Fluid balance and pCRRT

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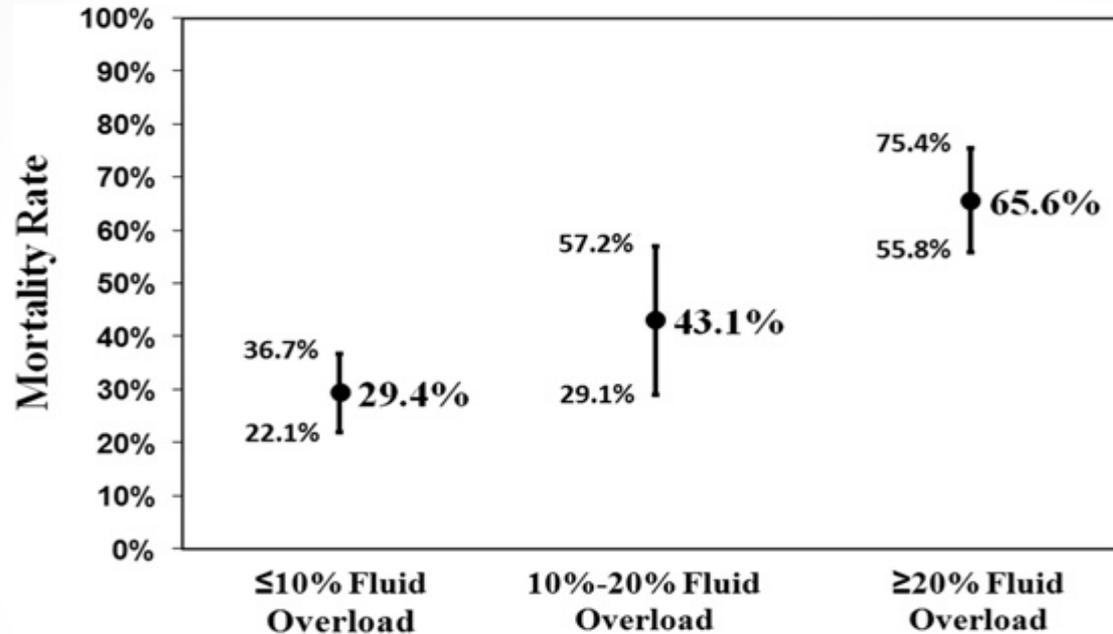**Sweden**

Fluid balance in PICU

Fluid bolus therapy (FBT) is beneficial to the patients during resuscitation phase. Although data from the FEAST-study give reason for concern.

There are convincing evidence that fluid overload results in negative outcome.

In pediatric shock patients, the severity and duration of early fluid overload is associated with an increased mortality.

Fluid overload is often seen during the first days in the PICU.

Prowle JR et al. Nat Rev Nephrol (2010) 2: 107-115. Bhaskar P et al. Intensive care med (2015) 41: 1445-1453. Sutherland SM et al. Am J Kidney Dis (2010) 55: 316-325. Alsous F et al. Chest (2000) 117: 1749-1754

Fluid overload (FO) in patients > 1 year

Adjusted OR was 1.03 (1.01-1.05). Suggesting 3% increase in mortality for each 1 % increase in severity of fluid overload. When fluid overload was dichotomized to ≥ 20 % and ≤ 20 % patients with ≥ 20 % fluid overload had an adjusted mortality OR 8.5 (2.8-25.7).

Sutherland et al. American Journal of Kidney disease. 2010

Fluid balance after continuous renal replacement therapy initiation and outcome in paediatric multiple organ failure

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Study objectives

Possible association between fluid removal and mortality during the first three days after CRRT-initiation.

Characterise the impact of fluid overload on mortality during the first week in the PICU.

