505, Japan
Introduction: We automated a manual syringe-driven extracorporeal renal replacement therapy system for neonates that we had previously designed [1]. The system has an ultra-small volume circuit (total circuit volume, 3.2mL) that is suitable for treatment of neonates without blood priming. The present in vitro study examined the ability of the automated system to remove solutes and maintain water balance compared with that of the manual system.
Methods: Stored whole-blood samples containing exogenous urea, creatinine (Cr), potassium (K) and ammonia (NH_3) to imitate acute kidney injury and hyperammonemia were dialyzed for 3h (blood flow rate, 4.0mL/min; dialysate flow rate, 600mL/h) using the manual and automated systems. Solute concentrations and sample weight were measured before and after 3h of dialysis.
Results: Clearance of urea nitrogen, Cr, K and NH_3 ranged from 1.7 to 2.3mL/min and 2.4 to 2.6mL/min in the manual and automated systems, respectively. Median weight in samples after 3h of dialysis was decreased by 3.8g and increased by 8.3g in the manual and automated systems, respectively.
Conclusion: The automated system cleared solutes more effectively than the manual system in vitro, but the ability to maintain water balance in the automated system requires further development.
Reference: 1) Nishimi S, Ishikawa K, Oda S, Furukawa H, Takada A, Chida S. In vitro ability of a novel system for neonatal extracorporeal renal replacement therapy with ultra-small volume circuit for removing solutes. J Iwate Med Assoc. 2015 (in press)

P23 - NOT TOO FAST: CVVH AND CONTROLLING THE RATE OF SODIUM CORRECTION

A J Jones, T. Brick, G. Hutton, S. Ray, S. Skellett
Paediatric Intensive Care Unit, Great Ormond Street Hospital for Children. UK

Introduction: Severe hyponatraemia following excessive fluid overload can present a unique management challenge. We describe a child with congenital

nephrotic syndrome and discuss the relative merits of a hitherto described and a novel technique to control sodium concentration on CVVH.
Case Summary: A 2month old 4kg child with congenital nephrotic syndrome became anuric after a dose of captopril and developed respiratory distress with signs of fluid overload. On admission to PICU her plasma sodium was 111mmol/L. CVVH was started at a pump speed of 50ml/min with a filtration fraction of 10%. The replacement fluid had a sodium concentration of 140mmol/L. The plasma sodium began to correct at a rate of 0.7mmol/L/hour, and within 9hours had risen to 117mmol/L.
In the absence of an alternative replacement fluid the rate of sodium increase was mitigated by giving 50ml/hour of 5% dextrose to the child, reducing the filtration fraction, and initially running the child at even balance. Over the next 4days CVVH was continued and sodium slowly increased to 137mmol/L, while achieving an overall negative balance of 800ml.
Conclusion: While adding water to the replacement fluid to slow the rate of sodium correction on CVVH has previously been described[1], this may be labour intensive, has potential for error, and dilutes other solutes. Instead we successfully controlled sodium rise using low dose CVVH with a titratable dextrose infusion to the child. We also suggest that an important step in preventing a rapid sodium rise would be to match sodium concentration of the priming fluid to that of plasma. Given the complexities involved and the multiple variables at play, we have devised a single-compartment computer model to assist in predicting the rate of solute correction on CVVH.
Reference: [1] Ostermann M, et al. Management of sodium disorders during continuous haemofiltration. *Critical Care* 2010;14:418.

P24 - IMMEDIATE AND LONG-TERM OUTCOME OF THERAPEUTIC PLASMA EXCHANGE ON PAEDIATRIC NEUROLOGICAL CONDITIONS

K.G.B. Loo, T. Thomas, Y.H. Chan
Department of Paediatric Medicine, KK Women's and Children's Hospital, Singapore

Introduction: Therapeutic plasma exchange (TPE) is a procedure that reduces the amount of circulating pathologic substances, such as antibodies. TPE has a therapeutic role in autoimmune mediated neurological conditions. The study of TPE is more extensive in adult patients. Most paediatric studies survey the immediate effect of TPE and usually focus only on 1 neurological disease. This study aims to evaluate the immediate and long-term (at 1year post-TPE) therapeutic effects of TPE on paediatric neurological conditions and complications associated with TPE in paediatric patients.
Methods: This is a retrospective review of medical records of all paediatric patients who received TPE for the treatment of neurological conditions between 2012-2015 in KK Women's and Children's Hospital, Singapore.
Results: Seven patients received TPE for neurological conditions from 2012-2015. TPE was performed using filtration method via central access. Four (57%) were male. Their age ranged from 2 to 16years old (median of 12years). The conditions included anti-N-methyl-D-aspartate receptor encephalitis, neuromyelitis optica, myasthenia gravis, febrile infection-related epilepsy syndrome and central nervous system lupus. All patients had steroid therapy and 2 received intravenous immunoglobulin prior to TPE. All 4 patients (57%) with autoimmune bodies detected had partial or complete immediate improvement of the neurologic symptoms. Regarding long-term outcome, 30% attained good functional recovery, 60% had persistent symptoms or functional deficits and 1 died. Complications of TPE included hypotension and rashes.
Conclusion: TPE is a relatively safe procedure and demonstrated good immediate effect, in our series, for neurological conditions with positive autoimmune antibodies. Effect on the long-term outcome of neurological conditions in these patients was modest.

P25 - USE OF CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN PAEDIATRIC DIABETIC KETOACIDOSIS (DKA): NOTTINGHAMS EXPERIENCE.

K. Broom, S. Alurkar
Nottingham Children's Hospital. UK

Introduction: DKA is a known complication of diabetes mellitus (DM) and is associated with substantial mortality and morbidity within the paediatric population. This is predominantly due to cerebral oedema caused osmotic cellular swelling. Another potentially fatal but less recognised complication is acute kidney injury (AKI) [1.2.] The use of CRRT in DKA is largely uncommon, but may have a place when AKI is evident.
Case Summaries: Case 1: A 13yr old girl presented to the Emergency Department (ED) in DKA and was transferred to PICU. Significant renal impairment was noted after admission, serum urea 19.6mmol/L, creatinine 245 umol/L and hyperchloraemia. Continuous veno-venous hemofiltration (CVVH) was commenced. CVVH was discontinued on Day 9 and converted to intermittent haemodialysis. Renal function returned to normal prior to discharge from PICU.
Case 2: A 13yr old girl presented to ED and was admitted to PICU with DKA and AKI. On Day 7 of admission worsening renal function was noted, creatinine 813umol/L and urea 35mmol/L. Peritoneal dialysis was commenced for 5days, after which her renal function returned to normal.
Case 3: An 11yr old boy presented to ED with a profound acidosis and hypovolemia. He was intubated and transferred to PICU. CVVH was commenced on day 2 for a total of four days. Renal function returned to normal but had persistent hypertension on discharge.
Conclusion: AKI is a potentially life threatening complication of DKA. Early recognition and treatment with CRRT may correct metabolic abnormalities rapidly and improve outcome.
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2. Al-Matrafi, J. Vethamuthu, J and Feber, J. Severe Acute Renal Failure in a Patient with Diabetic Ketoacidosis. *Saudi Journal of Kidney Diseases and Transplantation*. 2009: 20(5): 831-834

P26 - LIFELONG FOLLOW UP POST AKI IN PICU

M. A. McLaughlin, F. K. Hussain
Nottingham Children's Hospital, East Midlands, East of England and South Yorkshire Renal Network. UK

Introduction: Historically across the EMEESY network there was no defined pathway for follow up post AKI. In 2014 a new pathway was introduced. Initially this was for all patients receiving RRT for AKI within PICU, for 5years post AKI. This has now been lengthened to lifelong and has been extended to all stage 3 AKI.
Growing evidence suggests there is increased risk of developing CKD post AKI[1,2]. We also know CKD is a progressive, yet modifiable disease. By offering this lifelong follow up pathway of care, we hope to modify the progression of the disease post AKI.
Case Summary: This follow up pathway involves:

- Creatinine check year 1 and 5
- Annual BP check
- Annual urine dipstick (+/- protein:creatinine ratio)
- Formal GFR 1yr and 5yr

For 5years this will take place within the hospital setting across the network clinics, after this if there are no other concerns the child will be discharged to their GP for ongoing lifelong follow up.

To date 17 patients have been referred for follow up across the EMEESY network.
Conclusion: Identifying the patients for follow up is problematic; ensuring the initial referral occurs. In time through adapting our systems for identification of AKI across the network we hope this pathway will become ingrained in everyday practice. The ultimate aim would be to lessen the severity of CKD post AKI, the lifelong follow up of this cohort of patients will allow this to be assessed.
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P27 - SIMULATION TRAINING –BRIDGING THE GAP IN THEORY TO PRACTICE IN CVVH

M. A. McLaughlin[1], C. Whittaker [1], C. Jack [2]
[1]*Nottingham Children's Hospital (NCH),* [2]*Sheffield Children's Hospital (SCH)*

Introduction: Five years ago the EMEESY network set up a series of simulation scenarios for CVVH, to meet the educational deficit which had been identified by the nursing teams within the regional PICU's (NCH, SCH & LCH).
Simulation is a rapidly evolving area within healthcare education[3]. A healthcare climate where there are continual technological advances, coupled with greater complexity of patient needs and an ever increasing constriction on budgets and staffing, makes for a significant educational challenge[1.2.3] . Simulation attempts to bridge this gap, through replicating the real-life clinical environment and exposing the learners to events in a safe, controlled environment, where patient safety cannot be compromised[1.2.3].
Case Summary: Over the last 5years we have successfully facilitated 7 simulation training days. The initial focus was consolidation of skills within the existing team of CVVH trained staff, but has since incorporated medical staff and other nursing team members. We have trained 62nursing team members, 4 medical staff. Half these days include didactic sessions on topics such as principles of CVVH and pharmacology. The remainder of the day is devoted to simulation based training and ethics discussions. The simulations are based on real life experiences.
Conclusion: This has led to:

- Increased staff satisfaction
- Increased competence and confidence in troubleshooting
- More CVVH trained staff
- More comprehensive understanding of the care of a child receiving CVVH
- Robust educational team for providing all CVVH training across the network

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P28 - IS THE USE OF EPOPROSTENOL PREDICTABLE IN CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT)?

B. Mayo, M. Farley and P. Nayak
Paediatric Intensive Care Unit, Birmingham Children's Hospital (BCH). UK

Introduction: At BCH, heparin sodium and epoprostenol are used as circuit anticoagulation during CRRT. Epoprostenol is indicated in thrombocytopenia, recent severe haemorrhage or filter hypercoagulability, defined as loss of two circuits in 24hours.
Previous research has shown that, when compared with heparin sodium, epoprostenol therapy increases the filter life and reduces haemorrhagic complications (1,2). Cost is frequently cited as a reason for not using epoprostenol. This review aims to establish if there are common characteristics amongst past patients who required epoprostenol, in order to inform future decision making.
Methods:

- A retrospective database review of patients who required CRRT and use of epoprostenol as circuit anticoagulation between January 2013 to January 2015 (Group A) in a 31-bedded tertiary PICU in the UK.
- Group A's demographics were matched with patients who had required CRRT and heparin sodium as circuit anticoagulation (Group B).

Results: During this period, 113 patients received CRRT. Group A (12 patients) had a higher inotrope requirement and worse coagulopathy on CRRT commencement, a longer period of CRRT and had a relatively increased mortality rate when compared with Group B.
Conclusion: In our experience, patients requiring epoprostenol are sicker at CRRT initiation. Commencement of epoprostenol only as second line anticoagulation may interfere with their seamless treatment with CRRT. Study limitations are the single centre setting and small sample size. A larger study is recommended.
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P29 - CUTE RENAL FAILURE AND RHABDOMYOLYSIS AFTER PEDIATRIC NEAR DROWNING

Ward C, **Hall M**, **Talbott G**, **Subtirelu M**.
Department of Pediatrics, University of Tennessee College of Medicine – Chattanooga, TN. USA

Introduction: Acute renal failure (ARF) and rhabdomyolysis secondary to a near drowning event is rare and has not been reported in a pediatric patient.
Case Summary: We report a previously healthy fifteen year old male who experienced a near drowning event in a warm fresh water pool. He developed pulmonary edema requiring ventilatory support and tea-colored urine within twenty-four hours. His serumcreatinine increased to 3.9mg/dl by day four. Creatine phosphokinase was elevated and peaked at day four. Urinalysis showed large blood without significant red blood cells by microscopy. Urine myoglobin was positive. He developed hypertension requiring nicardipine. Supportive care included fluid management, diuretics, urine alkalization, sodium polystyrene sulfonate for hyperkalemia, and antihypertensives. His kidney function began to

improve after day five with normalization by day eight. He did not require renal replacement therapy. Other organ systems were spared from significant injury.
Conclusion: This is the first reported pediatric case of ARF with rhabdomyolysis secondary to near drowning. Possible explanations include renal tissue hypoxia/reperfusion injury complicated by myoglobin induced kidney injury (1). Muscle damage may have developed from the initial dramatic self-rescue efforts to prevent submersion, further exacerbated by prolonged muscle tissue hypoxia. This case of ARF and rhabdomyolysis in a pediatric near drowning demonstrates that kidney injury may manifest in the absence of significant multiorgan dysfunction with a hypoxic ischemic event. Screening for rhabdomyolysis may identify a population at increased risk for acute kidney injury that may benefit from specific interventions.
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P30 - SINGLE CENTER EXPERIENCE OF CVVH USE IN ACUTE MANAGEMENT OF INBORN ERRORS OF METABOLISM

A.F. Yetimakman, S. Kesici, M. Tanyıldız, B. Bayrakcı
Hacettepe University, Department of Pediatrics, Division of Pediatric Intensive Care

Introduction: Severe metabolic crises in children with inborn errors of metabolism can result in mortality or severe morbidities. Rapid clearance of the accumulated toxic metabolites is crucial in order to prevent death or neurological sequela and peritoneal dialysis cannot serve for this purpose because of the slow clearance. Treatment with intermittent hemodialysis, on the other hand, has the disadvantage of rebound increases of toxic metabolites between dialysis sessions. We present the use of continuous venovenous hemofiltration (CVVH) or hemodiafiltration (CVVHD) in four children for treatment of metabolic crises of propionic acidemia, methylmalonic acidemia, maple syrup urine disease (MSUD) and severe lactic acidosis, respectively.
Method: Since the metabolic acidosis was resistant to conventional therapies, CVVH was started in the first 24h for all of the patients. Double lumen central venous catheters placed through the internal jugular vein were used as the vascular access. During the treatment, the blood flow rate was set 4–12ml/kg/min according to the patient's weight. The CVVH therapy was ended when the metabolic homeostasis was secured except for the one case in which the hemofilter clotted and the patient didn't need further therapy.
Results: Metabolic acidosis resistant to intravenous bicarbonate therapy was successfully managed in all of the cases. Levels of ammonia was decreased more than 50% within the 24h of onset of therapy in the methylmalonic acidemia patient. The child with MSUD had sufficient reduction in branched-chain amino acids with hemofiltration. The only complication was the clotting of hemofilter in this patient. Three of the patients survived while one patient died because of sepsis.
Conclusion: CVVH and CVVHD can be used effectively in the acute management of metabolic crises associated with inborn errors of metabolism in the experienced centers.

P31 - ACUTE KIDNEY INJURY IN PREMATURE INFANTS: IMPACT OF ACUTE FLUID STATUS CHANGES ON THE INCIDENCE, CLINICAL OUTCOMES AND BIOMARKER PERFORMANCE.

David Askenazi [1, 4], Behtash Saeidi [1, 4], Rajesh Koralkar [1,4], Namasivayam Ambalavanan .[2, 4], Russell L Griffin [3, 4],

Background and objectives: In premature infants, abrupt changes in fluid status occur over the first week of life, which can alter the concentration of serum creatinine (SCr), and thus the definition of AKI. We sought to a) determine how fluid adjustment (FA) of SCr affects incidence of AKI, b) describe the demographics and outcome differences in AKI (according to SCr and FA-SCr AKI classification) and c) determine whether candidate urine biomarkers perform better under the SCr-based vs FA-SCr AKI definition.
Design, **setting**, **participants**, & **measurements**: We performed a prospective cohort study on 122 very low birth weight infants. FA-SCr values were estimated using changes in total body water (TBW) using the following equation: SCr x [TBW + (current wt. – BW)]/ TBW; where TBW is 0.8 x weight in kg). SCr-AKI and FA-SCr AKI were defined if values increased by≥0.3mg/dl from previous lowest value.
Results: The incidence of AKI decreased using the FA-SCr definition (23/122 (18.8%) compared to the SCr AKI definition (34/122 (27.9%); $p<0.05$). There was agreement in 105/122 (86%) subjects, and discordance in 17/122 (14%) between the 2 definitions. Those with AKI by both definitions had 3.2 higher odds of BPD/mortality and 3.1 higher odds of IVH than those without AKI by either definitions. All candidate urine AKI biomarkers performed better under the FA-SCr based definitions than the SCr based definition, with urine neutrophil gelatinase-associated lipocalin (NGAL) on day 4 for FA-SCr AKI having the best performance (AUC adjusted for GA=0.86).
Conclusions: Adjusting SCr for acute change in fluid status may help delineate which infants have a rise in SCr simply as a reflection of acute weight loss, and which infants have true renal functional changes. Further studies in this and other studies are needed.

