



EM CASES SUMMARY

Episode 55 – The Weingart Himmel Sessions Part 2: Fluid Management in Sepsis & Post-Intubation Analgesia & Sedation

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Fluid of Choice in Severe Sepsis & Septic Shock

Choices for *initial* fluid management in the ED for severe sepsis and septic shock are Normal Saline, Ringer's Lactate or Plasmalite. Practically speaking, Normal Saline is what North American EDs are most familiar with and is recommended for the first 3-4L of fluid resuscitation despite concerns of *hyperchloremic acidosis* with larger volumes. If more than 3-4L of fluid is required, some

experts suggest switching to Ringer's Lactate or Plasmalite to minimize the risk of acidosis.

Is there a role for colloids such as albumin in the early management of hypovolemic shock?

The CRISTAL trial comparing albumin and crystalloids in the ICU setting showed no difference in 28 day mortality.

How Much Fluid, How Fast for Severe Sepsis & Septic Shock

Based on the recent PROCESS and ARISE trials our experts recommend 3-4L over the first 6 hours of resuscitation.

Our experts recommend 2L in the first 30 mins with a minimum of 2 large bore peripheral IVs *under pressure bags* pumped up to 300mmHg.

Venous Access for Severe Sepsis & Septic Shock

For patients who present to the ED with severe septic shock and no IV access, as a temporizing measure,

consider multiple intraosseus (IO) lines. Note that the humerus has the fastest infusion rates, and so should be considered the IO location of choice for the crashing patient.

While norepinephrine, the pressor of choice in septic shock, *can* be administered through an IO or a peripheral IV safely in low doses for a short period of time, if you anticipate that the patient might require pressors, place a central line after the patient has been stabilized (usually after the first 2L of fluid) so that by the time the third liter of fluid is running the pressor has been started.

When to Stop Giving Fluids - Measuring Fluid Status & Goals of Fluid Resuscitation

Knowing when to stop fluid resuscitation is one of the most difficult aspects of sepsis management.

A simple approach to the goals of fluid resuscitation in severe sepsis and septic shock:

Once you've given about 2-3L of fluid, if the patient's mean arterial pressure (MAP) is less than 65, start norepinephrine, stop the fluid and get the patient to the ICU.

A three-pronged nuanced approach to the goals of fluid resuscitation in severe sepsis and septic shock:

1. Clinical Factors – level of awareness, renal output, mottled skin, HR, MAP of 65 (approximate BP of 90/55), JVP
2. Fluid Tolerance – point of care ultrasound for IVC width and collapsibility
For an analysis on the value of IVC POCUS for measuring fluid tolerance visit the EDE blog <http://edeblog.com/2014/04/ivc-meta-analysis-analyzed/>, fluid in the lungs and JVD
3. Fluid Responsiveness –
 - a) *Passive Leg Raise Test* - patient sits up in bed at a 45 degree angle and the BP is noted; then lie the patient supine and raise their legs 45 degrees – if there is an augmentation in their

BP then the patient will likely benefit from more fluid (sensitivity 86%, specificity 90%)

b) End-tidal CO₂

c) Pulse Pressure Variability

Starting Norepinephrine in Severe Sepsis & Septic Shock

The current trend in critical care is to start pressors EARLY rather than waiting until the patient crashes to start pressors.

Once you've administered about 2-3L of fluid, if the patient's mean arterial pressure (MAP) is less than 65, start norepinephrine at a low dose of 1-2 micrograms/min via a peripheral IV or IO or central line, titrate up to 5 micrograms/min to maintain a MAP of 65 and stop the fluids completely and transfer fluid administration to a central line. If a MAP of 65 cannot be maintained despite 5 micrograms/min of norepinephrine then titrate the norepinephrine further to 10-15 micrograms/min and give 250-500ml Ringer's Lactate boluses based on fluid tolerance, fluid responsiveness and serial lactate measurements.