Inclusion criteria

- Newborns up to 18 years

- 3 or more failing organs

- pCRRT requirement due to acute kidney injury and/or fluid overload

Patient characteristics by survival

Variable	All patients n=63	Survivors n=45 (71%)	Non Survivors n=18 (29%)	p
Newborns, n (%)	24 (38)	14 (31)	10 (55)	0.09 [a]
Infants (1-12 months), n (%)	10 (16)	5 (11)	5 (28)	0.13 [a]
Children > 12 months, n (%)	29 (46)	26 (58)	3 (17)	0.005 [a]
Gender (male: female) %	57:43	56:44	59:41	0.78[a]
PIM-3, PDR, median (IQR)	17 (8.6-46.8)	13 (7-30)	23 (16-59)	0.01 [a]
PELOD-2 CRRT initiation, median (IQR)	11 (9-13)	12 (8-13)	11 (10-13)	0.98 [a]
Comorbidity, n (%)	44 (70)	28 (62)	16 (89)	0.06 [b]
ECMO at CRRT initiation, n (%)	28 (44)	21 (47)	7 (39)	0.78 [b]

Patient characteristics by survival cont

Variable	All patients n=63	Survivors n=45 (71%)	Non Survivors n=18 (29%)	p
Number of vasoactive and/or inotropic drugs at CRRT initiation, median (IQR)	2 (1-2)	1 (0.5-2)	2 (1-3)	0.06 [a]
FO on admission, %, Median (IQR)	8 (0-18)	7 (0-15)	11 (0-26)	0.36 [a]
Change in FO from admission to CRRT initiation, %, median (IQR)	3 (0-14)	3 (0-12)	8 (0-25)	0.03 [a]
FO at CRRT initiation, %, median (IQR)	18 (11-24)	15 (9-22)	24 (17-37)	0.002 [a]
Timing of CRRT from PICU admission, h, median (IQR)	28 (7-72)	28 (7-72)	45 (6-73)	0.42 [a]

Patient characteristics by survival cont

| Variable	All patients n=63	Survivors n=45 (71%)	Non Survivors n=18 (29%)	p
Severe sepsis or septic shock, n (%)	24 (38)	17 (38)	7 (39)	1.0 [b]
Non-septic shock, n, (%)	13 (21)	10 (22)	3 (17)	0.74 [b]
Respiratory failure, n, (%)	20 (32)	15 (33)	5 (28)	0.77 [b]
Liver failure, n, (%)	7 (11)	4 (9)	3 (17)	0.40 [b]

Mortality and age

Newborns: (n=24)   41%

1-12 months: (n=10)   50 %

> 1 year: (n= 29)   10 %

Total: (n=63)   29%

Outcomes by fluid balance after CRRT initiation

Variable	All patients	Positive fluid balance 3 days after CRRT	Negative fluid balance 3 days after CRRT	p
	n=63	n=14	n=49	
PICU mortality, n, %	18 (29)	12 (86)	6 (12)	<0.0001 [a]
CRRT free days at day 30, days, median (IQR)	19 (2-25)	2 (0-4.5)	23 (6-26)	0.0002 [b]
Ventilator free days at day 30, days, median (IQR)	6 (0 – 23)	0 (0-0.25)	17 (0 - 25)	0.0003 [b]