P32 - SINGLE PASS ALBUMIN DIALYSIS (SPAD) AND PLASMAPHERESIS FOR COPPER TOXICITY IN ACUTE WILSON'S DISEASE

Chia Wei Teoh, Shireen Bakhsh, Elizabeth Harvey, Damien Noone
The Hospital for Sick Children, Toronto, Ontario, Canada

Introduction: Wilson's disease is a disorder of copper metabolism that results in accumulation of copper in tissues. In acute Wilson's disease, patients present with fulminant liver failure, encephalopathy and haemolytic anaemia due to copper release from necrotic hepatocytes. Several extracorporeal techniques have been used to clear the copper and to safely bridge to liver transplantation.
We report our experience with two patients in whom we used a combination of plasmapheresis and single pass albumin dialysis (SPAD) or SPAD alone.
Case Summary: A 13year old boy (patient 1) and a 19year old girl (patient 2) presented with fulminant hepatic failure, haemolytic anaemia and acute kidney injury. Patient 1 was treated with SPAD on days 2-6 with addition of daily plasmapheresis days 3-6. Serum copper decreased from 48.7μmol/L to 25.8μmol/L (47% decrease) after the first session of plasmapheresis, and from 35.5μmol/L to 21.5μmol/L (39.4% decrease) after the second session. Mean decrease of copper was 43.2% and serum copper level was 16.2μmol/L after 4 sessions of plasmapheresis. He underwent successful liver transplantation on day 6. Patient 2 commenced SPAD day 3 and 4. Serum copper decreased from 22.3μmol/L to 15.9μmol/L (28.7% decrease) after the first treatment. She underwent successful liver transplantation on day 4 post-presentation.
Conclusion: Our data suggests that SPAD with or without plasmapheresis, is effective in reducing serum copper levels as a bridge to liver transplantation in Wilson's disease. Plasmapheresis may be more effective, but is associated with rebound increase in copper levels between sessions.

P33 - FLUID OVERLOAD IN NEONATES RECEIVING CONTINUOUS RENAL REPLACEMENT THERAPY

Sang Teak Lee, Heeyeon Cho
Department of Pediatrics, Samsung Medical Center, Sungkyunkwan University School of Medicine

Introduction: The aim of this study is to analysis the fluid overload (FO) and mortality in neonate with continuous renal replacement therapy (CRRT).
Methods: A retrospective review was performed in 13 neonates who underwent at least 48hours of CRRT in neonatal intensive care unit (NICU) from January 2013 and to December 2014. FO was defined as a percentage equal to {(weight [kg] at CRRT initiation–weight [kg] at NICU admission)/weight [kg] at NICU admission} x 100. We divided the patients into group with inborn error of metabolism (IEM, n=4) and group with acute kidney injury (AKI, n=9).
Results: The mean age at CRRT initiation was 17days, and the mean days in NICU prior to CRRT was 10.5days. The duration of CRRT was 5.5days. The mean body weight at NICU admission and at CRRT initiation was 2.9kg and 3.5kg, respectively. The mean FO was 18.0%, and there was significant difference between group with IEM and AKI (5.3% vs. 24.5%). The mean blood flow rate was 10.4ml/kg/hour, and the mean effluent volume was 1982ml/hour/1.73m^2. The mean circuit life span was 53.5hours, and there was no difference between groups. Seven patients survived at the time of NICU discharge. In group with IEM, one patient with 7.1% of FO expired. In group with AKI, five patients expired and showed FO above 7.6%. Three of them had FO above 20%. In group with AKI, two patients with FO above 20% survived. However, one patient expired after discharge, and the other patient progressed to chronic kidney disease. Two patients with AKI and FO below 7.6% survived without morbidity.
Conclusion: Early initiation of CRRT might improve the clinical course in neonate with IEM. Mortality is more common in neonates with severe FO at CRRT initiation.

P34 - EXTRACORPOREAL LIVER SUPPORT MODIFIES PELD SCORE IN PEDIATRIC PATIENTS AWAITING LIVER TRANSPLANT

R. Lion[1], M. Desai[1], P. Srivaths[2], A. Arrington[1], F. Lam[1], R. Himes[3], P. Hertel[3], J. Goss[4], A. Ackan-Arikan[1]
[1]*Department of Pediatrics, Section of Critical Care Medicine, Texas Children's Hospital, Baylor College of Medicine, Houston, TX.* [2]*SeDepartment of Pediatrics, Section of Nephrology, Texas Children's Hospital, Baylor College of Medicine, Houston, TX.* [3]*SDepartment of Pediatrics, Section of Gastroenterology, Hepatology and Nutrition, Baylor College of Medicine, Texas Children's Liver Center, Baylor College of Medicine, Houston, TX.* [4]*Michael E. DeBakey Department of Surgery, Texas Children's Liver Center, Baylor College of Medicine, Houston, TX*

Introduction: The Pediatric End-stage Liver Disease (PELD) score is a validated system used to assign illness severity and assist in determination of transplant candidacy[1]. The adult version of this score-MELD-is considered a poor discriminator in critically ill adults with liver failure[2,3]. It is unknown whether albumin-assisted dialysis for extracorporeal liver support (ELS) would impact PELD score in the pediatric population.
Methods: We reviewed our institutional database of all patients receiving ELS. Patients who were receiving ELS while actively listed for liver transplantation were included. Patients receiving ELS for other indications were excluded. Chart review consisted of provider documentation, serum laboratory data, vital signs and medication administration during identified treatments. PELD score was calculated using the following formula:

$$\text{PELD Score} = 10 \times [0.480 \times \ln(\text{bilirubin})] + [1.857 \times \ln(\text{INR})] - [0.687 \times \ln(\text{albumin})] + \text{Listing Age Factor} + \text{Growth}$$

Results: A total of 34 ELS treatments were identified in patients listed for liver transplantation. All treatments were delivered using the molecular adsorbent recirculating system with pre-dilutional continuous venovenous hemodiafiltration. Mean PELD score pre-ELS, mid-ELS and post-ELS treatment for all patients was 20.6, 17.9 and 17.1. There was a significant decrease in PELD score between pre-ELS and mid-ELS ($p<0.001$) as well as pre-ELS and post-ELS values ($p<0.001$).
Conclusion: Extracorporeal liver support significantly decreased PELD score during and after treatment sessions in pediatric patients awaiting liver transplantation.
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P35 - CRRT FOR A NEWBORN WITH SEPTIC SHOCK AND MULTI-ORGAN FAILURE

L. Wihak1, J. Rozdilsky1, T. Holt1,2. 1Saskatoon Health Region, Saskatoon SK, Canada 2University of Saskatchewan, Saskatoon SK, Canada.

Introduction: Sepsis in newborns with multi-organ failure (MOF) and severe fluid volume overload (FVO) is associated with high mortality. (1) Continuous renal replacement therapy (CRRT) specific for this demographic has evolved with smaller circuits and biologically acceptable membranes, allowing temperate optimization of pediatric critical care therapies.
Case Summary: This 3.2kg neonate with perforated small bowel, presented to the Paediatric Intensive Care Unit (PICU) with septic shock following surgical resection. He had MOF, disseminated intravascular coagulopathy, severe FVO (33.4%), and acute kidney injury (AKI). (AKIN 3, eGFR of 9.9mL/min/1.73m2)
After placement of an 8FR femoral hemocatheter, the HF20 Polyarylethersulfone membrane was primed with 5% Albumin, and he was given a transfusion with PRBCs prior to, and concurrent with, the circuit start-up. (2) An empiric epinephrine infusion was initiated; and hemodynamic stability was maintained at commencement of CVVHDF, using the Prismaflex$^{tm.}$
With gentle ultrafiltration to achieve euvolemia, his lactate decreased (from 17mmol/L to 3mmol/L) within 24hours; capillary leak and coagulation profile improved; vasopressors were discontinued after two days; and nutrition was optimized. After 11days of CVVHDF, he was transitioned off CRRT without difficulty.
This infant was discharged home. He is currently a thriving healthy toddler.
Conclusion: CRRT is a fundamental, likely under-utilized option, for critically ill low body weight infants, to optimize their pediatric critical care and prevent mortality.

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P36 - BLOOD PRODUCT ADMINISTRATION IS NOT ASSOCIATED WITH UNSCHEDULED FILTER CHANGE IN PEDIATRIC PATIENTS WITH LIVER FAILURE ON CONTINOUS RENAL REPLACEMENT THERAPY

L. Tal[1], P. Srivaths[1], J. Teruya[2], S.M. Jamieson[2], S.M. Swartz[1], A.G. Allsteadt[3], M.S. Desai[4], H. Currier[3], A. Akcan- Arikan[1,4]
Department of Pediatrics, Renal Section, Baylor College of Medicine/ Texas Children's Hospital, Houston, TX [1]; Department of Pathology, Blood Bank and Transfusion Section, Texas Children's Hospital, Houston, TX [2]; Department of Renal Dialysis/Pheresis, Texas Children's Hospital, Houston, TX [3]; Department of Pediatrics, Critical Care Section, Baylor College of Medicine/Texas Children's Hospital, Houston, TX [4]

Purpose: Continuous renal replacement therapy (CRRT) unscheduled filter loss can lead to inadequate dialysis delivery, blood loss and exposure to packed red blood cells (pRBCs) for patients (pts) on blood prime. Plasma transfusions were reported to be associated with filter loss in pediatric liver failure (LF) pts on CRRT anticoagulated with prostaglandin and heparin[1]. We recently did not find an association with blood product administration and unscheduled filter loss in pts without LF. We hypothesized blood product transfusion would not be associated with filter loss in LF pts receiving regional citrate anticoagulation (RCA).
Methods: CRRT pts with LF evaluated over a 12month period were included. Children without LF or on modified CRRT through extracorporeal membrane oxygenator circuits were excluded. Blood products included pRBCs, platelets, fresh frozen plasma, and cryoprecipitate. The primary outcome was unscheduled CRRT filter loss within 2hours of blood product administration.
Results: There were 15 pts with 148 filter changes, 93 (63%) changed electively, mean filter life 57.3 +/- 32.9hrs. Pts received 864 blood products on CRRT. 36 products were given within 2hours preceding filter change. 17 filter losses occurred in the 2hour window following blood product administration. There was no association between blood product administration and filter loss in the patients studied (p=0.16). Most common cause of unscheduled filter loss was access problems (38%).
Conclusions: Blood product administration was not associated with filter loss in pediatric CRRT pts with LF on RCA. Access problems were most commonly observed in association with unscheduled filter loss.
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P37 - CONTINUOUS RENAL REPLACEMENT THERAPY IN THE NICU; TEN YEARS' EXPERIENCE IN A SINGLE CENTER

Mariko Sawada, Kazutoshi Ueda, Koji Matsuo, Satoko Tokumasu, Kayo Ogino, Tomohiro Hayashi,Masumi Saito*, Masamichi Kubota, Akihito Takahashi, Shinichi Watabe, Kenji Waki,
Yoshio Arakaki. Department of Pediatrics, Kurashiki Central Hospital, Department of Clinical Engineering, Kurashiki Central Hospital, 1-1-1 Miwa, Kurashiki, Okayama, 7108602, Japan*

Introduction: A Japanese clinical guideline of neonatal continuous renal replacement therapy (CRRT) was published in 2013; however, few neonatal intensive care units (NICUs) perform CRRT, and patient mortality remains high. Our objective was to study the clinical course of patients receiving CRRT in the NICU, and to analyze factors associated with mortality.
Methods: We performed a retrospective observational study of all neonates who received CRRT at our NICU between 2005 and 2014. Patient characteristics, laboratory findings at initiation of CRRT, setting of CRRT, and 3-month mortality were reviewed retrospectively. Survivors and non-survivors were compared using univariate and multivariate analysis.
Results: Twenty-seven patients received CRRT and had data available for analysis. Median patient age was 2days (range, 0–210 days), and median body weight was 2.9kg (range, 1.2–3.8kg). Diaphragmatic hernia was the most common underlying disease, with associated shock due to persistent pulmonary hypertension of the newborn. No patients had renal or urological disease. The mean blood flow was 12±6mL/kg/min, and the mean CRRT dose was 208±140mL/kg/h. Median treatment duration was 8days (range, 2–124 days). Overall survival was 51.9% within 3months. Univariate and multivariate analysis indicated no risk factors for mortality. Non-survivors tended to have a lower PF ratio (93 versus 163), higher lactate (9.9 versus 4.4mmol/L) and higher serum creatinine (1.77 versus 0.97mg/dL), and higher%fluid overload (44.7 versus 11.4%). All survivors recovered to dialysis-independence at hospital discharge. All non-survivors died from their primary disease.
Conclusion: Later initiation of CRRT and fluid overload might be risk factors for mortality in neonates. The survey of neonatal CRRT should be continued.

P38 - CASE SERIES - USAGE OF PROSTACYCLIN (EPOPROSTENOL) AS ANTICOAGULANT IN CONTINUOUS VENO-VENOUS HAEMODIAFILTARION (CVVHDF) IN CRITICALLY ILL CHILDREN

T.C. Kwok; D. Raffaj; M. Mclaughlin
Paediatric Intensive Care Unit, Queen's Medical Center, Nottingham. UK

Introduction: Heparin is the routine anti-coagulation used in maintaining continuous veno-venous haemodiafiltration (CVVHDF) circuit in critically ill children. However, it may be contraindicated in children with bleeding risk.
Epoprostenol, a prostacyclin analogue offers an alternative with its anti-platelet aggregant effect. However, it may cause hypotension due to vasodilation. There are limited studies investigating the role of epoprostenol in CVVHDF in critically ill children[1].
Methods: 3 patients from September 2013 to March 2015 used epoprostenol as anticoagulant in CVVHDF. Retrospective audit was performed investigating circuit duration (efficacy); bleeding/thrombocytopenia and hypotensive episodes (safety).
Case 1: 11year old boy admitted with diabetic ketoacidosis. Due to haemothorax, his 64hours of CVVHDF (32hours/circuit) used epoprostenol only (10ng/kg/min). 1 blood and 3 platelet transfusions were required.
Case 2: 14year old boy developed multi-organ failure post appendectomy. His initial 193hours of CVVHDF (24hours/circuit) used heparin only (7.5Unit/kg/hour on average). Due to frequent filter changes, a combination of 9ng/kg/min epoprostenol and 5Unit/kg/hour heparin was used for 60hours (60hours/circuit). He required 4 blood and 5 cryoprecipitate transfusions when heparin was used, compared to 1 blood and 3 cryoprecipitate for the latter.
Case 3: 15year old boy admitted following road traffic accident. Due to failure of peritoneal dialysis and disrupted aortic arch, his 15hours CVVHDF (15hours/circuit) used epoprostenol only (3.8ng/kg/min),

before withholding anticoagulation for next 34hours (17hours/circuit). No transfusions were required.
Inotropic requirement was not increased in all cases.
Conclusion: From our experience, epoprostenol increases life expectancy of circuit without increasing bleeding/thrombocytopenic or hypotensive episodes. However, there is no consensus in deciding how and when epoprostenol should be used in CVVHDF.
Reference: Gainza F, Quintanilla N, Pijoan J, Delgado S, Urbizu J, Lampreabe I. Role of prostacyclin (epoprostenol) as anticoagulation in continuous renal replacement therapies: efficacy, security and cost analysis. Nephrology.2006:19:648-655

P39 - STEPS TO COMPETENCY AND BEYOND: A TRAINING PROGRAMME IN THE DELIVERY OF CONTINOUS RENAL REPLACEMENT THERAPY (CRRT)

C. A. Bonthron· D. L. Smith
Leeds Children's Hospital, Great George Street, Leeds. UK

Background: The provision of a safe and sustainable CRRT service in a unit with an average of 12 patients per year presented technical and training challenges. Inconsistencies in care and practical skills directly affected decision-making and reduced filter life. A comprehensive in-depth training program was implemented for selected nursing staff to combat these issues.
Method: High fidelity simulation scenarios using real case studies[1], focused on clinical decision-making and specific practical skills such as connection, disconnection and troubleshooting[2]. Focused feedback groups, pictorial step-by-step guides and safety checklists were supplemented by clinical training days and bedside support.
Results: 30 nurses (25%) of the nursing workforce were enrolled and completed the training programme. This resulted in the provision of 24hour standardised CRRT service and extension of filter life to 65-72 hours in 75% of cases. There was also a measurable reduction in critical incidents. Nurse satisfaction and acceptability of this modality increased following our interventions. There was a 33% increase in the CRRT provision in the year following the introduction of the programme.
Conclusion: Targeted training programmes incorporating simulation, visual tools and peer feedback enhanced learning which led to a safe more efficacious cost-effective service.
References: 1. Roberts D, Greene L. The theatre of high-fidelity simulation education. Nurse Education Today 2011; 31: 694-698. 2. Butler KW, Veltre DE, Brady D. Implementation of active learning pedagogy comparing low-fidelity simulation versus high-fidelity simulation in pediatric. Nursing Education. Clinical Simulation in Nursing 2009; 5: 129-136.

