ASN COVID-19 ACUTE KIDNEY CARE COMMITTEE

Use of Alternative CRRT Solutions during COVID-19 Pandemic and Other Crises

The purpose of this document is to guide institutions and nephrologists on the appropriate use of non-traditional CRRT solutions. The use of such solutions has become necessary during the COVID pandemic. Conservation strategies in the use of the traditional bicarbonate solutions have been discussed in a separate document.

A. STANDARD CRRT SOLUTIONS
   • Commercially made bicarbonate based solutions (NxStage, Baxter, B.Braun in US)
   • Local pharmacy made bicarbonate based solutions

B. ALTERNATIVE CRRT SOLUTIONS
   1. Lactate based solutions (NxStage home hemodialysis fluids in 5L bags)
   2. Production of bicarbonate solutions in hemodialysis units using pre-mixed concentrated dialysate
      o Centers that have collaborated with FDA to produce dialysate solutions
         i. Johns Hopkins
         ii. Cleveland Clinic
         iii. Columbia
         iv. University of Michigan

C. APPROPRIATE USE OF ALTERNATIVE SOLUTIONS
   1) Lactate vs Bicarbonate
      • 4 small studies to date (Cochrane Database Syst Rev. 2015 Mar 5;(3):CD006819)
      • Lactate solutions are associated with small elevations in lactate levels (Cochrane Database Syst Rev. 2015 Mar 5;(3):CD006819)
      • No change in bicarbonate levels were noted.
      • One study suggested worsening hemodynamic instability with lactate solutions (Kierdorf et al, Volume 56, Supplement 72, November 1999, S32-S36)

   Lactate solutions may NOT be suitable for the following patients
   1. Patients with severe hepatic dysfunction
   2. Liver transplant patients immediately post-transplant. Consider using bicarbonate solutions until liver function has improved
   3. Severe hemodynamic instability
   4. Presence of lactic acidosis from shock, sepsis, other causes.

   Modality selection for lactate solutions
   • Lactate solutions should be used per manufacturer’s recommendations.
   • Some lactate solutions may not be used as replacement fluid (infusion).

   2) Bicarbonate solutions manufactured in hemodialysis units
      • SOLUTIONS DO NOT MEET FDA STANDARDS TO BE USED AS AN INFUSION
      • These solutions can be used as:
1. A dialysate solution for sustained low efficiency dialysis (SLED) or Prolonged Intermittent renal replacement therapy (PIRRT)
2. A dialysate solution for CVVHD
3. A dialysate solution for CVVHDF. However, the fluid for hemofiltration (infusion) has to be a traditional FDA approved solution.

- **FDA offers the following guidelines regarding solutions generated in dialysis units**
  1. *The fluids should only be used as a dialysate and not as infusates, as they are not sterile.*
  2. *These fluids should ideally be used within 4 hours but not stored for more than 24 hours.*
  3. *Do not ship bags of fluid as the filled bags have not been evaluated to withstand shipping conditions.*
  4. *Use only off-the shelf (i.e., currently legally marketed, sterile) supplies.*
  5. *For fluid contacting components, use only supplies cleared to be used in a hemodialysis fluid pathway, as they have undergone appropriate biocompatibility testing.*
  6. *Do initial testing and intermittent monitoring for bacteria/endotoxins.*

- Each hemodialysis center and hospital system should obtain authorization from FDA before manufacturing these solutions. Solutions should be manufactured according to FDA guidelines regarding testing, monitoring and packaging.

**D. IMPLEMENTATION**
- Successful implementation of the use of alternative solutions for CRRT and PIRRT will require a multidisciplinary approach. Each institution should establish a core work group to implement the protocol and do frequent “check-ins” to ensure appropriate use. This may include groups such as:
  - Nephrologists/intensivists
  - Local hemodialysis units and biomedical technicians
  - Hospital Supply chain
  - Administration/Legal
  - Pharmacists
  - Dialysis staff
  - ICU Nursing
  - EMR/IT support (e.g. changing order sets, appropriate alerts)