Auditing the rate of Continuous Kidney Replacement Therapy (CKRT) supplied at London teaching hospital

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Introduction

We carried out an audit to assess average prescribed dose against average delivered dose of CKRT in a 41 bedded ICU to determine viability of cutting prescribed dose to make fluid savings while still achieving optimal delivered dose.

KDIGO (2012) recommended prescribed dose should be higher than 25ml/kg/h in order to achieve a delivered dose of 20-25ml/kg Actual Body Weight (ABW)/h of effluent flow. Local guidelines recommend dialysis rates of 30ml/kg Ideal Body Weight (IBW)/h without accounting for impact of ultrafiltration on effluent flow.

Bagged fluid is financially and ecologically expensive. Auditing against the ADQI (2016, 2019) benchmark defining adequate dosing as delivery of >80% of prescribed dose 80% of the time enabled identification of savings

Method

In order to ascertain the dose delivered patients that required CKRT across the units were identified.
Data collected daily

- Treatment time: the length of time the circuit was running over previous 24 hours
- Fluid data: all fluids contributing to effluent flow (ultrafiltration, citrate, calcium and dialysate)

Demographic data
Ideal/actual body weight
To ascertain downtime, the alarm data was also collected and collated.

Inclusion

On St Thomas' Site
Citrate anticoagulation
Requiring continuous KRT over 24 hours

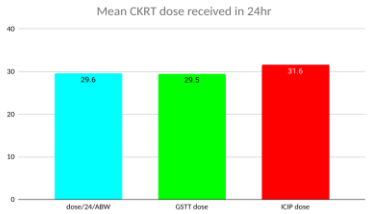
Exclusion

Non citrate anticoagulation
Hybrid KRT not intended to last 24 hours

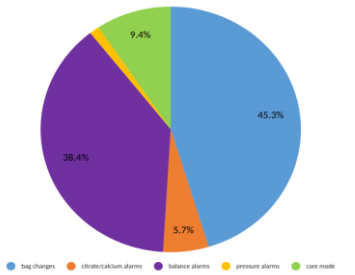
Results

A total of 65 KRT "days" were collected over the course of a month

The mean dose as calculated by "ICCA" (Intellispace critical care and anaesthesia, the computer software used by the trust) was 31.5ml/kg/IBW vs the calculated "GSTT" dose which does not take ultrafiltration into consideration which was 29.5ml/kg/IBW, with a standard deviation of 4.8. Both of these calculations disregard ultrafiltration when calculating dose, however, the ICCA dose does not factor in any downtime in the calculation, assuming that the circuits will run without fault or problem for 24 hours continuously.



The mean running time of the machines in 24 hours was 20.4 hours, as some of the data days had not started at exactly 6am the day before. Out of this 24.4 hours, the machines were running for 19.1 hours suggesting that the machines were running for 93.6% of the prescribed time



As shown above, the biggest cause for downtime in 24 hours on the Fresenius Multifiltrate Pro© appears to be bag changes, alongside balance alarms, often these are associated with each other.

Conclusions & Discussions

This audit showed that when delivering continuous treatment we are meeting ADQI benchmarks, delivering more than 80% of delivered dose in ml/kgIBW/h more than 80% of the time. Local guidelines could be changed accordingly to suggest a starting dose of 25ml/kg/IBW/hr. Literature advises that a dose of 20ml/kg/hr would be adequate, but changing the dose to 25ml/kg/hr would allow for leeway with downtime between circuits and during the 24 hour treatment time to deliver an effective dose to the patient

Although our trust dose does not take into consideration of ultrafiltration into the dose calculations, the mean dose difference between calculated "GSTT" dose and dose calculated as per KDIGO guidelines using ideal body weight is minimal at 0.1% and therefore for simplicity GSTT will continue to calculate dose with the current equation.

The difference between the dose delivered between Ideal and Actual body weight was perhaps unsurprisingly lower when calculated with ABW over IBW with the median dose 27.2ml/kg/hr (range 16.73 – 45.92) and 31.8ml/kg/h (range 17.7 – 55.5) respectively.This could be an area for more research in the future. Our trust uses IBW for ease as critically ill patients are difficult to weigh on admission and it is easier to estimate height and therefore an ideal body weight. This allows for an easier dose calculation.

A reduction in rate to 25ml/kg/hr could mean a financial saving to the trust. The mean bag use for 5L dialysate bags in 24 hours when running a rate of 29.4ml/kg/hr was 7.6 bags. A reduction in dose to 25ml/kg/hr would reduce the dialysate rate by 200 - 400ml/hr saving an estimated one dialysate bag and one waste bag per 24 hours of treatment. This would potentially save £30,000-35,000 a year.

Limitations

Data was only collected from one site in one hospital over one month, this could be repeated over a longer period to enhance the data
Only data on machines that had been running for 24 hours at 6am.
It was not possible to collect data at times when the renal nurses were not available.
Possibly altering the downtime/alarms data
No data were collected for circuits without citrate anticoagulation
No data was collected for patients receiving hybrid KRT (sometimes called SLED/PIRRT) under a protocol targeting a dose 60ml/kgIBW/h for 8h.

REFERENCES
Bagshaw, S.M., Chakravarthi, M.R., Ricci, Z., Tolwani, A., Neri, M., De Rosa, S., Kellum, J.A. and Ronco, C. (2016). Precision Continuous Renal Replacement Therapy and Solute Control. *Blood Purification*, 42(3), pp.238–247. doi:https://doi.org/10.1159/000448507.
KDIGO (2012). *KDIGO Clinical Practice Guideline for Acute Kidney Injury*. [online] Available at: https://kdigo.org/wp-content/uploads/2016/10/KDIGO-2012-AKI-Guideline-English.pdf.
Rewa, O.G., Tolwani, A., Mottes, T., Juncos, L.A., Ronco, C., Kashani, K., Rosner, M., Haase, M., Kellum, J. and Bagshaw, S.M. (2019). Quality of care and safety measures of acute renal replacement therapy: Workgroup statements from the 22nd acute disease quality initiative (ADQI) consensus conference. *Journal of Critical Care*, 54, pp.52–57. doi:https://doi.org/10.1016/j.jcrc.2019.07.003.