P40 - ZERO WAIT, ZERO HARM AND ZERO WASTE: PROMOTING NHS GOLD STANDARDS THROUGH INTENSIVE EDUCATION AND TRAINING IN HAEMOFILTRATION

J. Jim, E. Lock
Great Ormond Street Children's hospital. 24 Great Ormond Street. London. UK.

Background: Paediatric intensive care (PICU) nurses are providing gold standard care for patients requiring Continuous Renal Replacement Therapy, (CRRT) after regular mandatory training, education and assessments. A study was performed on a 15-bedded tertiary PICU where 120 nurses are employed and 60 (50%) were trained to provide CRRT to an average of 20 patients per year. The study evaluated training by measuring retained knowledge and skills through practical exercises and a quiz.
Method: In an exercise called "spot the difference" the Aquarius machine was set up for priming then partially dismantled. Nurses were asked to spot the difference by performing the necessary alterations in-order to re-prime. At least 8 out of 10 differences had to be spotted in-order to pass the test. In addition troubleshooting exercises were performed through scenarios. For beginners, assessment and training entailed 5 supervised shifts before being deemed competent to care independently for CRRT patients. A CRRT specialist nurse required a pass of>80% and a minimum 25 CRRT shifts.
Results: All the nurses passed the spot the difference test. Less than 2% failed to achieve pass mark of>80% on the quiz and were required to redo training. Feedback was highly complementary of the training process.
Conclusion: Training has been extended to nurses doing the Intensive care course. Hence, maximizing on available staff resources from 30% CRRT trained nurses 2013 to 50% by 2014 ensuring "zero waste" on nursing resources and "zero wait" for CRRT patients. Intense training and assessment ensured retained knowledge and skills resulting in more competent nurses with adequate knowledge and confidence to utilize other modalities of CRRT specifically treating more neonates under 3kg successfully whilst promoting "zero harm" to patients.

P41 - USE OF RAPID EXCHANGE IN CHILDREN REQUIRING CRRT CIRCUIT CHANGES

C. Pomarico, N. Collins, M.J.G. Somers
Boston Children's Hospital and Harvard Medical School

Introduction: The Rapid Exchange (RE) technique uses blood that is already part of a functioning CRRT circuit to prime a new circuit, transitioning the patient expeditiously. Advantages to RE include minimizing exposure to and use of blood products, maintaining therapeutic levels of key drugs, and limiting time off CRRT. Logistics of RE are complicated and experience with the procedure should minimize technical problems. In our center, circuits are changed electively after 72hours, and we consider RE for elective changes if there is no reason to suspend CRRT at that time.
Methods: We reviewed retrospectively the CRRT course in 14 consecutive children who had RE done with at least one circuit change. We compared outcomes between RE and non-RE.
Results: All children (7boys; 7girls) received CRRT using an M60 filter and blood/buffer or 5% albumin initiating primes. Median weight was 4.25kg (IQR 3.1-8.2) with median age 4.5months (IQR 1.8-12.2). 3/14 children survived. 121 total circuit changes were performed with median 6 circuit changes/child (IQR 4.8-10.3) during entire CRRT course. Of the 121 circuit changes, 64 (53%) were RE with RE averaging 50% for each child (IQR 38-72%). No RE needed to be aborted or changed to non-RE. We categorized each circuit change based on increased inotropic support or fluid resuscitation to maintain hemodynamics during that circuit change. A circuit change was "stable" with no changes in inotrope/fluid support. 44/64 (69%) REs were stable vs 31/57 non-REs (54%) (p=0.13). With each child, the proportion of stable REs averaged 67% (IQR 43-100) vs median 50% stability (IQR 0-88%) with non-REs (p=0.25).
Conclusion: RE should be considered with planned circuit changes in pediatric CRRT. Our data demonstrate that RE is as well tolerated as non-RE, with no adverse clinical consequences and with no technical issues requiring RE cessation.

P42 - PROFILE OF FLUID EXPOSURE IN PEDIATRIC CRITICALLY ILL PATIENTS

Z. H. Al-Lawati, C. E. Kennedy, A. Akcan-Arikan
Critical Care Medicine, Department of Pediatrics. Baylor College of Medicine. Houston. USA

Introduction: Fluid overload (FO) is common in the pediatric intensive care unit (PICU) and cannot be attributed solely to oliguric AKI. PICU patients receive large volume of fluids for resuscitation, medications, and nutrition; it is unclear what type of fluid plays a role in FO. We aimed to describe the type of fluid exposure (FE) in PICU patients.
Methods: Data collected prospectively on the type of FE to PICU patients on days 1 and 3 of PICU stay. Fluid boluses, blood products, enteral intake, nutrition (TPN), or "other" (IVF or medications) were tracked. Patients admitted >24hours over a month were included, patients on extracorporeal renal or life support were excluded.
Results: 102 patients were included, 61 stayed≥3days. Day 1 mean FE was of 3680+/-3525ml/m^2/day (1954 +/- 1191ml/m^/day "other", 134+/-317ml/m^2/day enteral). 59(57.8%) patients and, 17(16.7%). received boluses and blood products, respectively. Day 3 mean FE was 2210+/-596ml/m^2/day (1177+/-820ml/m^/day "other", 297+/-316ml/m^2/day enteral). 2 (3.3%), patients received boluses, 7(11.5%) received blood products. Patients who received boluses or blood products on day 1 had increased fluid exposure overall on day 1($p<0.01$), but not day 3. When bolus fluids and blood products were excluded, there was no difference between "other" FE between patients resuscitated (fluid boluses and blood products) vs not. 92% of patients had FE >1600ml/m^2/day on day 3.
Conclusion: In PICU patients, FE on admission is largely due to resuscitation; FE exceed maintenance requirements on day 3. Non-nutrition, non-resusciation FE may play a role in ongoing FO in PICU patients. Further studies to correlate "other" FE to FO and explore modifiable practice improvement opportunities are needed.

P43 - NEONATAL AKI: A SINGLE CENTER EXPERIENCE (Small steps to a long journey).

S. Vyas[1], B. Abdelrahma [2], A.F. Osman[2], M. Cohen[2], I. Roberti[1]
Children's Kidney Center at Saint Barnabas Medical Center, Livingston, NJ[1] and Children's Hospital of NJ, Newark, NJ[2].

Introduction: Neonatal AKI is an evolving entity as we treat more complex and very premature babies.
Methods: Retrospective chart review was done for Neonatal AKI consults from Jan 2008-Dec 2010 and via electronic health records (EHR) for diagnosis of AKI from Jan 2011-Dec 2013.
Results: Total of 75 patients were identified with AKI and classified by pRIFLE criteria. Overall, 52 (69%) had a nephrology (neph) consult. Neonates were divided into two groups: consulted or not by neph -table shown below.

Demographics (N=75)	Nephrology Consulted N=52 (69%)	No Nephrology consult N=23 (31%)
Gender (M/F)	28 (54%)/24	14 (61%) /9
Gestational Age(GA) (<28weeks)	30 (58%)	22 (96%)*
Age at AKI Presentation (median)	11days	11days
Episodes of AKI ≥2	9 (17%)	2 (9%)
Oliguric AKI	33 (64%)	19 (83%)
Blood pressure problems: HTN/ / vasopressors	3/ 17 (33%)	0/ 17 (74%)
Mechanical ventilation (MV)	41 (79%)	22 (96%)
Dialysis	5 (9.6%)	0
Nephrotoxic meds	20 (39%)	21 (91%)*
CAKUT	12 (23%)*	0
Outcome (recovered/CKD / expired/No follow up)	23/8/21/0	11/0/10/2
pRIFLE	0/9/29/13/1 (FLE=83%)	0/5/16/1/0 (FLE=74%)

Babies with AKI with no neph consults had higher use of vasopressors, MV, nephrotoxic meds and lower GA. Neph consults were higher in babies with AKI due to CAKUT and older GA.
Low GA, vasopressors, MV and neph consults were similar in neonates who recovered and those deceased. The expired group had higher rates of oliguria (87% vs 52%) and AKI severity by pRIFLE (87% vs 79% for FLE).
Conclusion: Neonatal AKI has significant mortality (41%) with poor long term follow up (20%) and often are not consulted by nephrologist. Oliguric AKI with worse pRIFLE was associated with mortality.

P44 - USEFULNESS OF THE CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN A MEXICAN PUBLIC HOSPITAL OF THIRD LEVEL

T. Reséndez, F. González-Salazar , O. Sáenz
Instituto Mexicano del Seguro Social, Hopital n° 25, Monterrey Mexico

Introduction: Acute renal failure is a common problem among patients in PICU in developing countries. In tertiary hospitals is considered as first choice CRRT. The main objective of this paper is to describe the outcomes in a population attended in a PICU from a high specialization hospital located in the north of Mexico.
Methods: There is an observational, descriptive and cross sectional study, data come from the files of paediatric patients attended in the PICU during 3years period. A total of 25 files of the respective patients were reviewed. Main variables were denouement, age, weight, gender, diagnosis, cause of need of therapy with CRRT, time of CRRT, creatinine and potassium levels. Data were collected in a datasheet of Excel. Then, they were analysed with SPSS® V_{18} statistical software.
Results: All the CRRT procedures were realized in a PRISMA machine. Filters were M-60 and M-100 in 60 and 40% respectively. Most of the patients were males 14 (56%), the mean of the age was 86months, and 52% of the kids have between 8 and 14years. The main diagnosis was renal failure (52%), while the main cause to start CRRT procedure was oliguria and azotemia (56%) , the most frequent mode of treatment was CVVHDF in 72% of patients. The average of CRRT procedure's prolongation was of 4.3days (1 to 10days). The relationship filter-use/hours was of 41hours per filter. !8 patients survived, 7 died.
Conclusion: Our outcomes show CRRT as a useful procedure in renal failure and critically compromised patients attended in our PICU.

P45 - CONTINUOUS RENAL REPLACEMENT THERAPY AS ADJUNCT TO METHOTREXATE TOXICITY MANAGEMENT

K. Balutis [2], T. Holt [1,2], J. Rozdilsky [1], L. Wihak [1]
[1]Saskatoon Health Region, Saskatoon, Sk, Canada, [2]University of Saskatchewan, Saskatoon, Sk, Canada

Introduction: Continuous Renal Replacement Therapy (CRRT) has been shown to be a valuable adjunct to glucarpidase for treatment of

methotrexate toxicity [1]. In this case, CRRT reduced toxic levels of methotrexate significantly when glucarpidse was not immediately available.

Case Summary: This 11year old girl with osteosarcoma and previous amputation of her right arm developed methotrexate toxicity following administration of Week 15 chemotherapy. Having no previous history of renal dysfunction, methotrexate 12 grams/m2 (weight 51.9kg; BSA 1.48m^2) was administered, accompanied by prehydration, alkalinisation and leucovorin "rescue". Forty eight hours post-methotrexate, her level was 470 mcmol/L (target at 48hours is<0.1 mcmol/L). Glucarpidase, the standard therapy, would be available within 24hours.

Accompanied by acute renal failure (AKIN III, eGFR of 29mL/min.) and a 13.7% fluid volume overload, this patient developed pulmonary edema and increased oxygen demands. The patient was transferred to PICU, intubated and a hemocatheter inserted. CVVHDF was rapidly initiated for fluid and drug removal. After 10hours of CRRT, her methotrexate level had decreased by 47.9%; the glucarpidase was available and given. Subsequently, her methotrexate levels decreased, but remained in the toxic range and rebounded. Ongoing renal dysfunction necessitated CRRT for an additional 7days before successful CRRT weaning.

This patient shows no residual renal dysfunction and has completed subsequent modified chemotherapy courses.

Conclusion: CRRT is a useful adjunct in the management of methotrexate nephrotoxicity. Utilizing the CVVHDF mode, toxic methotrexate levels were decreased by 47.9% within 10hours of treatment.

[1] Viley AM, Mueller BA, Haines H, Alten JA, & Askenazi D J. Treatment of methotrexate intoxication with various modalities of continuous extracoporeal therapy and glucarpidase. *Pharmacotherapy* 30:1: 53e-58e

P46 - HEMOLYTIC UREMIC SYNDROME IN CHILDREN – SINGLE CENTER EXPERIENCE

A.C. Lungu[1], O. Limoncu[1], M. Gafencu[2], C. Stoica[1]
[1]*"Fundeni" Clinical Institute, Bucharest, Romania.* [2]*Emergency Children Hospital Timisoara, Bucharest.*

Introduction and aims: Hemolytic Uremic Syndrome (HUS) is defined by the triad of microangiopathic hemolytic anemia, thrombocytopenia and acute renal failure. HUS is an important cause for acute kidney injury in children and one of the most difficult to treat. The aim of the study is to present the renal replacement therapy methods, type of HUS, complications and mortality of this disease in children .

Methods: A clinical retrospective analysis was carried on 43 children patients, aged 2months to16 years, with the diagnosis of HUS, who were admitted to the Pediatric Nephrology Department of Fundeni Clinical Institute, Bucharest, between 1993 and 2013. The evaluation considered if HUS was typical or atypical; the method of dialysis used (hemodialysis, peritoneal dialysis, or none); the complications (cardiovascular, neurological, hepatic,); development of Chronic Kidney Disease and mortality.

Results: Of the 43 patients children with HUS 23 were females, and 20 were males. The repartition of the cohort by age groups was: 0-1 year: 20, 9%, 1-3 years: 30,2%, 3-6 years: 25,5%, 6-12 years: 16,2%, more than 12years: 7,1%. 86% of the children were dialyzed (69,8%-hemodialysis, 16,2%- peritoneal dialysis) and 14% of patients did not received any type of renal replacement therapy. The complications were: cardiovascular (25%), neurological (27,9%), hepatic (46,5%). 9, 3% of the patients developed Chronic Kidney Disease. 4,6% received renal transplant. 11,6% of patients presented HUS relapses. The mortality rate was 10,9%.

Conclusions: The most affected group of age was 1-3 years. 86% of patients were dialyzed, the preferred method was hemodialysis (69,8%). Mortality rate is correlated with the severity of extra renal involvement, especially the central nervous system, the type of HUS and age.

P47 - WHAT WAS UNTRANSPLANTABLE (LIVER) YESTERDAY IS VERY MUCH TRANSPLANTABLE IN TODAY'S WORLD- ROLE OF EXTRACORPOREAL THERAPY IN BRIDGING TO LIVER TRANSPLANTATION

G.Sambandamoorthy, G. Auzinger , R. Loveridge , A. Deep
King's College Hospital, London.UK

Introduction: Paediatric Acute Liver failure (PALF) results in severe coagulopathy and multi-organ failure with a risk of death if not transplanted early , however severe multi-organ failure might itself be a contraindication to transplantation as that might lead to graft failure and death post-operatively. We describe a 11year old boy with fulminant Wilson's disease who developed refractory vasoplegic shock, ARDS, Grade III encephalopathy, Acute Kidney Injury, who was successfully bridged to liver transplantation with ECMO and CRRT.

Case Summary: An 11year old previously well boy was admitted to our Paediatric Intensive care unit (PICU) following intubation and ventilation for rapidly progressive encephalopathy(grade 3), jaundice, ascites, INR >9. Other lab parameters confirmed Wilson's disease. After few days of vomiting and diarrhoea, he became progressively unwell with features of acute liver failure.

He developed severe multi organ failure within 24-48 hours of PICU admission. He had progressive respiratory failure with PaO2/FiO2 ratio<100, severe fluid refractory vasoplegic shock requiring four drugs (Adrenaline, Noradrenaline, Vasopressin and hydrocortisone) and intracranial hypertension. He was edging on the side of being non-salvageable.

