

## Management of Fluid Balance and Renal Replacement Therapy in COVID-19 ARDS patients

Effective diuresis may be important in selected COVID-19 patients to improve oxygenation. In addition, the number of available CVVHD machines for fluid removal may not be adequate therefore it is essential to optimise medical therapy in the first instance.

### FLUID BALANCE

- Each patient is individual - review daily
- **Be aware of iatrogenic AKI caused by excessive diuresis**
- Minimise unnecessary fluid intake – concentrate IV drugs and use enteral route where possible
- Diuresis with furosemide alone often results in profound hypernatraemia and alkalosis
- Natriuresis is preferable and results in a more stable electrolyte profile in addition to better fluid loss
- Furosemide monotherapy is unlikely to be sufficient: suggest start 2 agent therapy
- The following drugs in combination with furosemide may help to achieve natriuresis<sup>1</sup>.
- Thiazides, Spironolactone, Acetazolamide and Aminophylline can all be given together. Choice of additional agent/agents at discretion of physician. If failing on 2 agents add in additional.

Furosemide	Variable infusion 1-30mg/hr	Loop diuretic	Aim max 400ml/hr of urine Adjust rate accordingly
Thiazide i.e. Bendroflumethiazide	5mg via NGT for BFZ	Acts of DCT natriuresis	Monitor potassium
Spironolactone	50mg 12h via NGT	Acts on DCT to promote K retention & natriuresis	Monitor potassium Can be increased to 100mg BD
Acetazolamide	Bolus 500mg 12h <i>if</i> pH>7.45	Acts on PCT to promote Natriuresis	
Aminophylline (500mg in 500mls 5% dextrose)	Fixed infusion rate 10mg/hr	Natriuresis	Fixed rate <b>Tachycardia may limit use</b>

- Careful attention to electrolytes

### RENAL REPLACEMENT THERAPY

- There are concerns that there may not be enough CVVHD machines for the number of patients who require them
- **Continue to use CVVHD as normal until demand exceeds the number of available machines**
- Subsequently follow this protocol
  - 1. UNSTABLE PATIENTS** (Those with hyperkalaemia, life threatening diuretic resistant fluid overload or severe acidaemia)
    - Should receive CVVHD as per normal protocol with a filter change every 72 hours or longer.

## Critical Care Guidelines FOR CRITICAL CARE USE ONLY

### 2. STABLE PATIENTS (when not enough CVVHD machines available)

- Depending on resources and patient stability they can either receive
  - i. **High dose CVVHD delivered over 12 to 24 hours**
    - This will allow CVVHD machines to be used between different patients however will have a significant impact on consumables.
    - Multibic/heparin **will give better clearance as dialysate flow rate higher**
    - **Beware** – when using citrate for high dose CVVHD patients there is an increased risk of citrate toxicity as higher blood flows than normal are utilised therefore more citrate delivered to patient
  - ii. **Intermittent haemodialysis (IHD)**
    - Try high dose CVVHD delivered over 12 to 24 hours in the first instance
    - Renal are able to provide IHD but will need prior notice preferably > 24 hours
    - IHD can be provided in cubicles 16 and 17 in 118, 117 and 116D as these spaces have the correct water supply – move patient to these areas where possible
    - Remaining 118/116 beds difficult to provide IHD as will require a v.bulky reverse osmosis machine
- **Multibic/heparin vs citrate for High dose CVVHD**
  - Option 1 **Preferred multibic/heparin** (will give better clearance as dialysate flow rate higher)
  - Option 2 **citrate** (useful if v stable, just for ultrafiltration, no issues e.g. liver)  
***Need to consider stock levels when deciding between treatment options***
- **Multibic/heparin settings for High dose CVVHD**
  - a. Decide regarding anticoagulation - IV heparin (see heparin protocol on intranet in critical care renal section). Other anticoagulation available.
  - b. Blood flow 250-450mls/minute (initially as tolerated)
  - c. Dialysate flow to 4800mls/hour initially
  - d. Fluid off to 250-450mls/hour (as directed by required fluid balance)
- **Citrate settings for High dose CVVHD**
  - e. Blood flow to 180mls/min initially
  - f. Dialysate flow to 3600mls/hour initially
  - g. Fluid off to 250-450mls/hour (as directed by required fluid balance)
  - h. Note patients at slightly higher risk of citrate toxicity and hypocalcaemia

1. Morris C, Plumb J. Mobilising Oedema in the Oedematous Critically Ill Patient with ARDS: Do we seek Natriuresis Not Diuresis? Journal of the Intensive Care Society. 2011 (12) 92-97.

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