

Shock fluids part 1: Principles, and treating the 'dry' dog. With Dr Rob Webster.

Shock recap

Defined as globally inadequate cellular energy production eventually leading to cardiac failure or neurological failure and death.

Circulatory shock = reduced O₂ delivery because of reduced cardiac output.

Note: These principles **do not** apply to cardiogenic shock.

Six cardinal signs of shock:

Tachycardia
Weak femoral pulses
Pale mucous membranes
Slow capillary refill time (CRT)
Dull mentation
Cold extremities.

If you see 2 or more of these: **start** by giving flow by O₂ and place an iv catheter.

Pro-tip: exclude cardiogenic shock at this point by looking at:

- signalment: large breed dogs with DCM or a pericardial effusion)
- heart murmur
- irregularly irregular pulses
- jugular pulse
- if available : AFAST ultrasound scan for contractility and effusion.

Note: small breed dogs in CHF come in with pulmonary oedema, **not** circulatory shock.

Advanced fluid resuscitation

PRINCIPLES

Remember the concept of the pipe and the sponge:

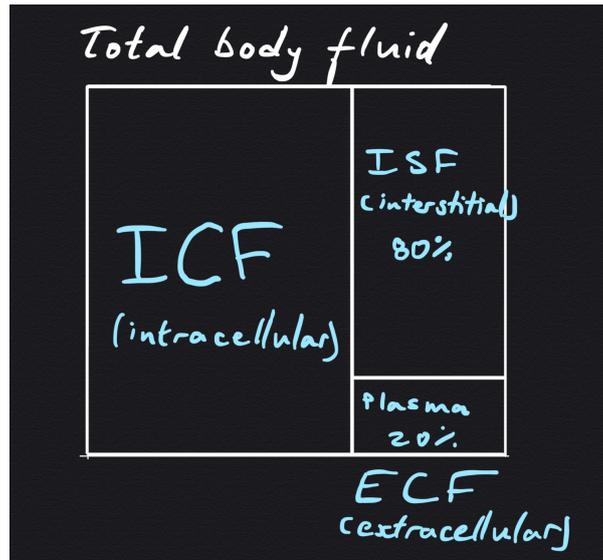


FLUID COMPARTMENTS:

total body fluid - 60% of body weight,
2/3 of this is intracellular fluid.
1/3 is extracellular fluid.

Intracellular fluid is not involved in the shock state in hypovolemic shock. In the shock state when we have hypovolaemia is **low blood volume**. The deficit is in the extracellular fluid.

About 80% of the ECF is interstitial fluid.
20% is plasma - intravascular.



WHERE DOES YOUR FLUID THERAPY GO?

Colloids (synthetic, plasma or blood) stay in the plasma volume.
Crystalloids don't stay in the intravascular space.

Pro -tip: Don't think of crystalloids as intravenous fluids, but think of them as **extracellular fluids!** They'll go almost straight into the interstitial space.

Note: When the interstitial space gets supersaturated (like a sponge) that in certain organs (eg surgery sites, kidneys) it does things like reduce cellular function and reduced healing. Excessive fluid therapy is not without consequence!

'When the sponge is dry as hell- give crystalloids. BUT, if the sponge is full, and all you have is low volume in the intravascular space then there's no benefit in filling the sponge with extra fluid.'

Most of our inadequate volume patients are either:

- Dry
- Bleeding
- Septic

Treatment: The 'dry' patient.

EXAMPLES:

The vomiting dog, like intestinal obstruction, significant acute kidney injury, Addisonian patient.

PRESENTATION:

Tachycardia, weak femoral pulses, dull demeanour, skin tenting, sunken eyes, dry mucous membranes. Elevated total protein. Clinical signs of pre-existing disease - eg vomiting for a few days, unwell.

TREATMENT:

We need to fill the pipes **and** the sponge...

Generally by the time you see these signs they have at least a 10% fluid deficit, so total volume needed is 10% of body weight, ie 1L per 10kg. **BUT not all at once.**

Pick a crystalloid: bolus: 10-20mls/kg bolus. (Rob usually uses 20mls/kg)

Give it over 10 - 15 mins (pressure infuser, pump or just as fast as it will flow if you have neither. Initial boluses is to improve perfusion. (To expand the pipe.)

Ideally want to see a drop in heart rate (eg from 160 down to 120), pinker mm and better pulses, but the most telling thing to look for is changes in mentation. They just look happier.

Once perfusion restored then we work towards replacing the total fluid deficit over the next 24 hours.

Note - remember to take what you gave at the start off your total fluid replacement volume.

Monitor response to fluid therapy through weight, clinical signs.

If available: run PCV, TP, blood gas analysis and a blood pressure.

If you can measure blood pressure and the patient is hypotensive then give fluids until we get a MAP above 60mmHG.

Monitor lactate - make sure the lactate is decreasing as you'd expect based on the change in clinical signs.

Key monitoring tools: Clinical signs, blood lactate, blood pressure.