Given the fulminant liver disease, we utilised the very narrow window of opportunity with VV ECMO+CRRT–pre, intra and post liver transplant to take care of ARDS, refractory vasoplegic shock, neuroprotection for raised ICP and prevent hypoxic damage to graft. He made remarkable recovery with completely normal neurology post-transplant. ECMO was discontinued after 8days he was extubated on day 11.

Conclusion: The fact that extracorporeal support in the form of ECMO and CRRT can alter the natural course of the disease makes it very difficult to predict outcomes in ALF. ECMO support in PALF is feasible and it is becoming exceedingly hard not to offer extracorporeal therapy to these patients who can be successfully bridged to liver transplantation

P48 - STEERING THE WAY: IMPLEMENTATION OF A MULTIDISCIPLINARY CRRT LEADERSHIP TEAM

J. Uhlrich, Children's Hospital Colorado, T. Stidham, University of Colorado & Children's Hospital Colorado, K. Ward, University of Colorado & Children's Hospital Colorado, M. Cadnapaphornchai, University of Colorado a& Children's Hospital Colorado, C. Okada, University of Colorado & Children's Hospital Colorado. USA

Introduction: CRRT is a complex and often underutilized therapy despite increasing evidence supporting its use in a variety of critical conditions. Historically at our center and many others, there has been limited PICU involvement in CRRT implementation and management. A multidisciplinary steering committee and PICU liaison team was created to facilitate process and outcome improvement, targeting multiple quality and safety initiatives.

Methods: A multidisciplinary committee was implemented in January 2014, focusing on program development and system improvement opportunities. The committee is comprised of medical provider, nursing, pharmacy, and administration representation from nephrology and critical care areas. Concurrently, a PICU

CRRT liaison team was formed for consultation regarding patient selection and therapy management. A program coordinator role was implemented to provide oversight. System changes over the next 12months included the following: full pump management by CRRT specialists, policy revisions to include complex populations, implementation of electrolyte additive process, and interactive specialist and medical provider education and training. A retrospective analysis was conducted to compare PICU CRRT patient days and post-therapy survival prior to and following this intervention.

Results: Following these programmatic changes, CRRT patient days in 2014 increased by 162% (225% in non-ECMO patients and 36% in ECMO patients). Complications of electrolyte abnormalities on CRRT were reduced, evidenced by decreased incidence of hypophosphatemia (67% relative risk reduction) and improved circuit life. There was a trend toward improved survival to PICU discharge, though not statistically significant.

Conclusion: The development of a multidisciplinary CRRT steering committee with focused PICU leadership has contributed to increased therapy usage, suggestive of more appropriate and timely patient selection, decreased complications, and a trend toward improved survival. This demonstrates the feasibility of a multidisciplinary leadership team to bring about improved program management and patient outcomes.

P49 - IMPLEMENTATION OF A NOVEL STANDARDIZED PROCESS FOR ADDITIVE REPLACEMENT AND DIALYSIS FLUIDS REDUCES ELECTROLYTE COMPLICATIONS

J. Uhlrich, Children's Hospital Colorado, T. Stidham, University of Colorado & Children's Hospital Colorado, K. Ward, University of Colorado & Children's Hospital Colorado
A. Koch, Children's Hospital Colorado, M. Millard, Children's Hospital Colorado
M. Cadnapaphornchai, University of Colorado & Children's Hospital Colorado
C. Okada, University of Colorado & Children's Hospital Colorado. USA

Introduction: The utilization of standard commercially available dialysate and replacement fluids, though safest, limits the ability to tailor the prescription in order to optimize patient electrolytes and avoid common CRRT related electrolyte derangements. We implemented a novel process to safely prescribe and administer additive dialysis solutions. We evaluated frequency of hypophosphatemia and adverse events as outcome measures.

Methods: The process involved a multidisciplinary approach with collaboration from nephrology, pediatric intensive care, pharmacy and hospital safety and quality teams. An extensive multistep protocol was created, standardizing every step of the process from prescription through compounding and administration with multiple embedded safety and quality measures. To assess efficacy and safety of this intervention we performed a retrospective analysis comparing the frequency of phosphorus derangements and the need for repletion in all CRRT patients with or without additive fluids prescribed.

Results: Since 2014, there were 227 CRRT patient days using standard dialysis solutions and 124 CRRT patient days with additive solutions The attributable risk of hypophosphatemia adjusted per CRRT day was reduced by 67% with additive fluids prescribed (approximately one episode per CRRT day with standard solutions and one episode per three CRRT days with additive solutions). Frequency of hypophosphatemia which required intervention with intravenous or enteral supplementation was higher in the group receiving standard solutions. There were no increases in the frequency of hyperphosphatemia with additive solutions and no reported medication errors related to institution of this new additive process.

Conclusion: Significant collaboration was required to create a safe, effective and standardized process for additive solution administration and subsequently led to reduced frequency of hypophosphatemia without adverse events. This process allows for patient specific prescriptions and is likely to ameliorate multiple patient and CRRT related electrolyte derangements.

P50 - EMERGENT INITIATION OF CRRT FOR PROPOFOL INFUSION SYNDROME: A CASE STUDY

Young. C,
Children's Hospital Los Angeles. USA

Introduction: CRRT has been shown to be a beneficial therapy in the treatment of drug toxicities. CRRT uses convection to eliminate the toxic drug from the blood stream and limit or prevent further organ failure. Propofol Infusion Syndrome (PIS) occurs when it is used in high doses for an extended period of time. Clinical manifestations for PIS are numerous and often fatal if not corrected in time. Fortunately PIS is rare occurrence.

Case summary: Nineteen year old male admitted to the PICU following a microvascular flap repair for a gunshot wound to the face. Due to the nature of the surgical repair, it was vital that he remained immobilized to optimize engrafting. He remained intubated, arterial and CVP lines in place. Propofol at 150mcg/kg/min was used to prevent mobilization. After 72hours of being on this infusion, patient demonstrated symptoms of PIS: hypotension, lactic acidosis, rhabdomyolysis, acute renal failure, green urine discoloration pulmonary edema, ST segment elevation and a Brugada ECG pattern. Patient's fluid balance was positive by 15 liters, had elevated lactate and cardiac enzymes (CKMB and troponin), lactate levels and $ScvO_2$ 51%. Propofol was discontinued and Fentanyl initiated along with Dopamine, Epinephrine, Esmolol and Nitroglycerin infusions were started for hypotension and myocardial ischemia. CRRT was initiated for PIS and fluid overload. Within 12hours of initiating CRRT, the ECG returned to NSR with stable vital signs. Within 24hours, the Dopamine and Epinephrine infusions were discontinued and lab values returned to normal. Urine output improved to 0.5cc/kg/hr. Within 72hours, CRRT was discontinued.

Conclusion: Emergent initiation of CRRT for PIS prevented irreversible multi-organ dysfunction syndrome and allowed for stabilization in a near fatal event.

Reference: Zaccheo MM, Bucher DH. Propofol Infusion Syndrome, a rare complication with potentially fatal results. Crit Care Nurs 2008 June 28(3) 18-26.

P51 - THE UTILITY OF PLASMA DIAFILTRATION IN PEDIATRIC LIVER FAILURE

Atsuko Noguchi[1], Satoko Tsuchida[2], Daiki Kondo[1], Ikuko Takahashi[1], Hiroaki Tamura[1], Hajime Nakae[3], Tsutomu Takahashi[1]
[1]Department of Pediatrics, Akita University Graduate School of Medicine, Japan [2]Department of Pediatrics, Akita Red Cross Hospital, Japan [3]Department of Emergency and Critical Care Medicine, Akita University GraduateSchool of Medicine, Japan

Introduction: Plasma diafiltration (PDF) is blood purification therapy in which plasma exchange(PE) is performed with a membrane plasma separator while dialysate flows outside the hollow fibers. It excels in removal of middle-molecule substances, bilirubin or inflammatory cytokine. That needs a little amount of FFPs, and the devise is simple compared with PE+ hemodiafiltration(HDF).

We performed PDF for five pediatric patients with acute liver failure, and evaluated some serum parameters, compared with HDF.

Subjects and Method: The ages of subjects were 8 to 14years old, and body weights were 22 to 42kg. The etiologies of them were as follows; Case 1 was hepatitis B and case 2 was idiopathic. They were fulminant liver failure. The others (case3-5) were influenza A infection, severe heat stroke and macrophage activation syndrome. We used the Evacure EC-2A (Kuraray Medical Inc.) with administration of FFPs(150~1200ml) and 25% albumin solution. PE or HDF were combined properly. Except for case 2, their liver functions recovered. Before and after each PDF session, we measured serum parameters(ALT, T.Bil, INR) and compared those with that of HDF. Differences between 2 groups were analyzed using repeated measure ANOVA.
Result: Serum parameters were significantly decreased after PDF session ($n=7$, $P<0.05$). Difference between PDF and HDF were not significant. In addition, we measured serum cytokines(IL-18, IL-6, TNF-α,IL2-R) in case 5 before and after PDF session. These parameters decreased sufficiently.
Conclusion: We could perform PDF safely for pediatric acute liver failure. PDF sufficiently improved serum parameters, with smaller amounts of FFPs than PE.

P52 - Continuous Renal Replacement Therapy (CRRT) in Children with Sepsis and Multi Organ Dysfunction Syndrome- Indian scenario.

Krishna Mohan Gulla[1], Kanav Anand[2], Anil Sachdev[1], P.K.Pruthi[2], Dhiren Gupta[1], Neeraj Gupta[1]
Division of [1]Pediatric Critical Care and [2]Pediatric Nephrology, Institute of Child Health, Sir Ganga Ram Hospital, New Delhi, India

Background: Sepsis with multi organ dysfunction syndrome (MODS) is a common occurrence in Pediatric Intensive Care Unit (PICU) in sick children. Unfortunately scanty literature is available regarding CRRT utility in sepsis with MODS from developing countries.
Objectives: To report our experience and emphasize the initiation of early CRRT in managing children with sepsis and MODS in a developing nation.
Materials and methods: Medical records of children required CRRT in PICU at Sir Ganga Ram Hospital from September 2010 to February 2015 were retrospectively analyzed to obtain data on demographic factors, mode of CRRT& its prescription, probable effect of CRRT on inotropic score, plateau pressures, P/F ratio, hemodynamicstability while on CRRT, anticoagulants, feasibility and complications.
Results: During the study period 27 children required CRRT(male-16). The median age was 11years (range 1.1- 16) and median weight was 39kg (range 7.5- 65). 21 had primary diagnosis of sepsis with MODS. At initiation of CRRT, all patients were receiving mechanical ventilation and inotropic support. 47.8% patients had fluid overload (F.O) of >10% at the time of initiation of CRRT. 14 patients of 27 patients (51.8%) survived. Survival rate was 61.1% (11/18) in those patients who received CRRT within 48hours of ICU admission and was 33.3%(3/9) in those who received CRRT after 48hours of ICU admission (p value 0.0001). Creatinine at initiation of CRRT in children who received CRRT within 48hours of admission was2.1mg/dl(1.9 – 3.85) whereas 3.7mg/dl(2-3.95) in those who received CRRT after 48hours(p value=0.03). There was no statistically significant difference in duration of ICU stay, time from admission to CRRT initiation, fluid overload, CRRT duration, PRISM score at 12hours, percentage of decrease in inotrope score, plateau pressure and percentage of increase in P/F ratios between the those patients who received CRRT within 48hours and after 48hours of admission to ICU. However, comparison between survivors and non survivors revealed that percentage of decrease in inotrope score, plateau pressure and percentage of increase in P/F ratio were higher in survivor group compared to non survivor group (p values are 0.022, 0.00 and 0.03 respectively). Total 34 CRRT sessions were given amounting to 1304.4hours with mean life span of each filter was 47.62hours. Femoral venous access was used in 23(85%)patients. Blood was used for circuit priming in 15(55.5%) patients. All patients were given CVVHDF as a modality of CRRT. Heparin was used as an anticoagulant in only (10/27)37% of patients in view of coagulopathy. Manageable dyselectrolytemias namely hypokalemia, hypophosphatemia, hypomagnesemia, hypokalemia were observed in 21(77.8%),16(59.2%),13(41.8%), 7(25.8%) respectively. Only one patient had major intracranial bleed secondary to anticoagulation with heparin.
Conclusion: Early initiation of CRRT in children with sepsis and MODS may improve the survival but large sample size is required for validation in Indian scenario.

P53 - PLASMAPHERESIS ON ECMO: CASE STUDY.

Pereira, L. and O'Callaghan, M.
(ECMO), Great Ormond Street Hospital NHS Foundation Trust, London. UK

Case study of a 14year old teenager, diagnosed with Acute Respiratory Distress Syndrome (ARDS). Treatment required Extracorporeal Membrane Oxygenation (ECMO), in conjunction with plasmapheresis therapy. The treatment options of plasmapheresis during his ECMO run were successful. Within our, practice we frequently utilise Renal Replacement Therapy (RRT), in conjunction with ECMO support. The ECMO Nurse specialist manages and regularly troubleshoots both modes of treatment successfully. Plasmapheresis is rarely utilised in the Paediatric Cardiac Intensive Care unit (CICU) because allocation, management and treatment of patients requiring plasmapheresis are usually admitted to the Paediatric Intensive Care Unit (PICU).
Anticoagulation can be affected due to rapid plasma exchange during the course of treatment over a 24hours period. Heightened vigilance of Activated clotting time (ACT) and Clotting profiles are required to maintain the integrity of the ECMO circuit.
Description: Plasmapheresis is undertaken by the Apheresis Nurse. ECMO Nurse Specialist looks after the ECMO Circuit and another nurse cares for the patient. The connections for plasmapheresis are carried out by the ECMO Nurse Specialist ensuring no air is entrained during the process of connection or removal.
Evaluation and discussion: Over the last three years, three patients required plasmapheresis therapy while on ECMO support within our institution, with only one survivor. Of the non-survivors, one was a post-transplant with acute rejection (ECPR) and the other a patient with autoimmune disease. Numbers, as indicated, are extremely small as the need for concurrent use of both therapies is rare.
Although plasmapheresis is relatively similar to RRT, the risk factors lie in managing to maintain cardiovascular equilibrium, troubleshoot pressures and flow for both machines whilst maintaining adequate anticoagulation throughout the procedure.
Plasmapheresis is a treatment mode that can be safely utilised whilst on ECMO support.

P54 - INCIDENCE OF ACUTE KIDNEY INJURY IN PICU AT A TERTIARY CARE CENTRE ACCORDING TO MODIFIED pRIFLE CRITERIA AND RISK FACTORS PREDISPOSING TO AKI IN THESE CHILDREN.

Kedarnath. M. , XX Shwetha XX ,Ginigeri.C.
People Tree Hospitals, Bangalore.

INTRODUCTION: The reported mortality from AKI is still as high as 60% in critically ill children . Most of the reported clinical studies focus on patients requiring renal replacement therapy, clearly experienced severe renal injury. However, recent studies demonstrate that even a modest rise in serum creatinine (SCr) is a risk factor for mortality in adult and pediatric patients.

AIMS and OBJECTIVES: Primary Objective :To evaluate the incidence of Acute Kidney Injury [AKI] in PICU patients in a private tertiary care center
INCLUSION CRITERIA : All patients requiring ventilation during PICU stay in the study period.
EXCLUSION CRITERIA :

1) Babies<1 Months
2) Patients staying in PICU for <48hrs
3) Patient with pre-existing renal injury.

CLINICAL DATA COLLECTION:- A detailed history was taken and general and systemic examination was conducted and filled in a proforma by the on-duty doctor. The parameters included

- Age, sex, anthropometric parameters.
- Parameters of PRISM Score
- Components of pRIFLE criteria

RESULTS: The overall incidence of AKI in children admitted to our PICU was 43.8% (n=50) and is associated with a high mortality rate. (16%)

The incidence of AKI estimated by the creatinine method of pRIFLE criteria was (42.1%)as against the incidence estimated by the urine output method(16.6%) ,and was statistically significant.($p<0.05$).

The main risk factors identified to be associated with development of AKI are PRISM score >10,days of ventilation>4days,use of Nor adrenaline and use of Acyclovir.

The use of Furosemide in patients with a cummulative fluid balance of 10% and 10 to 20%was found to be protective(OR >1) ($p<0.01$) against the development of AKI.

CONCLUSION:
The pRIFLE classification system can serve in identification and understanding of AKI epidemiology in critically ill pediatric patients and stands validated in developing countries also.

Several risk factors for AKI have been identified, most of which are readily modifiable, useful in managing AKI early and prevent subsequent morbidity and mortality.