Fluid overload the first week after admission
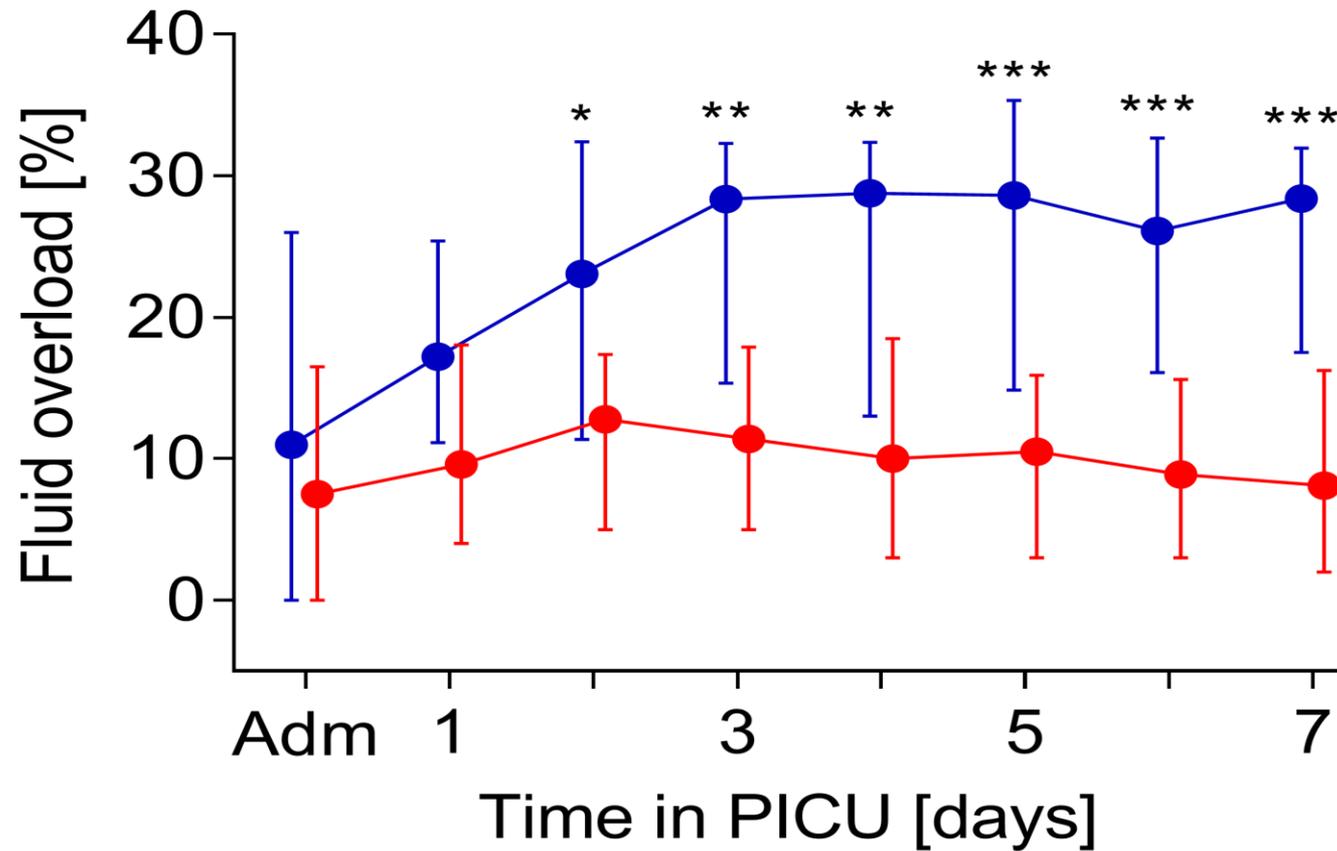
Fluid overload from admission until 3 days after CRRT-initiation
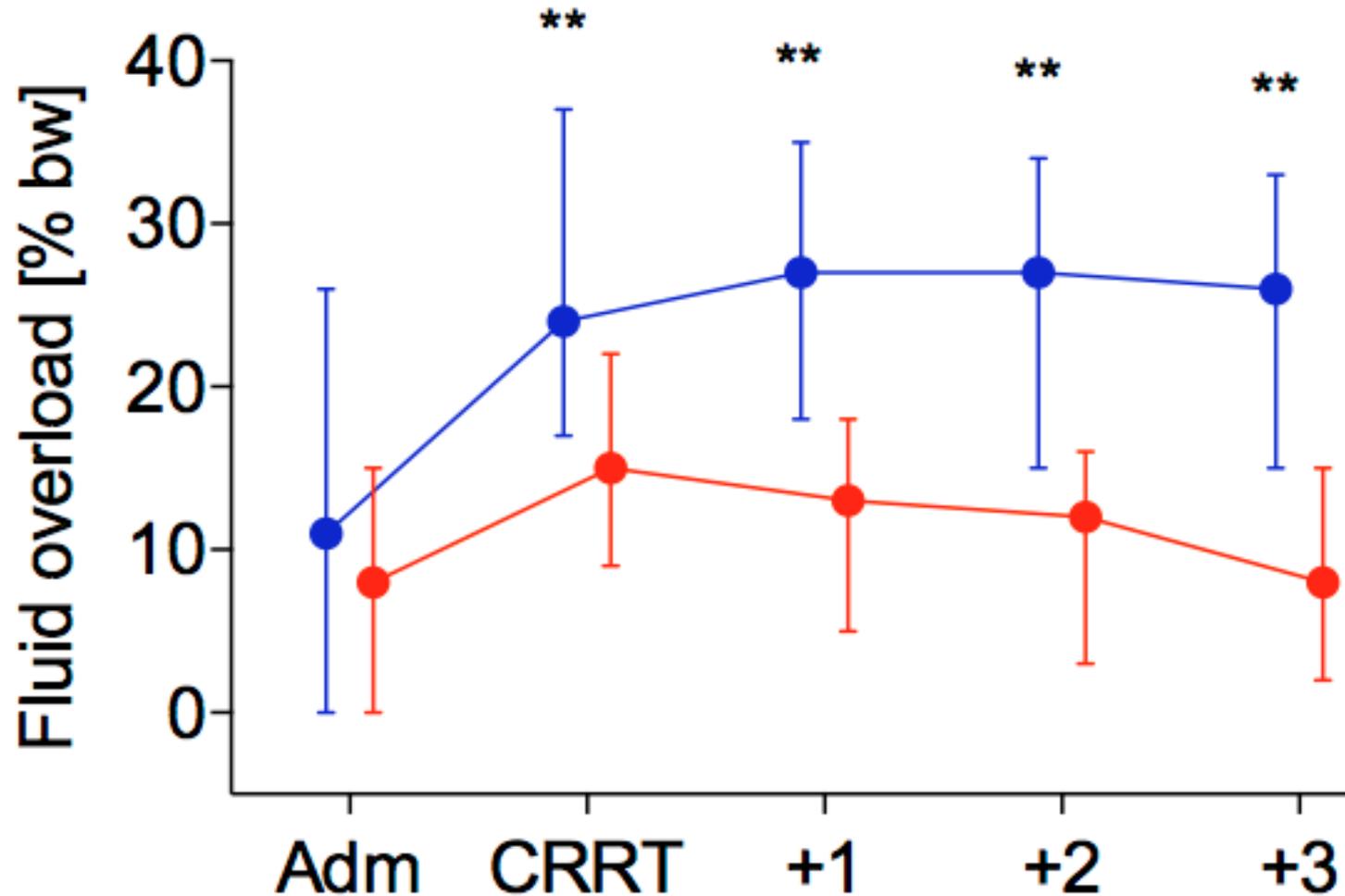
Predictors of mortality by <u>univariate</u> logistic regression