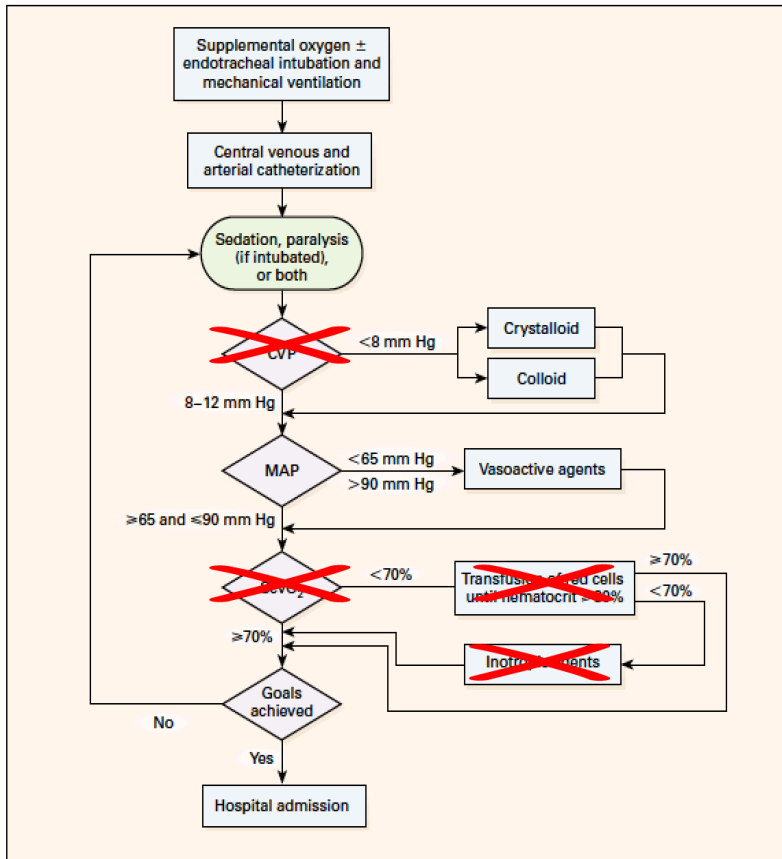
The ARISE Trial in Severe Sepsis & Septic Shock

The ARISE Trial was a prospective RCT at multiple centers with 1600 patients with severe sepsis and septic shock that examined the benefit of protocolized Early Goal Directed Therapy which included monitoring the Central Venous Pressure (CVP) and the Central Venous Oxygenation Saturation (ScVO₂) vs usual care. There was no difference in 90 day mortality between usual care and Early Goal Directed Therapy (19%).

The ARISE trial showed that monitoring CVP and ScVO₂ had no added benefit, and can be removed from the Early Goal Directed Therapy algorithm as displayed in the algorithm below.

The conclusions that can be drawn from the literature to date on resuscitation goals for the patient with severe sepsis or septic shock are the following:

1. Early antibiotic administration
2. Adequate volume resuscitation
3. Maintenance of End-organ perfusion



Post Intubation Analgesia & Sedation

The importance of appropriate *early* Post-Intubation Analgesia and Sedation is that under treatment or over treatment of pain and agitation in the ED has been associated with developing acute delirium, which has been associated with an increased mortality rate in ICU patients suffering from severe sepsis or septic shock.

PAD - A Simple Mnemonic for The Order of Medications Post-Intubation Analgesia & Sedation

'PAD'

Pain – IV Fentanyl 50-200 micrograms titrated to effect
 Agitation – IV Propofol 30microgrms/kg/min or Dexmedetomidine (not available in most EDs and is very expensive)

Delirium – delirium will likely be prevented if you manage Pain and Agitation

For patients who are aggressively attempting to pull out their ETT and require immediate sedation and analgesia, consider Ketamine 7mg/kg IV (approx. 50mg IV), then 0.15-0.25mg/kg q5-10 mins prn titrated to effect.

Benzodiazepines may increase the incidence of delirium and prolong the time on the ventilator, and so are not favored as a first line for sedation. If you choose to use benzodiazepines, be sure to control pain first with fentanyl before any benzodiazepine is administered, and use small doses (eg: 1-2mg Midazolam)

KEY REFERENCES

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