P55 - SAFETY AND EFFICACY OF REGIONAL CITRATE ANTICOAGULATION IN PEDIATRIC LIVER FAILURE

Akcan-Arikan. A, Tal. L, Rodriguez. K, Himes.R, Desai. M, Srivaths, P.
Texas Children's Hospital, 6621 Fannin Street, Houston, TX 77030. USA

Regional citrate anticoagulation (RCA) is becoming increasingly more common as anticoagulation of choice in continuous renal replacement therapy (CRRT). With impaired citrate metabolism such as in liver failure (LF), citrate accumulation and resultant toxicity (citrate lock, CL) is a safety concern, yet no pediatric data exist. In our institution, with>600 pediatric CRRT days/year, standard anticoagulation of choice for CRRT is RCA.

Objective: Describe the efficacy and safety profile of RCA use in pediatric LF.
Methods: Retrospective review of institutional CRRT database.
Results: 44 patients (pts) with LF had 691 CRRT days over 2years. All pts received continuous venovenoushemodiafiltration (CVVHDF) with RCA. All were invasively ventilated and were on at least one vasoactive amine. 24 (55%) patients had CL (defined as total calcium (mg/dL)/ionized calcium (mmol/L)>10). Pts who had plasma exchange (n=17) were more likely to have CL (76% vs 41%, p=0.02). Interventions for CL included increasing clearance (n=6), decreasing citrate (n=11), stopping citrate (n=2), CL resolved with interventions in all cases. No persistent hypotension was documented in association with citrate toxicity. Median filter life, available for 149 filters, was 68hrs (IQR 26,78). Overall, 13 pts (29%) had bleeding complications; 9 oozing at catheter site, 2 pts had pulmonary hemorrhage awaiting liver transplant, 2 had small intracranial hemorrhage (both occurred after transplantation with good graft function).
Conclusion: RCA seems to be safe and effective for CRRT in LF. Pts need to be closely monitored for developing CL especially if they have additional citrate exposure such as with TPE.

P56 - PARALLEL CENTRIFUGATION PLASMA-EXCHANGE AND CONTINUOUS VENOVENOUS HEMODIAFILTRATION

Tran CL,[1], Yang. L,[1], Swanton-Plummer,MG[1], Winters, JL, [2] and Cramer II CH,[1]
Pediatric Nephrology [1] and Transfusion Medicine [2], Mayo Clinic, Rochester MN. USA

Introduction: Performing plasma-exchange (PLEX) in infants receiving continuous renal replacement therapy (CRRT) is challenging because of limited access, hemodynamic instability, and loss of CRRT therapy while performing PLEX. This report describes parallel PLEX-CRRT therapy which addresses the above challenges.
Case Summary: Two month old Hispanic female weighing 4.3kg presented with anuric acute renal failure, thrombocytopenia, hemolytic anemia, and renal histological confirmation of thrombotic microangiopathy (TMA). Initially, centrifugation PLEX followed by continuous venovenous hemodiafiltration (CVVHDF) was prescribed; however, because of hemodynamic instability with initiation of each treatment and time off of CVVHDF they were arranged to be done in parallel.
PLEX was performed using COBE Spectra with circuit volume of 160mL primed with blood. Plasma was the replacement fluid. The PLEX circuit was anti-coagulated with ACD-A at an AC ratio of 15:1.
CVVHDF was performed with the Prismaflex via an 8Fr temporary hemodialysis catheter in the right internal jugular vein using a HF1000 filter and citrate regional anticoagulation.
PLEX was connected in parallel to the CVVHDF system. PLEX inflow connected to arterial side of the circuit between the catheter and pre-blood pump citrate infusion. PLEX outflow connected to the return side of the circuit between return clamp and catheter, both via 3-way stopcocks.
The arterial and return access pressures did not become negative/positive by more/less than 10mmHg from baseline. There was an inconsistent pattern of transient hypotension responsive to calcium chloride bolus. Patient serum ionized calciums associated with the 4 PLEX sessions varied between 3.76mg/dL-5.19mg/dL.
Conclusion: Parallel centrifugation PLEX and CVVHDF can be considered in infants. Close monitoring of hemodynamic parameters and ionized calcium are recommended.

P57 - AN EXAMINATION OF THE CHANGES IN BLOOD PURIFICATION THERAPY AT OUR HOSPITAL. :THE USEFULNESS OF SELECTIVE PLASMA FILTRATION WITH DIALYSIS.

Satoko Tsuchida* *** Atsuko Noguchi*, Ikuko Takahashi*,Hiroaki Tamura*, Daiki Kondo*, Masataka Inoue*, Tsutomu Takahashi* and Hajime Nakae**

*Department of Pediatrics, Akita University School of Medicine, **Department of Emergency and Critical Care Medicine, *** Akita Red Cross Hospital

Introduction: Due to recent advances in equipment size and materials, blood purification can be performed safely for the disease in children. From 2006 we started Plasma diafiltration (PDF) as selective plasma filtration with dialysis.
We examine the changes in blood purification therapy at our hospital over the past 12years.
Methods: Between 2000 to 2012, 66 pediatric patients at Akita University Hospital were studied, and their medical backgrounds, method of blood purification and the results of therapy were compared.
The types of modalities, i.e. peritoneal dialysis (PD), continuous hemodiafiltration, hemodialysis, plasma exchange, direct hemoperfusion therapy with polymyxin B immobilized fiber (PMX-DHP) and PDF , were choiced for the medical condition.
A membrane plasma separator (Evacure EC-2A®) is used while dialysate flows outside of the hollow-fibers continuously as PDF.
Results: 36 patient had blood purification therapy by the extracorporeal renal replacement therapy (ECRRT) and 30 patient by PD. Comparing each six years period, we find that the number of ECRRT patient is increased from 11 to 25. Additionally the total survival rate and esidual sequelae rate is improved; from 63% to 76% , and 54% to 30% respectively, in spite of an increased ratio of multiple organ failure. In the under 10kg Body Weight group, the percentage of ECRRT patients remained constant, but the survival rate improved from 40.0% to 55.6%.
After 2006, PDF was performed on 64.3% of the ECRRT patients in over 10kg B.W. group resulting in increased non-renal indications i.e. acute liver failure, macrophage activation syndrome with s-JIA, viral associated hemophagocytic syndrome, influenza-related multiple organ failure, and heat stroke.
Conclusion: PDF may be a one of useful blood purification therapies due to its effectiveness for removing substances with medium molecular weights, such as inflammatory cytokines, and minimally invasive for patients because of the amount of FFP.

P58 - "GROWING UP within the pCRRT SERVICE"

Schumann. M, Fennell. A.
Children's University Hospital Temple Street, Dublin, Rep. of Ireland

Introduction: In recent years pCRRT has become an imperative therapy in the management of critically ill children in our centre and worldwide. This poster aims to discuss and highlights the challenges of the pCRRT team and its recruitment as well as the continuous education program needed to deliver a safe pCRRT service.
Methods and results: The poster discusses staff training and education to fulfil the increased demand for highly-trained staff delivering an efficient pCRRT service. As the evidence recommending the use of early onset of CRRT increases, our service has expanded in the last 6years from a having a small core team and an on-call service to a team of over 20 staff delivering a 24/7 service. Staff training courses are provided twice a year with new members joining the team on a regular basis allowing us to provide a pCRRT service around the 'clock' at a nurse-patient ratio of 2:1 at all times.
Furthermore, quality assurance is paramount to the success of our pCRRT program achieved in particular through the usage of competency booklet, regular refresher courses and liaison with other centres providing pCRRT.
Conclusion: pCRRT service has grown in recent years and with it the demands for adequate staffing levels. In our centre pCRRT is now considered a pro-active treatment in comparison to a rescue treatment. Staff training courses are provided twice a year with on-going education sessions and refresher courses yearly.

P59 - Renal Angina Index at 24hours is associated with survival outcome in children admitted with Severe Dengue in PICU – A retrospective cohort study

Sasidaran Kandasamy*, Niranjan Vijayakumar*, Ayyammal*, Sheeja Sugunan*, Prasanna Narayanan*, Sindhuja Lakshminarayanan*, Thangavelu Sankaralingam*
Division of Pediatric Intensive Care, Dr Mehta Children's Hospital Pvt Ltd, Chennai -INDIA

Introduction:
Dengue fever is one of the tropical febrile illnesses contributing to major mortality in children of developing world. DSS is caused by increased capillary permeability and has case fatality rate upto 47%. Time sensitive fluid resuscitation is one of the major strategies emphasized in WHO protocol to improve their survival. *Despite the documented benefits of aggressive fluid resuscitation in shock, the recent studies highlight the potential harm associated especially in those with endotheliopathy and capillary leak*. Based on these observations, we decided to measure the Renal Angina Index at 24hours and study its association with survival outcome in our retrospective cohort.
Subjects and methods: Case records of children admitted to our PICU in 2013 fulfilling the WHO case definition of severe dengue were reviewed. Data regarding eCrCl (estimated creatinine clearance by modified Schwartz formula) at admission, fluid balance, inotrope requirement, durations of oxygen requirement, mechanical ventilation requirement, Renal Angina Index at 24hours, PICU stay, total hospital stay, survival outcome were recorded in the study proforma.
Results: Of 26 children, 14 were boys and 12 girls. The median duration of ICU stay was 60hours, and that of hospital stay 109hours. eCrCl was less than 60ml/min/1.73m^2 in 6 patients (83.3% expired and 16.7% survived). *Positive fluid balance (FO>15%) in the first 24 and 36hours were significantly higher in children who expired (p- 0.011)*. The median RAI in the children who survived was 1 (IQR 1-4.25) and in children who died was 10 (IQR 5-10). *Odds ratio for death as outcome when RAI >5 was 4.52 (p=0.006)*.
Conclusion: Positive fluid balance (FO >15%) at 24hours had a significant positive correlation with mortality and negative correlation with admission eCrCl. *RAI >5 may function as a tool to predict mortality outcome. RAI needs to be evaluated in prospective studies as predictive tool to guide classifying high risk group who may require restrictive fluid resuscitation*.

P60 - LIFE- SAVING TREATMENT FOR MEDICALLY REFRACTORY HYPERAMMONEMIA: CONTINUOUS RENAL REPLACEMENT THERAPY

Demirkol, D, Karacabey, BN, Zeybek, CA, Cesur Y.
Koç University School of Medicine, Davutpaşa Cad., No: 4, Topkapı, 34010, Istanbul, TURKEY

Introduction: In the present study, the authors' primary aim is to investigate the effectiveness of continuous renal replacement therapy (CRRT) in the treatment of hyperammonemia. The secondary aim of the study is to demonstrate the association between hyperammonemia and vasoactive requirements.

Methods: Fifteen patients were referred to paediatric intensive care unit because of hyperammonemia between 2012 and 2014. All patients were analysed retrospectively.
Results: Fourteen patients were under the age of 1year, and 11 of them were neonates with a mean age of 4.75±3.5days (range, 0–12 days). Thirteen children were treated with CRRT. The mean plasma ammonia level at the initiation of CRRT was 2007±1200 (range, 1551–4367) μmol/L, and the mean duration of CRRT was 43±18 (range, 24–79) h. The mean 50% reduction time for ammonia was 7.3±3.8 (range, 3–15) h. The mean blood flow rate was 6.2±1.1 (range, 4.2–8.2) mL/kg/min, mean dialysate rate was 2637±861mL/h/1.73m^2, and mean effluent rate was 4453±1122mL/h/1.73m^2. No catheter complications were observed. Blood cultures and infection markers were negative during hospitalisation. Twelve patients (80%) were required vasoactive medications. The median 2 (0-4) vasoactive medications were used. The authors' hypothesis was that vasoactive requirements might be associated with hyperammonemia and were compared several parameters with initial plasma ammonia levels. The authors found a significant correlation between initial plasma ammonia levels and Glasgow Coma Scale (p=0.004), paediatric logistic organ dysfunction (p=0.026), and paediatric risk of mortality III score (p=0.006). There was no significant correlation between initial serum ammonia level and vasoactive inotropic score and shock index. The mortality rate was 7.6%, which is low compared with previous studies (Table 1) (1-5).
Conclusion: The authors considered CRRT a safe and effective method in the treatment of hyperammonemia. Furthermore hyperammonemic catabolic patients frequently developed circulatory failure and should be followed closely for requirement to vasoactive medication therapy.

P61 - THE LONG AND SHORT OF PAEDIATRIC CONTINUOUS RENAL REPLACEMENT THERAPIES

Lawlor.M. Bentley.G.
Paediatric Intensive Care Unit in the Children's University Hospital, Temple Street 2015.

Introduction: The aim is to review the profile of patients who had some form of renal therapy i.e. CVVH, CVVHDF, TPE and PD performed in the last six years in our unit.
It will compare the relative number of patients receiving pCRRT.
It will review the utilization of pCRRT in comparison to clinical indications for the patient.
It will compare the type, length of treatment and outcomes from the various methods of treatment.
Method: This is a single centred six year retrospective study. Data was collected on all admissions into the unit on the Paediatric Intensive Care Audit Network (PICANet) and Intelliview Clinical Information Portfolio (ICIP) systems (2011-2014). Prior to electronic data collection data was collected by chart review.
Findings: There were a total of 61 children treated with CRRT from 2008-2014. This data highlighted a year-on-year increase in the number of CVVH runs and total run times. To accommodate this increase in demand there was a corresponding increase in training and educating of nursing staff.
Indications for treatments included sepsis, HUS, ESRF, Auto Immune conditions, metabolic conditions ARF and failed renal transplant The data indicated an increase in treatment of certain patient profiles i.e. sepsis.
Conclusion: Increases where observed in predicted renal therapies. There was a corresponding increase in competent trained nurses.
The data reflects a change in the septic patient profile. Proactive intervention was occurring in comparison to reactive intervention. This has resulted in changes in standard treatments of sepsis in our unit.

P62 - WHAT IS THE BEST VASCULAR ACCESS SITE FOR CONTINUOUS RENAL REPLACEMENT THERAPY DURING NEONATAL PERIOD?

D. Demirkol, M. Buyukpastırmacı, B.N. Karacabey, F. Aygün, C.A. Zeybek
Koç University School of Medicine, Davutpaşa Cad., No: 4, Topkapı, 34010, Istanbul, TURKEY

Introduction: Acute hyperammonemia is a medical emergency requiring treatment. Hyperammonemia resistant to medical therapies can be properly managed by CRRT. It may be difficult to achieve appropriate vascular access for CRRT especially in neonates. In this article, we aim to discuss the effectiveness of using umbilical artery and vein in neonates for CRRT with the use of fully integrated CRRT machines.
Cases: Term, newborn girl (gestation 39weeks, birth weight 3.3kg) at postnatal day four and preterm, newborn girl (gestation 36weeks, birth weight 2.2kg) at postnatal day two were admitted to PICU because of hyperammonemic coma resistant to medical therapies. The ammonia concentration was 1267μmol/L and 2342μmol/L, respectively. We inserted in the first case 7F catheter in the umbilical vein and 5F catheter in the umbilical artery and in the second case the 5F catheters in the umbilical vein and artery. The hemodiafiltration with the use of fully integrated system was started. In the first case serum ammonia concentrations decreased continuously to 333μmol/L at the six hours and 158μmol/L at the twelve hours of hemodiafiltration. The hemodiafiltration was stopped at the 16th hours of treatment. She was diagnosed as citrullinemia. In the second case serum ammonia concentrations decreased gradually to 1724μmol/L at the 6hours, 1025μmol/L at the 12hours, 625μmol/L at the 24hours of hemodiafiltration and 207μmol/L at the 48hours. The hemodiafiltration was stopped at the 48th hours of treatment. She was diagnosed as carbamoyl phosphate synthetase deficiency. No complication was developed.
Conclusion: The accesses for CRRT can be achieve via umbilical artery and vein in neonates less than 3.5kg even with the use of fully integrated CRRT machines.