Variable	OR (95% CI)	p
<u>**Categorical variables**</u>		
Cumulative positive fluid balance 3 days after CRRT initiation	**6.6 (2.8-15.5)**	**<0.0001**
Fluid overload more than 20% at CRRT initiation	**2.53 (1.38-4.65)**	**0.0015**
Age < 1 year	**2.62 (1.32-5.20)**	**0.0021**
2 or more vasoactive/ Inotropic drugs at CRRT initiation	**1.72 (0.95-3.12)**	**0.062**
Septic shock as main Reason for PICU	**0.91 (0.51-1.61)**	**0.74**

Predictors of mortality by <u>univariate</u> logistic regression cont

Variable	OR (95% CI)	p
<u>Numeric variables</u>		
Fraction dialysis (per %)	0.92 (0.85-0.99)	0.0012
Circuit life span during the first 3 days after CRRT (per h)	0.97 (0.95-0.9996)	0.041
PIM-3 score on admission (per %)	1.02 (0.997-1.04)	0.092
PELOD-2 score at CRRT initiation (per point)	1.05 (0.86-1.28)	0.64
Timing of CRRT (per h after admission to the PICU	1.003 (0.99-1.01)	0.56

Predictors of mortality by <u>Multivariate</u> logistic regression analysis

Variable	OR (95% CI)	p
Cumulative positive fluid balance 3 days after CRRT initiation	9.50 (2.87-31.4)	<0.0001
Fluid overload (> 20 % at CRRT initiation)	3.95 (1.33-11.7)	0.0019

Conclusion

The ability to acheive a negative fluid balance after CRRT initiation is associated with survial in children with MOF

The results suggests that once CRRT is initiated, an important goal should be fluid removal.

Thank you for your attention!