Impact of fluid overload on the evolution of patients with septic shock.

Introduction:

It is well known that the fluids resuscitation guided by objectives is essential in the initial management of septic shock. However, when this fluid contribution becomes an excess in the post-resuscitation phase it can generate interstitial edema that produces alteration in the diffusion of oxygen and metabolites at the tissue level, and the consequent accumulation in various organs.

Currently there is growing literature that relates the presence of fluid excess with a worse prognosis and higher mortality in critically ill patients, therefore a more careful management in phases after resuscitation could avoid the unnecessary fluid excess and the adverse effects of their inappropriate use, improving the prognosis of the patients.

However, it is still not clear how much fluid is “excessive” to impact in the prognosis. Therefore, there is no parameter that defines a clear objective to achieve in the post-resuscitation phases of septic shock.

Some studies have linked the presence of fluid excess with volume gain. This volume gain has been defined as % of daily cumulative fluid balance respect to the weight at admission. Fluid excess or “Fluid overload” is not clearly defined, but it has been used arbitrarily as a value greater than 10% of volume gain.

For these reasons the objective here is to determine a cut-off value of volume gain after the third day of admission (until the first week or all hospitalization) which triggers a bad prognosis and which could be usefull as a management objective in the post-resuscitation phase in septic shock.

Definitions:

- Daily Fluid Balance (DFB): Differences between fluid intake (IV fluids, nutrition, medications) and fluid output (urine, ultrafiltration, output from surgical drains, etc.) *
- Daily Cumulative Fluid Balance (DCB): Addition of the daily HEB.
- Volume gain: DCB divided by weight in admission x 100.
- Fluid overload: Volume gain >10%.
- PMV: Prolonged Mechanical ventilation >7 days.

We separated cumulative fluid balance into “early” (days 1–2) and “later” time points (from day 3), on the basis that early fluid balance may be more reflective of resuscitation fluid administration and thus potentially more confounded by severity of illness

* Study day 1 was from ICU admission until 07:00 or 8:00 am depending on unit practice, whereas subsequent study days were consecutive 24-hour periods, or part there of on the day of ICU discharge.

**We estimated AKI severity using the Kidney Disease: Improving Global Outcomes (KDIGO) consensus criteria for the definition and classification of AKI (17) daily.

Table 2 | Staging of AKI

Stage	Serum creatinine	Urine output
1	1.5–1.9 times baseline OR ⩾0.3 mg/dl (⩾26.5 μmol/l) increase	<0.5 ml/kg/h for 6–12 hours
2	2.0–2.9 times baseline	<0.5 ml/kg/h for ⩾12 hours
3	3.0 times baseline OR Increase in serum creatinine to ⩾4.0 mg/dl (⩾353.6 μmol/l) OR Initiation of renal replacement therapy OR, In patients <18 years, decrease in eGFR to <35 ml/min per 1.73 m^2	<0.3 ml/kg/h for ⩾24 hours OR Anuria for ⩾12 hours

Deresuscitative measures were defined as any use of furosemide or fluid removal using RRT.

Criteria to select variables for inclusion in multivariate models: Relevance to underlying hypothesis clinical plausibility, previously reported associations in the literature, and univariate associations with a *p* value of less than 0.2.

Data:

Patients: with Septic Shock / Shock septic and acute lung injury.
At admission and 3th day.
Demographics:

- Age
- Sex.
- Weight
- Height
- Body mass index (BMI)
- Admission source.

Comorbidities:

- End stage renal disease (dialysis).
- Congestive cardiac failure. (NYHA 3-4)
- Cirrhosis.

Gravity scores:

- Simplified Acute Physiology Score (SAPS II).
- Acute Physiology and chronic Health Evaluation (APACHE II).
- Daily Sequential organ failure Assessment (SOFA).
- MODS ()

Source of sepsis:

- Respiratory.
- Abdominal.
- Urinary
- Soft tissues.
- Others.
- Incidence of ARDS or acute lung injury.

Haemodynamic variables:

- Mean arterial pressure.
- Heart rate.
- Central venous pressure.
- SVcO2.
- ELWI
- Serum lactate.
- vasopressor dose (noradrenaline mcg/kg/min)
- inotropes dose (Dobutamine mcg/kg/min)

Fluids Balance

- Daily Weight.
- Daily fluid balance.
- Cumulative fluid balance.
- Volume gain.
- Volumen overload.
- Fluid intake (IV fluids, nutrition, medications)

Renal Variables:

- Creatinine.
- Urea.
- Use of continuous renal replacement techniques.
- TRRC with extractions
- Furosemide use and total dose
- Incidence of renal failure (daily KDIGO score**),
- Urine output (ml/24h)

Respiratory variables:

- PaFiO2.
- PEEP.
- ELWI.
- ADRS.

Outcomes

- ICU mortality.
- 28^{th} day mortality.
- 60^{th} day mortality.

- Hospital mortality.
- Days of mechanical ventilation.
- ICU stay.

Other questions:

- How patients with negative weight gain evolve the first three days spontaneously or by means of deresuscitation methods
- How patients with positive weight gain from the 3rd day and maintain it despite deresuscitation measures evolve.
- Evaluate what kind of fluid is related with fluid overload (Resuscitation, nutrition, maintenance or diluent for medications)