P63 - CRRT <10kg: Challenges and outcome

Kukreja PD, Kampfen S, Mok Q

Background : Continuous renal replacement therapy is an important supportive therapy for critically ill children with AKI. CRRT in smaller children is technically challenging. We describe the experiences of children weighing below 10kg undergoing CRRT in our paediatric intensive care unit over a 6year period between 2008-2014
Methodology: This was a retrospective single-centre study in children<10kg treated using CRRT at the PICU at Great Ormond street Hospital ,London . The primary end point was death/survival at PICU discharge .The secondary data collected to determine the incidence of complications related to the technique and their relationship with patient characteristics, clinical severity, need for vasoactive drugs and mechanical ventilation, and the characteristics of the filtration techniques.
Results and observations: Demographic clinical and laboratory variables were summarized by standard descriptive statistics. 72 admissions <10kg required CRRT during the study period. Overall survival was 62%. Patients weighing <5kg had 1.6 times higher odds of death than above 5kg (0.44-5.03, p0.5). The worst survival (33%) was seen amongst patients with a haemato-oncological diagnosis. Median patient age was 90days (IQR 11-390), weight 5.1kg (3.2-8.5). Median FO% at the time of CRRT initiation was 3.38% in survivors versus 10.85% among non survivors (p=0.05). Patients with Inotrope use prior to commencing CVVH had 5.6 times higher odds of death than those without (95% CI 1.075-29.4, P<0.05)
Conclusion: Fluid overload and inotrope use prior to CRRT initiation is associated with mortality

P64 - CONTINUOUS RENAL REPLACEMENT THERAPY: MAINTAINING SKILLS AND KNOWLEDGE IN A LOW VOLUME HIGH ACUITY PICU

E. K. Beckingham[1] and S. S. Ganu[1,2].
[1] *Women's and Children's Health Network SA Australia,* [2]*University of Adelaide Australia*

Paediatric continuous renal replacement therapy (CRRT) is recognized as a complex, high risk therapy that requires significant expertise. Furthermore to maintain these skills and knowledge individual staff need to have sufficient exposure to caring for these patients requiring this invasive therapy.
The Women's and Children's Health Network Paediatric Intensive Care Unit (WCHN PICU) in Adelaide, South Australia admits less than 7% of the total PICU Admissions in Australia and New Zealand. Of these admissions less than 1% will require CRRT. The frequency of CRRT use can vary widely between 2 to 10 patients per calendar year(ANZPIC Registry 2015). At times, there was interval of 9months between consecutive patients requiring CRRT.
Literature suggests that knowledge can be achieved through both theoretical and clinical experience. Theoretical knowledge can generally be easily accessed and readily available to learners in many formats such as didactic learning, e-Learning and problem based learning. However gaining clinical experience in a procedure or providing best practice care can be more difficult, especially if the exposure to these is infrequent due to a small and diverse patient population.
This poster will focus on the multi-layered continuing education programme, including high fidelity simulation that has been developed to ensure that Registered Nurses are adequately trained to care for these low volume high acuity patients within our PICU.
(*ANZPIC Registry 2015: Australia New Zealand Paediatric Intensive Care Registry)

P65 - CONTINUOUS RENAL REPLACEMENT THERAPY IN CRITICALLY ILL CHILDREN RECEIVING EXTRACORPOREAL MEMBRANE OXYGENATION

P.L. Koh[1], Y.W.P. Lau[1], S.G. Goh[2], G. MacLaren[2]
[1]*Khoo Teck Puat-National University Children's Medical Institute, National University Health System, Singapore,* [2]*Department of Cardiac, Thoracic and Vascular Surgery, National University Hospital, Singapore*

Introduction: Children receiving extracorporeal membrane oxygenation (ECMO) are at risk of acute kidney injury (AKI) and fluid overload (FO). AKI and FO are associated with increased mortality. Continuous renal replacement therapy (CRRT) is important in the management of AKI or FO. The aim of this study was to review the outcome of patients in our paediatric intensive care unit (PICU) who received CRRT during ECMO during a 3-year period.
Methods: We conducted a retrospective review of patients who received CRRT during ECMO between January 2012 and December 2014. The primary outcome was PICU mortality.
Results: Twenty ECMO runs were conducted in 18 patients. Six patients (33%) received concurrent CRRT (aged 1day – 17.4years). Primary indication for ECMO was cardiac failure in 2 patients and respiratory failure in the others. Diagnoses were heterogeneous and included myocarditis, congenital heart disease, acute respiratory distress syndrome (ARDS) and congenital diaphragmatic hernia. All patients received veno-arterial ECMO. Primary indication for CRRT was AKI in 4 patients and FO in 2 patients. CRRT was provided by a dedicated machine connected to the ECMO circuit. Complications included bleeding, bacteraemia and haemolysis. Four patients died on ECMO after a median of 19.5days and CRRT median duration of 6.5days. One patient was successfully decannulated off ECMO after 16days, and renal function recovered, but died 1month later. There was only 1 survivor who received 8days of ECMO for ARDS and CRRT for 18days. She had full renal recovery. PICU mortality in the CRRT/ECMO patients was 83% compared to mortality of 58% in patients who received ECMO but did not receive CRRT.
Conclusion: In this small retrospective study, mortality was high in the patients who received concurrent CRRT and ECMO. This is likely due to the higher degree of disease severity in these patients.

P66 - IRON REMOVAL IN TRANSFUSION-ASSOCIATED IRON OVERLOAD WITH DEFEROXAMINE AND RENAL REPLACEMENT THERAPY (HDF) IN A PATIENT WITH END-STAGE RENAL DISEASE (ESRD)

S. Rödl[1]; H. Hubmann[1]; R.Ulreich[1]; I. Marschitz[2]; N. Hofer[1]; C. Cimenti[1]; G. Grangl[1]; G. Zobel[1]
[1]*Pediatric Intensive Care Unit, Department of Pediatrics, Medical University of Graz, Austria.* [2]*Department of Pediatrics, Paracelsus Medical University of Salzburg, Austria*

Introduction:
Transfusion-dependent patients receive 200mg of iron with each erythrocyte concentrate. Iron accumulation contributes to morbidity and mortality in these patients. Deferoxamine has a high iron-binding-capacity and enables the renal removal of iron. This therapy is recommended after 10 to 25 transfusions or in case of a ferritin level higher than 1000ng/ml. Data on iron removal in ESRD patients by means of the Prismaflex HF 1000 in conjunction with Deferoxamine treatment are not available yet. We report on a successful iron removal in a hematooncological patient with ESRD and extensive iron overload by using Deferoxamine and HDF with a Prismaflex® device and the .Prismaflex® HF1000 set.
Patient and Methods: A 10year old patient after bone marrow transplantation and a complicated course with microangiopathic hemolytic anemia and ESRD and a history of a transfusion requirement of 100 cumulative packed red blood cells was treated in our pediatric intensive care unit from 11/2013 to 02/2014. Iron overload has been verified by MRI and histologically. The ESRD was treated with HDF with Prismaflex® HF1000 sets. The iron overload was treated with 75mg/kg Deferoxamine, administered before each HDF. This water-soluble complex was removed by HDF.
Results: The total amount of iron to be eliminated was calculated 20g. At start of HDF supported with chelating therapy, plasma ferritin was 32280ng/ml. The achieved iron clearance averaged 23.8ml/min (3.2-52.3), the middle iron elimination was 8.1mg/h (0.84-19). Mean creatinine clearance was 47.4ml/min (93.3-16.2) urea clearance 68.3ml/min (96.2-33.8). At the end of treatment period Ferritin was decreased to 3873ng/ml.
Conclusion: The measured iron levels in the course of HDF, in combination with decreasing ferritin marked a decrease of the total body iron. We show that iron removal by Prismaflex® HF 1000 set and Deferoxamine is efficient.

P67 - TANDEM TREATMENT OF PLASMAPHERESIS AND HEMODIALYSIS WITH CITRATE ANTICOAGULATION IN CHILDREN

S. Rödl[1]; R.Ulreich[1]; I. Marschitz[2]; N. Hofer[1]; H. Hubmann[1]; C. Cimenti[1]; G. Grangl[1]; G. Zobel[1]
[1]*Pediatric Intensive Care Unit, Department of Pediatrics, Medical University of Graz, Austria,* [2]*Department of Pediatrics, Paracelsus Medical University of Salzburg, Austria*

Introduction: Immune-mediated diseases with renal failure require treatment with plasmapheresis (PP) and hemodialysis (HD). These techniques are usually applied separately. We describe the details of "tandem" use of both techniques with simultaneous regional citrate anticoagulation (RCA) of HD.

Patients and Methods: Between 2006 and 2015 six patients (weight range 14 to 60kg) were admitted for renal failure and additional indications for PP and were treated with tandem PP and HD. HD was performed using a Prismaflex® device and Prismaflex ST60 or HF1000 sets, respectively. PP was performed by using a Prismaflex® device and Prismaflex PF1000 or PF2000 sets, respectively. For the PP blood was drawn from the HD device after the filter. Both return lines and the calcium substitution were connected via a Y-piece and a stopcock.
The following restrictions were made: the post-dilution was reduced to 5% of the blood flow, the blood flow in plasmapheresis was limited to 70% of the blood flow rate in HD, the plasma filtration was limited to 20% of the blood flow in plasmapheresis and the ionized calcium samples of patients were monitored every 30minutes during tandem therapy.
Results: We performed a total of 101 tandem treatment sessions. None of the patients had disorders due to plasma volume shifts. Electrolyte and acid-base balance were easily controlled by adjustments in HD. There were no episodes of hypotension or systemic bleeding.
Since the Prismaflex® device accepts a positive inlet pressure a standstill of HD stops PP automatically.
During simultaneous PP the need for calcium substitution was 30% higher than in sole HD treatment.
Conclusion: Simultaneous HD and PP reduces treatment time and also enables the RCA on the plasmapheresis treatment. By HD both a metabolic balance and a volume correction is possible. In addition, this treatment reduces the risk of systemic bleeding during plasmapheresis.

P68 - INITIAL HIGH VOLUME TREATMENT OF HYPERAMMONAEMIA IN NEONATES WITH PRISMAFLEX HF20 SETS

S. Rödl[1]; R.Ulreich[1]; C. Cimenti[1]; W. Radauer[2]; I. Marschitz[2]; N. Hofer[1]; G. Grangl[1]; H. Hubmann[1]; G. Zobel[1]
[1]Pediatric Intensive Care Unit, Department of Pediatrics, Medical University of Graz, Austria, [2]Department of Pediatrics, Paracelsus Medical University of Salzburg, Austria

Introduction: Hyperammonaemia is a rare but potentially life-threatening complication of several metabolic disorders in neonates. An early and effective elimination of ammonia is essential in order to prevent neurological damage.
The Prismaflex® device with the Prismaflex® HF 20 set is suitable for the treatment of infants including neonates. However, up to date, no data exist on its use for ammonia clearance in this age group.
Methods: We report on three patients with neonatal hyperammonaemia treated with hemodiafiltration (HDF).
Three neonates born at term and aged 2 to4 days (current weight 2.7 to 2.9kg) were admitted to our paediatric intensive care unit for hyperammonaemia. All had clinical signs of acute metabolic encephalopathy. All patients were treated with conventional therapy (amino-acid-free and high caloric diet, sodium benzoate, l-arginine, l-carnitine) and with high volume HDF by using Prismaflex® HF 20 sets.
Underlying diagnoses were propionic acidaemia, CPR-1-deficiency, and NAGS deficiency.
Results: Ammonia levels at start of HDF were 512, 588, and 2880μg/dl, respectively and 42, 26, and 506μg/dl, respectively after HDF. Mean blood flow was 11.1ml/kg/min (range 17.9 to 10.7), mean dialysate flow was 200.8ml/kg/h (35.7 to 642.9). Mean ammonia clearance was 12.1ml/min (2.4 to 24.9). Ammonia clearance and decline of blood ammonia levels correlated to the blood and dialysate flow.
Two patients were discharged without major neurological defects and with a specific long term therapy. In the patient with NAGS deficiency who had the highest ammonia levels prior to HDF, therapy including HDF was withdrawn because of severe cerebral damage.
Conclusion: The Prismaflex® HF 20 set allows effective elimination of ammonia by the use of initially high blood and dialysate flows. The fast and effective clearance might prevent long-term neurological damage. The Prismaflex® device in combination with the HF20 set worked well in neonates <3kg.

P69 - LONGTERM EXPERIENCE OF AUTOMATIC REGIONAL CITRATE ANTICOAGULATION IN PEDIATRIC PATIENTS IN RENAL REPLACEMENT THERAPY

S. Rödl[1]; H. Hubmann[1]; N. Hofer[1]; R.Ulreich[1]; I. Marschitz[2]; C. Cimenti[1]; G. Grangl[1]; G. Zobel[1]
[1]Pediatric Intensive Care Unit, Department of Pediatrics, Medical University of Graz, Austria; [2]Department of Pediatrics, Paracelsus Medical University of Salzburg, Austria

Introduction: Regional citrate anticoagulation (RCA) is a standard procedure in renal replacement therapy (RRT) in adults. In pediatric patients this procedure is complicated by the need for frequent laboratory controls and separately regulated external infusion pumps.
The Prismaflex® device with the software version 5.0 or higher supports automatic RCA in all available filter sets with automatic dosing of citrate and calcium.
Patients and Methods: From 9/2010 to 4/2015 22 patients (weight range 3-50kg) were admitted to our PICU for RRT due to acute or chronic renal failure (ARF or CRF). Prismaflex® device (software version 5.0 or 6.10) was used together with the HF 20, ST 60, and HF 1000 filter sets.
For RCA we used 47.5mmol/L trisodiumcitrate. Prism0CalB22 or Prism0Cal were used as calcium-free dialysate solution and Phoxilium as post-dilution replacement fluid. Calcium replacement was done with a 10% calcium gluconate solution (0.223 molar).
Results: In 17 patients with ARF CRRT was performed for a total of 2000hours and in 10 patients with CRF intermittent RRT was performed in 1700 sessions.
All solutions contain physiological concentration of electrolytes (except calcium) to avoid metabolic imbalances. Sodium concentration is isotonic in all solutions. All solutions are compatible with the entire range of flow rates. The flow rate of calcium replacement is calculated by the Prismaflex® software according to percentage of calcium loss. Phosphate is mainly eliminated by filtration and substituted by the replacement fluid.
Conclusion: The combination of RCA by using a sodium isotonic citrate solution with a citrate concentration of 47.5mmol/L and Prism0CalB22 or Prism0Cal respectively as dialysate fluid is well compatible with all pediatric Prismaflex® sets without limitations regarding flow rates. Stable electrolyte concentrations and acid-base balance are achieved in both continuous and intermittent RRT.

P70 - ACYCLOVIR CRYSTALLURIA: THE UTILITY OF BEDSIDE URINE ROUTINE MICROSCOPY

Authors: P.Jain, R. Ramesh Kumar, S.Mahadevan
Department of Pediatrics, JIPMER, Puducherry, India.

Introduction: *Acyclovir* can cause crystalluria though it is an uncommon side effect of commonly used drug. Urine sediment examination has important clinical implications in a large spectrum of diseases. We highlight the utility of art and science of urine microscopy.
Case summary: A seven year old boy was brought to the ED with history of fever for 3days and altered sensorium for 1day. On examination, child had features of raised ICP. Possibility of acute febrile encephalopathy was considered. He was empirically started on IV Ceftriaxone and IV Acyclovir (30mg/kg/day). On day 3, his urine became cloudy and full of grossly visible crystal aggregates. Urinary microscopy revealed abundant, transparent and fine needle shaped crystals. This macroscopic and microscopic picture of urine suggested acyclovir crystalluria to be the most likely

diagnosis. The drug was stopped and adequate hydration ensured to maintain adequate urine output. Renal function tests were normal. Urine was clear of crystals within twelve hours.
Conclusion: Acyclovir induced crystalluria occurs especially when given intravenously at high dosages and to dehydrated patients. (1). Acyclovir crystals in urine give a silky and opalescent macroscopic appearance. Acyclovir crystalluria may be asymptomatic or it can also cause acute renal failure (2). Recent literature on urine sediment examination shows that it has important implications in large spectrum of diseases. Therefore, it should be widely used by clinicians. Timely recognition and prompt intervention can prevent drug-induced nephrotoxicity.
References: 1. Fleischer R, Johnson M. Acyclovir nephrotoxicity: a case report highlighting the importance of prevention, detection, and treatment of acyclovir-induced nephropathy. *Case Report Med*. 2010; 2010.pii:602783
2. Fogazzi GB. Crystalluria: a neglected aspect of urinary sediment analysis.Nephrol Dial Transplant 1996; 11: 379–387

P71 - CLINICAL PROFILE AND OUTCOME OF PACIENTS RECEIVING VENOVENOUS RENAL REPLACEMENT THERAPY IN A TERTIARY PEDIATRIC INTENSIVE CARE UNIT

A.R.F.B.Queiroz[1], L.L.Pimentel[1], J.L.L.Soutinho[1], G.Baldanzi[2], A.Watanabe[1], V.H.K.Koch[1]
[1] Pediatric Nephrology Unit – Instituto da Criança - University of São Paulo, HC-FMUSP,Brazil, [2]Pediatric Intensive Care Unit – Instituto da Criança - University of São Paulo, HC-FMUSP,Brazil

Introduction: The need for renal replacement therapy (RRT) in patients in pediatric intensive care unit (PICU) is variable according to the severity of patient condition, and it has been related to high mortality, and to residual renal lesions in the survivors.
Methods: Retrospective analysis of patients on RRT in a tertiary PICU. Period: September 2014 - February 2015. Collected data: patient demographics, underlying diseases, organ dysfunctions, infections, RRT modality, mortality, length of hospital stay and presence of residual renal lesions at discharge. Continuous veno-venous hemodiafiltration (CVVHDF) and intermittent hemodialysis (IHD) were performed in patients with peritoneal dialysis failure or contraindications, and CVVHDF was chosen for patients with hemodynamic instability and/or liver failure.
Results: RRT was performed in 28 patients of 120 (23%) admissions.Gender: 18/28(64%) males. Mean age: 93 mo (7-210mo). Reasons for PICU admission: severe sepsis/septic shock: 9/28(32%), post kidney transplant: 2/28(7%), post liver transplant/liver failure: 6/28(21%), indication of RRT: 2/28(7%), other causes: 9/29(32%). All patients had chronic diseases: oncological: 7/28(25%), kidney/urological: 8/28(28,5%), hepatic:10/28(35,7%), others: 3/28(10,7%). RRT indication: fluid overload:16/28(57%), uremia: 5/28(17%), metabolic/electrolytic disorders: 4/28(14%).Initial RRT modality: peritoneal: 3/28 (11%), CVVHDF: 21/28(75%) and IHD: 4/28(14%). Average time on CVVHDF: 13days (1-49). Positive blood cultures: 22/28 patients: 15/22(68%) multidrug-resistant Gram negative bacilli. RRT mortality: 39.2%(11/28); mortality of patients on vasoactive drugs and mechanical ventilation: 64.3%(9/14). Time of survivors stay: 66.5days (13-171d). Previous chronic kidney disease (CKD): 6/17(35,3%).Residual renal lesions in no CKD patients: systemic arterial hypertension: 6/11(54.5%), proteinuria: 3/11(27%), hyperfiltration (GFR 122,8-480mL/min/1.73m^2): 8/11(72%) and electrolyte disorder: 8/11(72%).
Conclusion: High incidence of RRT was observed in patients admitted to PICU during that period. The initial modality in most patients was CVVHDFdue to severity of cases, with high mortality. Residual kidney lesions were common on survivor's discharge, and these patients should be prospectively followed.

