

## The Sick Patient: Circulation

### How much fluids to give? (01:41)

- Give fluids early and fast – Buys time to work out what is wrong
- Surviving Sepsis Campaign: **20-30ml/kg in the first hour**
- Assessment
  - History: Ongoing losses (vomiting/diarrhea), I/O charting
  - Vitals: Blood pressure, heart rate, pulse pressure
  - Examination: Mucous membrane, sunken eyes, skin turgor, urine output/concentration, drowsiness
  - Investigations: Lactate, POCUS
- Targets
  - MAP: 65mmHg
  - Clinical State: Mentation, urine output
- Determining the first bolus?
  - Remember that hypoperfusion usually kills – while problems of fluid overload comes later on
  - While it is fair to consider rationalizing amount of fluids in patients with ESRF/low EF, these patients can still be hypovolemic and in those instances would require fluids (CHECK DRY AND PRESENT WEIGHT)
  - Fluid boluses should be run over a short period (e.g. 15-30 mins) to induce an atrial stretch

### Assessing Fluid Responsiveness (08:24)

- Passive Leg Raise Test (<https://litfl.com/passive-leg-raise/>)
  - Sit patient at 45 degrees head up semi-recumbent position
  - Lower patient's upper body to horizontal and passively raise legs at 45 degrees up
  - Maximal effect occurs at 30-90 seconds
  - Assess for a narrowing in pulse pressure
- Pulse Pressure
  - Systolic minus diastolic pressure
    - § Systolic: Cardiac output
    - § Diastolic: Vascular tone
  - Widened pulse pressure suggests a vasodilated patient; if pulse pressure narrows with fluids, suggests fluid responsiveness
  - Narrow pulse pressure: Think Dengue, cardiogenic shock
- Review for causes of hypotension – Consider less obvious causes like adrenal insufficiency, PE,
- There are risks to excessive: Fluid overload, metabolic disturbances
- Always reassess the patient in totality: Don't treat a number, treat the patient

### Lactate (09:36)

- An indicator of hypoperfusion, may be a marker of mortality
- Must be taken in totality of rest of clinical picture and assessment of patient
- Other causes of raised lactate: Nebulisation, metformin, liver disease, seizures, metabolic defects

### Starting Steroids (19:00)

- Consider element of adrenal insufficiency if fluid refractory (after 1-2L of fluids)
- Can add-test cortisol to other bloods taken
- Can have low threshold for IV hydrocortisone

### Choice of Fluids (24:50)

- Balanced crystalloids first line – e.g. Hartmanns

- SMART Trial (NEJM 2018) <https://www.nejm.org/doi/full/10.1056/NEJMoa1711584>: ICU setting, Normal saline vs balanced solutions, adverse kidney event within 30 days (death, new RRT, persistent renal dysfunction), balanced crystalloids superior
- SALT ED Trial (NEJM 2018): ED setting, Normal saline vs balanced solution, Outcomes (hospital free days, major adverse kidney events), Results (no diff in hospital free days, balanced crystalloids resulted in lower major adverse kidney events)
- Concern with Normal Saline – Hyperchloremic metabolic acidosis, with risk of RRT requirements
- Bear in mind that Hartmann's contains potassium – Caution in hyperkalemic patients
- Albumin 5%
  - Usually second line after a fair amount of crystalloids
  - Can consider if hypoalbuminemic, cirrhotic: Although studies don't show mortality benefit
    - § SAFE Trial: <https://www.nejm.org/doi/full/10.1056/NEJMoa040232>
  - Will still eventually third space
  - But bear in mind that a patient with low albumin/hypotension, may be poor substrate

#### Vasopressors in the General Ward (35:11)

- Always use what you are familiar with
- Always have an end point
- Possible Indications
  - "Unfinished business" – Waiting for return of loved one in dying patient
  - Bridge to more definitive therapy (e.g. ICU, cath lab)
  - Post ROSC
- Dopamine most commonly used in the ward because nurses most familiar
  - Risks: Arrhythmogenic, nausea/vomiting, extravasation
  - Avoid in IHD, try to get big IV cannula in antecubital fossa
- Other Options: Phenylephrine, ephedrine
- Push dose boluses vs infusions

#### Take Home Points (50:38)

- Call for help early, ask for a second opinion, know your limitations
- Review sick patients in short intervals
- If you are unfamiliar with a drug, don't use it or check with someone familiar
- Hypotension is not a diagnosis; it is an effect/complication of an underlying pathology
- While numbers (e.g. BP, pulse pressure, lactate) are helpful, they are ultimately not the end point – Ultimately treat the patient