Introduction:
Most crystalloid solutions used in critically ill patients have a greater chloride (Cl) concentration than plasma, which may be detrimental. Replacing some Cl with bicarbonate (HCO₃) reduces Cl, but may increase partial pressure of carbon dioxide (PCO₂) in blood. Such an increase in PCO₂ may be harmful [1]. The main objective was to determine if a HCO₃ balanced fluid resulted in increased PaCO₂ compared to a conventional balanced fluid.

Methods:
Single center randomized controlled trial in an adult ICU, comparing balanced fluid (sodium,Na=142mmol/l, Chloride,Cl=99mmol/l, HCO₃=49mmol/l) vs conventional fluid (Na=130mmol/l, Cl=110mmol/l, HCO₃≤27mmol/l). University ethics committee approval:M080932. We used the absolute difference between the PCO₂ and 40mmHg as a comparison for the 2 fluid groups. Between-group comparisons of PCO₂ from D1-D7 was done by repeated measures ANOVA. A p value <0.05 was considered significant.

Results:
46 patients were allocated to the conventional group and 40 to the balanced group. At baseline the 2 groups were well matched (p>0.05) for age, weight, gender, severity of illness and organ support. There were no significant differences in PCO₂ between the two fluid groups, overall or at D1, D5 or D7. The balanced group showed a significant improvement in eGFR (sCr), between D0 and D5 (p=0.02) while the conventional group exhibited a significant decline (p=0.00). There were no significant differences between the 2 groups with respect to fluid requirements, number of positive blood cultures, ICU renal replacement utilization, ICU length of stay, ICU mortality and 28 day mortality.

Conclusion:
The use of a balanced fluid did not result in an increase in PCO₂ and appears to be safe. A beneficial effect on renal function was observed.

References:
Wilson RF et al. Bicarbonate therapy in severely acidotic trauma patients increases mortality: Journal of Trauma and Acute Care Surgery 74:45–50, 2013