P72 - Incidence of Acute Renal Failure and CRRT use in a Paediatric Burns intensive care unit

Radha Sabaratnam[1], Rebecca Martin[1], Emma Borrows[2], Dilshan Arawwawala[1], Harish Bangalore[2]

Introduction: To assess the incidence of acute renal failure using paediatric RIFLE criteria and the use of CRRT in significant burns and medical skin loss conditions in one burns intensive care unit over 5years.
Methods: All patients <16yrs admitted to burns ICU over a five year period were included. Paediatric RIFLE criteria (1) applied using maximum creatinine measured during admission. Patients requiring CRRT were identified. Case notes reviewed to identify indication, duration of therapy, nephrotoxic drugs, presence of sepsis, complications related to CRRT.
Results: 115 Patients included in analysis from 142. Mean length of stay 10.3days. Mean percentage burns or medical skin loss was 33%. The incidence of acute kidney injury was 15.7%, Risk category 10.4%, Injury category 3.4%, Failure 1.7%. Three patients (2.1%) required CRRT, one had 100% TENS (age 11, Risk), one had 90% burns (age 3, did not survive, Injury), one had 45% burns (age 8months, Risk). Indications: hyperkalaemia, pulmonary oedema, severe acidosis. Mean duration of CRRT was 8days. All were exposed to nephrotoxic drugs, all had severe sepsis. No complications specifically related to the CRRT.
Discussion: CRRT is rarely required in paediatric burns/medical skin loss patients but was related to significant morbidity and mortality in one case. The overall incidence of acute kidney injury is significant in this population but lower than previous similar studies (2).
References: 1. Modified RIFLE criteria in critically ill children with acute kidney injury, A Akcan-Arikan et al, *Kidney International* (2007) **71**, 1028–1035.
2. An assessment of acute kidney injury with modified RIFLE criteria in pediatric patients with severe burns, Palmieri et al,Intensive Care Med. 2009 Dec;35(12):2125-9

P73 - CISPLATIN NON-OLIGURIC ACUTE KIDNEY INJURY PEDIATRIC EXPERIMENTAL MODEL IN PIGS

M.J. Santiago[1], A. Lázaro[2], S.N. Fernández[1], J. López-Herce[1], J. López[1], J. Urbano[1], R. González[1], M.J. Solana[1], B. Toledo[1]
[1]PICU Hospital General Universitario Gregorio Marañón. [2]Nephrology Department. Biomedical Research Foundation. Hospital General Universitario Gregorio Marañón, Madrid, Spain.

Introduction: Developing a non-oliguric pediatric animal model of acute renal injury (AKI) could be useful to study the evolution of diuresis after treatments. Cisplatin causes a dose-dependant poliuric renal failure in humans. A dose of 5mg/kg has been used in rats to produced AKI but there are no studies in pigs.
Objective: To design an experimental pediatric animal model of acute kidney injury with cisplatin.
Methods: Acute kidney injury was induced with three different intravenous doses of Cisplatin (2, 3 and 5mg/kg) and two different periods of time between administration and evaluation (2 and 4days) were studied. Urine and blood samples were collected. Renal anatomy was measured to assess renal damage. In the second phase, analytical values and renal anatomy in 15 piglets treated with 3mg/kg of cisplatin was compared with 15 control piglets.
Results: The dose of 3mg/kg administered 48hours before the experience induced a significative increase in creatinine and urea without severe hyperkalemia.
A very severe oliguric AKI with extremely high hyperkalemia was observed four days after a 3mg/kg dose and 3days after a 5mg/kd dose.

Piglets treated with cisplatine 3mg/kg had significantly higher values of cretinine, urea, phosphate and amylase and lower values of diuresis, potassium, sodium and bicarbonate than control piglets. Histologically, renal damage was dose-dependent. Cisplatin 5mg/kg and 3mg/kg showed strong evidence of damage in comparison with 2mg/kg.
Conclusions: A dose of 3mg/kg of intravenous cisplatin induces non-oliguric AKI after 48hours in piglets. This dose and interval can be used for toxic pediatric animal models of AKI.

P74 - AN UNUSUAL CASE FOR CRRT

Gafencu Mihai[1,2], Camelia Daescu[1,2], Teofana Bizerea[1,2], Adrian Lungu[1,2], Gabriela Doros[1,2]
[1]University of Medicine and Pharmacy "Victor Babeş" Timişoara, [2]Children's Emergency Hospital "Louis Ţurcanu" Timişoara, [3] Clinical Institute Fundeni, Bucharest

Introduction: CRRT is an option for acute cases or particular situations. The use of this procedure can be a temporary solution for other special categories of patients. The aim of this case presentation was to focus on the possibility of using for short time the CRRT in pediatric patients with cardiovascular special features, as an alternative to HD.
Case summary: We want to present a case - G.C., female, age 9years and 6months, admitted with Stage V chronic kidney disease (CKD), on hemodialysis (central venous catheter); Bilateral cystic renal dysplasia; Anemia; Renal bone disease; Secondary hyperparathyroidism; 21-hydroxylase deficiency (Prader III); Delayed growth and Epilepsy. The patient, preterm, small for gestational age, known with adrenogenital syndrome from neonatal period by 21-hydroxylase deficiency (karyotype 46, XX). At 2months of age, the diagnosis of right multicystic renal dysplasia and and left renal hypoplasia was established. After 1year, following investigations for myoclonic seizures the patient was diagnosed with convulsive syndrome. Evolution was progressive towards CKD with associated complications. At the age of 4years (stage V) peritoneal dialysis was initiated (GFR less than 15mL/min). In the 4th year of peritoneal dialysis, the girl developed recurrent peritonitis. At 8years of age it has been decided to shift the patient on HD. Determined by the instability of the vascular bed translated by important blood pressure oscillations as well as one episode of cardiac arrest due to hypovolemia in the first minutes of HD, Continuous Renal Replacement Therapy was taken into consideration as an alternative approach of the case. The evolution of our patient on CRRT (twice per week, 6hours) was excellent.
Conclusion: In situation of small pediatric or instable cases in a hospital without practice and special training in HD for little kids, CRRT is a actual alternative for short time, in spite of the costs.

P75 - CONNECTION TO CONTINUOUS RENAL REPLACEMENT THERAPIES: HEMODYNAMIC REPERCUSSION IN A PEDIATRIC ANIMAL MODEL.

Sarah Nicole Fernández Lafever, Maria José Santiago Lozano, Jorge López González, Rafael González Cortés, Maria José Solana García, Javier Urbano Villaescusa, Blanca Toledo del Castillo, Jesús López-Herce Cid.
Pediatric Intensive Care Unit. Gregorio Marañón University Hospital. Madrid. Spain.

Objectives: To analyze hemodynamic repercussion of continuous renal replacement therapies in an experimental pediatric animal model.
Material and methods: Prospective experimental study in minipig piglets betwen 2 and 3months of age and 9-11kg. Piglets were monitored, anesthetized, intubated, central arterial and venous lines were inserted using a PICCO catheter system and a flow meter was placed on the left renal artery. Continuous veno-venous hemodiafiltration (CVVHDF) using a 0.2m^2 filter was started at a blood flow of 20ml/min and it was increased by 10ml/min every minute until the goal blood flow of 5ml/kg/min was reached. Hemodynamic parameters and renal flow parameters were registered at baseline (before the connection to CVVHDF) and at 5, 15 and 30minutes. Data were analyzed using the SPSS 20.0 program. Significant p <0.005. Confidence intervals of 95%.
Results: 34 piglets were analyzed. A significant decrease in systolic (13.93 +/- 5.12mmHg), diastolic (12.8 +/- 3.98mmHg) and mean (13.93 +/- 4.06mmHg) arterial blood pressure, cardiac index (CI) (0.23 +/- 0.18l/min/m2) and peripheral vascular resistance (PVR) (151.78 +/- 112.5dyn/seg/cm^5) were observed during connection. Gradual recovery of such parameters was observed at 15 and 30minutes after connection (difference between mean arterial blood pressure at baseline and at 30minutes: 6.15 +/- 5.04). No significant differences were observed in renal blood flow or in the intrathoracic volume index).
Conclusions: Progressive connection to CVVHDF produced a statistically but not clinically significant decrease in arterial blood pressure, CI and PVR with partial recovery of these parameters at 30minutes.

P76 - PLASMA EXCHANGE - WHEN IS ENOUGH ENOUGH?

G.Bentley, A. Fennell
Temple St Children's University Hospital TSCUH

Introduction: The aim of this poster is to review and present two case studies which were diagnosed and treated with therapeutic plasma exchange (TPE) for Acute Transverse Myelitis (ATM) in our paediatric intensive care unit (PICU). In this retrospective study, we compare patients who received a number of different treatments to identify the most effective therapies.
Acute transverse myelitis is a clinical syndrome affecting the spinal cord, which is characterized by acute onset of motor, sensory, and autonomic dysfunction. Approximately 20% of cases of acute transverse myelitis occur in children. (J Child Neurology, 2012)
Correct diagnosis is important for treatment and prognosis. Treatment begins with intensive surveillance for acute life-threatening respiratory or autonomic complications, providing ventilator support in an intensive care setting as necessary. Immuno suppressive therapy is recommended, using high-dose intravenous corticosteroids, immunoglobins and TPE.
Case summary: If clinical improvement does not begin or symptoms are worsening within 24 to 48hours of beginning corticosteroid treatment, consideration should be given for initiation of plasma exchange therapy, especially for longitudinally extensive transverse myelitis. A recent evidence-based guideline on the utilization of plasma exchange in the treatment of neurological diseases noted a single study with class II evidence for effectiveness of plasmapheresis in fulminant demyelinating conditions. (Wolf &Ludo 2012) At the authors' institution, we will typically perform anything from 5 - 14 exchanges of 1 – 1.5 plasma volumes per session
For the purpose of this review TPE, will be discussed at length and how many treatments/ sessions were completed, thus trying to conclude when is enough enough? In doing so it will describe and demonstrate how each patient received TPE, varying from 7 sessions consecutively, followed by alternate days in patient one verses 14 consecutive sessions in patient two.
Conclusion: Prognosis in children is not clear cut; although most data suggest perhaps as many as 30% to 50% make a full recovery, a significant portion will have residual debilitating motor sequelae. A small percentage of children diagnosed with acute transverse myelitis later are diagnosed with other demyelinating diseases, especially neuromyelitis optica, or multiple sclerosis. The most common long-term complications of acute transverse myelitis are urinary, motor, or sensory dysfunction.

P77 - NON-RENAL INDICATIONS FOR THE CONTINUOUS RENAL REPLACEMENT THERAPY IN THE INTENSIVE CARE UNIT OF TERCIARY CARE CENTER: ELEVEN YEARS OF EXPERIENCE

N. Stajic[1], J. Putnik[1], A. Paripovic[1], M. Djordjevic[1], J. Martic[1], B. Kecman[1], A. Sarajlija[1], K. Pejic[1], D. Prokic[1], J. Visekruna[1], R. Bogdanovic[1]
[1]*Institute for Mother and Child Health Care of Serbia, Belgrade.*

Introduction: Continuous renal replacement therapy (CRRT) had definitely found its place in the management of acute kidney injury (AKI). Non-renal indications for the CRRT are less frequent and sometimes specific technical approach is necessary. Congenital and acquired metabolic diseases and intoxications represent the main corpus of indications for CRRT in patients without AKI.
Methods: We retrospectively analyzed pediatric and neonatal intensive care unit patients in whom CRRT was performed between April 2014, and April 2015. Principal diagnoses as a reason for CRRT were defined and patients with non-renal indications were consider as a group of interest. Besides the diagnose, their basic data were collected (age, body mass and weight, pediatric risk of mortality score II at the admission, beginning of CRRT and at the end of procedure, and outcome)
Results: 144 CRRT patients were analyzed for both renal and non-renal indications. Eighty two of them survived (62%). Non-renal indications for CRRT were found among 32 patients (18 females and 14 males). Their mean age was 58,3±66,3months, 8 of them were newborn, 5 infants and 19 children above 12months and they weighted from 2.3 to 62 (17,8±17,4) kg. Twenty one patient had congenital metabolic disease (maple syrup urine disease 8, hyperamoniaemia 6, Wilson disease 2, isovaleric acidaemia 1, methylmalonic aciduria 1, Sy Pierson 1, tyrosinaemia 1, glycogenosis type Ib). Three patients had suffered of acquired metabolic diseases (lactic acidosis 1, hepatic insufficiency 1, hyperkaliaemia 1). Eight patients were intoxicated by exogenous toxins (fungal intoxication 3, methotrexate 2, carbamazepine 1, durophillinum 1, multiple drugs 1). Mean PRISM II was 10,63±7.13 at the start, and 4,72±6.75 at the end of CRRT procedure and the difference is highly statistically significant ($p<0.01$). CVVHDF was performed in 21, CVVHD in 3 ant SPAD in 8 patients. Twenty eight patients (87.50%) survived at list 2weeks after the completion of the CRRT procedure. There was no statistical difference between the mean age or sex between survivors and non-survivors. Survivors as it was expected, had significantly lower PRISM II at the start of treatment. Ultrafiltration rate was not statistically different between survivors and not-survivors.
Conclusion:
non-renal indications for CRRT should also have their place in the choice of therapeutic modality especially in patients with congenital metabolic diseases.

P78 - CREATING HIGH LEVEL COMPETENCE IN DELIVERING CONTINUOUS RENAL REPLACEMENT THERAPY

C.A. Peck, S.L. Chamberland
Hasbro Children's Hospital, Providence, Rhode Island, USA

Introduction: A parent's apprehension of having a critically ill child in the pediatric intensive care unit (PICU) is far reaching. Two cases of continuous renal replacement therapy (CRRT) will be described to capture the contrast between a failed attempt to implement and maintain CRRT and a subsequent successful run. Opportunities for improvement were identified resulting in enhancement of our current competency program within the framework of patient and family centered care.
Case summaries: With case one, CRRT with citrate anticoagulation was initiated on a 4year old with acute kidney injury with a small femoral catheter. After multiple attempts, CRRT was abandoned without harm to the patient; however there was a troubling parental perception of staff incompetence and lack of trust. A team consisting of representatives from medicine, nursing, pharmacy, quality and risk was assembled to address concerns within the existing program. Problematic areas included policy and procedure, equipment, documentation, education and resources.
Case two was a 19month old patient with nephrotic syndrome. Feedback and recommendations from the analysis of case one along with consultation from national experts were integrated into the patient's plan of care. Noted differences between case one and case two included heparin anticoagulation, a larger internal jugular catheter, and a deliberate mindfulness of parental presence fostering communication and partnering. After a two week CRRT run, the patient was successfully decannulated and discharged home soon after.
Conclusion: Within a one year time frame, the nurse CRRT competency in the pediatric intensive care unit increased from 23% to 79%. Proficient CRRT nurses worked directly with novice nurses to foster development and ease anxiety. A pediatric specific policy, order set, heparin and blood prime protocols were implemented. The second case reengaged, reenergized and recommitted the staff and ultimately led to an optimal patient outcome and highly satisfied family.

