

# Fluid management in Critical Care



## Goals

Euvolaemia

Sodium 135-145 mmol/l

## Assess fluid balance

**Fluid overload:** positive fluid balance, **oedema**, AKI, CVP  $>6^2$

**Volume loss** (isotonic dehydration):

- Bleeding
- GI (vomiting, diarrhoea):  $\rightarrow$ Na,  $\uparrow$ Hb<sup>1</sup>,  $\uparrow$ urea

**Water deficit** (hypotonic dehydration):  $\uparrow$ Na,  $\uparrow$ Hb<sup>1</sup>,  $\uparrow$ urea

<sup>1</sup>Hb may not be raised for other reasons

<sup>2</sup>If no other cause for CVP to be high e.g. heart failure

## Treat

**Fluid overload** - RRT, diuretics/natriuretics - see below

**Bleeding** - stop the bleeding, aim for MAP 60 or systolic 70-90 until bleeding controlled with 250ml boluses compound sodium lactate. Once bleeding controlled - packed red cells, correct clotting.

**GI loss** - compound sodium lactate to replace deficit

**Water deficit** - oral water / NG water / 5% glucose to replace deficit

**Mixed picture** - replace water and electrolyte deficit appropriately

*Systemic inflammatory response syndromes (sepsis, pancreatitis, trauma, major surgery) do **not** cause hypovolaemia and should **not** be treated with IV fluid resuscitation*

## Daily requirements

25-30 ml/kg/d water      1mmol/kg/d Na, K, Cl      50-100g/d glucose

Fluid intake in order of preference:

**Oral** - no additional IV fluid if meeting requirements

**NG** - feed **plus** water - **combined target** 1.2mls/kg/h

**IV:**

- ↑Na - 5% glucose (+ 20 - 40 mmol K per L)
- →Na - **4% glucose 0.18% sodium chloride (+ 20 - 40 mmol K per L)**
- ↓Na - No IV fluid - see hyponatraemia guideline on CRITICALCARE NORTHAMPTON.COM REVIEWING CRITICAL CARE, JOURNALS & FOAMED

<50kg - 1500mls/24h\*

50-80kg - 2000mls/24h\*

>80kg - 2500mls/24h\*

\* **subtract intake from other sources from administered volume (eg drug infusions)**

## Fluid removal

Renal Replacement Therapy (RRT) or diuretics/natriuretics

Goal is **sodium** (and water) removal

Targets:

- **Euvolaemia**
- Resolution of peripheral oedema, pulmonary oedema, AKI
- Neutral cumulative fluid balance, normal weight
- Na 135-145
- CVP <6 (as long as not chronic ↑)

### RRT

- Preferred option if significant fluid overload
- Rate of fluid removal with RRT up to max 12mls/kg/h
- Monitor CVS stability

### Diuretics/natriuretics

- Frusemide 10-50mg/h IV  
*plus*
- Spironolactone 100mg BD NG  
*plus/minus*
- Aminophylline 10mg/h IV

## Full guideline



## Additional notes

### Clinical signs are non-specific:

- ↓BP, ↑HR, ↓UO, ↑lactate, ↓peripheral perfusion, dry mouth are not specific for volume status
- They are more likely to be due to other causes (e.g. vasodilatation or heart failure)

### Kidney:

- AKI has several causes. In hospital, AKI is much more commonly caused by intrinsic factors and fluid overload (from elevated venous pressures) than hypovolaemia.
- Oliguria is part of the normal stress response and is non-specific to volume status - it may be due to either hypo or hypervolaemia or neither.

### Sodium:

- Is difficult for humans to excrete which gets worse with increasing illness severity.
- Causes water retention and fluid overload.
- Hypernatraemia is usually a combination of xs Na administration and water deficiency. It is:
  - associated with worse outcomes in ICU
  - both completely avoidable and unacceptable

### CVP

- Venous return = Mean Circulatory Filling Pressure - CVP
- Organ perfusion = arterial pressure - (compartment + venous pressures)
- CVP therefore opposes VR **and** organ blood flow and so should be as low as possible

### Lactate

- Is generated from glycolysis which is stimulated by sympathetic activation (stress response, B-agonists). It is metabolised by the liver.
- A high lactate is rarely due to hypovolaemia.