P79 - NURSE DRIVEN ANTICOAGULATION PROTOCOL IN PEDIATRIC CONTINUOUS RENAL REPLACEMENT THERAPY

[1] Maria Happe, [2]Gracious Sarasak, [3]Ayse Akcan Arikan,
[1]*Texas Children's Hospital, Pediatric Intensive Care Unit,* [2]*Texas Children's Hospital, Renal Unit,* [3]*Baylor College of Medicine, Sections of Pediatric Critical Care and Renal*

Introduction: Regional anticoagulation therapy with an anticoagulant citrate dextrose solution (ACD-A) and replacement of depleted serum calcium with intravenous calcium solutions in pediatric patients receiving continuous renal replacement therapy (CRRT) requires stringent monitoring of ionized calcium in both the circuit and patient.
Case summary: CRRT program in our institution is a hybrid model where treatment prescription is done by nephrologists; set-up, initiation, and discontinuation are performed by renal nurses; and ongoing monitoring is done by critical care nurses. Highly skilled bedside nurses in the critical care settings manage the CRRT machine, monitor the patient's response to therapy, and communicate closely with the nephrology team. Historically, communication between bedside nursing providers and renal physicians away from the bedside was required for titration of citrate and calcium infusions in response to ionized calcium levels. This model frequently led to time lapses in communication and delays in adjustment of ACD-A and calcium infusions. Timely and standardized response to out of range ionized calcium levels are necessary to ensure quality therapy and prevent undue patient harm. Implementation of a nurse driven titration of ACD-A and intravenous calcium solutions promotes timely response to altered ionized calcium levels, while still promoting communication between the bedside nurse and nephrology physician. This presentation will describe how one large, free-standing children's hospital successfully implemented a nurse driven titration protocol of ACD-A and calcium solutions in order to further promote safe patient care for patients receiving CRRT.
Conclusion: Nurse driven anticoagulation titration protocol for pediatric CRRT can be rapidly and successfully implemented to optimize treatment safety and efficacy.
Reference: Filippo Mariano, Daniela Bergamo, Ezio Nicola Gangemi, Zsuzsanna Hollo', Maurizio Stella, and Giorgio Triolo, "Citrate Anticoagulation for Continuous Renal Replacement Therapy in Critically Ill Patients: Success and Limits," International Journal of Nephrology, vol. 2011, Article ID 748320, 5 pages, 2011. doi:10.4061/2011/748320

P80 - A NOVEL METHOD OF BLOOD PRIME BUFFERING FOR PEDIATRIC CONTINUOUS RENAL REPLACEMENT THERAPY

Amelia Allstead, Sridevi Devaraj, Jun Teruya, Graciela Gonzalez, Ayse Akcan Arikan

Introduction: Pediatric patients (pts) frequently require blood priming of continuous renal replacement (CRRT) circuits due to relatively large extracorporeal circuit volume (ECV). Banked blood is acidotic and normal saline used to dilute the packed red blood cells (PRBCs) to reconstitute to a physiological hematocrit (Htc 35%) is an additive acid load. Rapid exposure of critically ill pts to acidotic blood could exacerbate hemodynamic instability.
Methods: We describe a novel method to buffer blood by dialyzing the blood in the CRRT circuit. We tested the in vitro buffering of reconstituted expired PRBCs via two different filters, AN69 and PAES. The CRRT machine was set-up and primed per manufacturer's recommendation. After crystalloid priming of the CRRT circuit, reconstituted PRBC bag is connected to access port to simulate the patient's circulating blood, return port is connected to a waste bag. Blood and dialysate pumps are both turned on at the same time and the filter blood primed. PRBCs pH was measured before, 5minutes into, and 10minutes after completion of blood prime for both filters. At the end of the blood priming (7minutes), postfilter pH increased by 0.5 points. Additional step-up times of recirculation for 5, 10, and 15minutes did not impact pH any further.
PRBCs ph levels

Filter	QB	QD	ph(pre,5,10,15min)
M60 (AN69)	30	2000	6.308, 6.622, 6.734, 6.809
HF1000 (PAES)	30	2000	<6.3, 6.889, 6.786, 6.827
HF 1000 (PAES)	20	3000	6.331, 6.974, 6.861, 6.994

Conclusion: The pH of blood prime can be altered by "dialyzing" during priming before patient is connected to buffer acidosis. Since only expired blood with lower pH was used, this experiment needs to be repeated in the clinical setting to ensure adequate buffering before initiating CRRT. Utilizing the CRRT circuit to buffer blood could prevent hemodynamic instability or requirement for bicarbonate exposure during CRRT start.

P81 - BENEFITS OF CONTINUOUS VENOVENOUS HEMODIALYISIS (CVVHD) IN CHILDREN WITH MULTIORGAN SYSTEM DYSFUNCTION (MOSD)

L .S Milner, J Nicoletta
Pediatric Nephrology ,Floating Hospital for Children Tufts University School of Medicine, 800 Washington St ,Box 201, Boston, MA 02111,

Background: The occurrence of MOSD in children with acute kidney injury (AKI) often requires continuous renal replacement therapy (CRRT) for control of fluid balance and biochemical abnormalities and is associated with a poorer outcome. The benefits of using CVVHD, which is a combined convective and diffusive dialysis modality in children with MOSD and severe AKI were evaluated .
Methods: 2 children with MOSD and severe AKI were studied and were divided into 2 groups Group 1 had 4 children with a primary hematologic process (H) and group 2 had 8 who were primarily non hematologic (NH) (2 hemolytic uremic syndrome, 1 metabolic disorder, 4 hepatorenal syndrome , 1 sepsis). CVVHD was initiated for fluid balance and metabolic control and was accomplished with a double lumen femoral or central line using a Baxter 25 or Next Stage dialyzer with bicarbonate dialysate infused at a rate of 0.1- 0.3ml/kg/min with heparin or citrate anticoagulation. Ultrafilitration was determined by fluid balance status
Results: The age range was 3days to 23years and a male: female ratio of 1.8:1. The overall survival for the whole group was 50% .The survival in NH group was 66% and no survivors occurred in the H group.
Conclusions: Beneficial effects of combined convective and diffusive CRRT using CVVHD were seen in children with MOSD without a primary hematologic process. CVVHD is a cost effective CRRT modality for children with severe AKI.

P82 - IMPLEMENTING ELS: A NURSING PERSPECTIVE

Shannon L. Holland.
Texas Children's Hospital, Houston, Texas, USA

Introduction: Excellent patient outcomes are the most significant driving force when evaluating new treatment therapies. Successful hospitals must closely evaluate cost to benefit ratios to ensure program sustainability. For nursing leadership, the most important cost is often related to labor.
Methods: When implementing extracorporeal liver support (ELS) at a large, free standing children's hospital, the Pediatric Intensive Care Unit (PICU) and Renal Dialysis teams looked for new ways to ensure patient care was provided in a timely and safe manner without incurring incremental costs. ELS therapy requires frequent lab draws and frequent titration of medications to maintain hemodynamic stability. Care and communication among team members must be timely and seamless. A core group of PICU nurses had previously been trained extensively in continuous renal replacement therapy (CRRT) and was the most natural group to safely and efficiently manage patients receiving ELS.
Results: Successful therapy with multiple patients has resulted in positive outcomes, and nursing personnel costs have not increased. The nursing hours spent directly with the patient increased dramatically while the patient is on ELS, yet the nurse to patient ratio did not change.
Conclusion: The organization continues to evaluate innovative ways to utilize renal and hepatic therapies to maximize patient outcomes while maintaining a positive financial outlook.

P83 - A RETROSPECTIVE ANALYSIS OF THE RENAL OUTCOMES IN ALL CHILDREN WHO RECEIVED CONTINUOUS VENO-VENOUS HAEMOFILTRATION (CVVHF) BETWEEN 2008 AND 2014 IN A QUARTERNARY PAEDIATRIC INTENSIVE CARE UNIT(PICU). IS THERE AN UNMET NEED FOR TERTIARY FOLLOW UP?

N. Perry[1], S. McDonald[1], L. MacFarlane[1], C. Kidson[1,2]
[1]Paediatric Intensive Care, Royal Hospital for Sick Children, Glasgow, UK; [2]Faculty of Medicine, University of Glasgow, Glasgow, UK

Introduction: Children who have received CVVHF in the PICU have a high mortality and renal morbidity. Those who survive to discharge and do not have a primary renal diagnosis are less likely to receive tertiary renal follow up despite having a period of time on full renal support within PICU.
Methods: Using the departments Clinical Information System database all patients who received CVVHF were identified and their profiles analysed retrospectively for mortality , estimated creatinine clearance(EstCrCl) and clinical outcomes following PICU discharge.
Results: Of the 89 children who received CVVHF during the study period 45% survived to discharge. Only 35% of the survivors were followed up by a nephrologist and 80% of this cohort had a primary renal diagnosis. EstCrCl using the Cockcroft Gault equation was calculated at admission, commencement of CVVHF and discharge for each surviving patient, the averages of these respectively were 36, 25 and 58mL/min respectively in all survivors and 37, 77 and 78mL/min in children who were not followed up.

Conclusion: Data on the long-term sequelae of CVVHF is limited. It is increasingly felt any episode of acute kidney injury (AKI) may be associated with future chronic kidney disease (CKD). Although our data shows an average improvement in EstCrCl at discharge the levels remain low. This suggests a need for prospective studies of this high risk group to determine the incidence of CKD development and to allow for earlier intervention.

P84 - PERCENTAGE FLUID OVERLOAD AND TIME TAKEN TO COMMENCE CONTINUOUS VENO-VENOUS HAEMOFILTRATION (CVVHF) ARE PREDICTORS OF MORTALITY; A RETROSPECTIVE DATA REVIEW FROM 2008 TO 2014 AT GLASGOW'S ROYAL HOSPITAL FOR SICK CHILDREN.

N. Perry[1], S. McDonald[1], L. MacFarlane[1], C. Kidson[1,2]
[1]*Paediatric Intensive Care, Royal Hospital for Sick Children, Glasgow, UK;* [2]*Faculty of Medicine, University of Glasgow, Glasgow, UK*

Introduction: In the critically ill child the initial kidney insult is often not preventable or predictable. Focus often turns to secondary prevention methods: recognition of the at risk patient, avoidance of nephrotoxins and maintenance of renal perfusion traditionally with a combination of inotropes and fluid. Recent studies have demonstrated that higher percentage fluid overload (>20%) at time of commencing renal replacement therapy (RRT) is associated with increased mortality. Therefore judicious use of fluid and earlier RRT intervention may be advocated
Methods: Using the departments Clinical Information System (Metavision) database all patients who received CVVHF were identified and their profiles analysed retrospectively for degree of fluid overload and time from admission to commencement of RRT.
Results: Retrospective analysis of the 89 patients who received CVVHF over a 7year period found a small survival bias in cases where initial fluid overload was low with an average fluid overload in survivors of 8.9% versus 15.2% in those children who subsequently died during their admission. For both the surviving and non-surviving patients, delayed commencement of CVVHF was associated with increased fluid overload while those who survived commenced CVVHF on average 61hours prior to those who succumbed. Highest mortality was found in fluid overload cases greater than 10%.
Conclusion: Early RRT intervention may avoid toxic high dose medication, protect against cumulative fluid overload and promote survival benefit in children who have sustained a significant acute kidney injury.

P85 - CONTINUOUS RENAL REPLACEMENT THERAPY IN PEDIATRIC PATIENTS AT THE HOSPITAL INFANTIL DE MÉXICO FEDERICO GÓMEZ

M. Del Villar –Vilchis*, L. Velazquez Jones, S. Valverde Rosas, I. Del Moral
Pediatric Nephrology, Hospital Infantil De México Federico Gómez Mexico City, Mexico

Introduction: Continuous renal replacement therapies (CRRT), are effective for the management of patients with hemodynamic instability and acute kidney injury.
Methods: A retrospective, cross-sectional study. We obtained records of 16 patients, that were reviewed from May 1th 2013 to July 31th 2014, in pediatric intensive care unit (PICU).
Results: The study includes 16 patients, 8 men and 8 women. Their ages were 7/12 - 8years (median 8). Registered weight was 7.6 to 60kg (median 23.7kg). All the patients received aminergic and/or vasopressor and all were mechanically ventilated. The primary causes of Acute Kidney Injury (AKI) were: cardiovascular surgery, oncologic urgencies, septic shock, nephrotic syndrome.
The indications for starting the administration of CRRT were oligoanuria, fluid overload, and metabolic acidosis. The CRRT modalities used: venous-venous hemofiltration in 9 patients (60%), venous-venous hemodiafiltration 2 patients (13%), both in 4 patients (27%). All with fluid replacement and prefilter replacement rate: 20ml/min 14 patient (87.5%), 45ml/min 1 patient (6.25%), and 70ml/min 1 patient (6.25%).
All with fluid replacement and prefilter replacement rate: 20ml/min 14 patient (87.5%), 45ml/min 1 patient (6.25%), and 70ml/min 1 patient (6.25%). The average ultrafiltration 3475ml SD. Clinical outcome was the improvement of 7 patients.
Conclusions: The treatment time was inadequate, because it was a surrogate service, and it was not possible to adjust properly.
The evolution of post-CTTR patients depends on the underlying disease and comorbidities presented at the time of the treatment indication.
Administration of CRRT improves patient survival, coinciding with reported records in literature.
Reference: 1. Sutherland Scott M., Alexander Steven R. Continuous Renal Replacement Therapy In children. Pediatric Nephrol (2012)27:2007–16
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P17/P86 - SAFETY AND EFFICACY OF PROSTACYCLIN (EPOPROSTENOL) AS AN ANTICOAGULANT IN CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT) IN PAEDIATRIC ACUTE LIVER FAILURE (PALF)

C. Goonasekera, M. Lasorella, G. Birader, A. Deep
Paediatric Intensive Care Unit, King's College Hospital London, London, United Kingdom

Background and aims: Patients with Acute liver failure (ALF)are pro-thrombotic and hence prone to circuit clotting leading to treatment downtimes on CRRT. In patients with ALF,heparin may either be contraindicated(thrombocytopenia)or insufficient(procoagulant).Epoprostenol,an anti-platelet agent could be an alternative to heparin to prevent circuit clotting.
Aims: To investigate efficacy and safety of Epoprostenol(synthetic prostacyclin analogue)as sole anti-haemostatic agent used for circuit patency during CRRT in patients with ALF
Methods: Prospective study of children with ALF admitted to PICU receiving CRRT over a 4year period. Patients were stratified according to the used anticoagulant- Epoprostenol PGI(2) group(n=45) and non-epoprostenol group(n=26).Efficacy was measured by filter life and mortality. Safety was assessed by number of bleeding episodes during CVVH, platelet consumption and hypotensive episodes(requirement for fluids/vasopressors)
Results: Seventy-one ALF patients underwent CRRT for a total of 11659hours utilising 393 filters(5.5 circuits/patient).Epoprostenol was used in 45 patients at the dose of 4ng/kg/min administered pre-filter for a total of 6761hours. In the non-epoprostenol group,36 patients underwent CRRT for 4898hours using unfractionated heparin.
Median filter life was 37.5hours in epoprostenol group and 24.5hours in non-epoprostenol group($p<0.001$).3/45(6.7%) patients on Epoprostenol and 9/26(34.6%)in non-epoprostenol group experienced bleeding episodes(0.44 episode per 1000 patient hours of treatment).Platelet consumption was significantly lower in epoprostenol group(938ml versus1913ml).Therapeutic intervention for hypotension was required in significantly lower CRRT sessions in Epoprostenol group(8.9% versus 34%).Despite higher PIM2 scores in Epoprostenol group(62.3%versus 45.7%),mortality was lower in this group(31.1%versus 42.3%)
Conclusions: Epoprostenol as the sole anti-hemostatic agent for CRRT increases mean filter life, decreases bleeding risk without increasing risk of hypotension, platelet transfusion or mortality.