



In The Name of
THE LORD



Perioperative fluid management

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Perioperative fluid management

- Worldwide, there are over 312 million surgical procedures performed annually. *Lancet*. 2015;385(Suppl 2):S11
- It has been previously estimated that up to 10% of patients can be classified as a high surgical risk account for 80% of post-operative mortality. *Crit Care*. 2006;10:R81
- The European Surgical Outcome Study demonstrated a 4% post-operative, in hospital mortality.
- Patients who developed any post-operative complication, in the first 30 days after surgery had a 30 day mortality of 13.3%, compared to 0.8% in those without post-operative complications.



Perioperative fluid management

- The concept of goal directed therapy
- The current focus is on fluid therapy guided by an individual patient's physiology as part of an assessment of a patient's fluid responsiveness.
- Fluid status can also be assessed by examining the microcirculation
- Fluid therapy needs to be targeted to specific end points and individualized.



FLUID CHOICE

- In health water and electrolytes can diffuse across the endothelium and move freely down their respective pressure gradients but the movement of larger molecules such as protein is limited by the glycocalyx, and they require an active transport system.
- Colloids were more likely to remain intravascularly than crystalloids, and greater hemodynamic stability could be achieved with lower volumes but increased acute kidney injury was more common.
- Crystalloids now form the mainstay of treatment. *Crit Care*. 2014;29:185.e1–7



Fluid Choice

- 0.9% saline has a chloride concentration of 154 mmol which is significantly higher than serum chloride.
- It is well recognised that its use can lead to a hyperchloremic acidosis.
- Post-operative hyperchloremia has been linked with increased post-operative complications, such as acute kidney injury and increased 30-day mortality. *Anesth Analg.* 2013;117:412–21



Factors affecting preoperative volume status or preoperative hypovolemia

Factors

Notes

Traditional preoperative fasting protocol Usually 8 h nothing by mouth

Unable to have oral intake Due to disease status

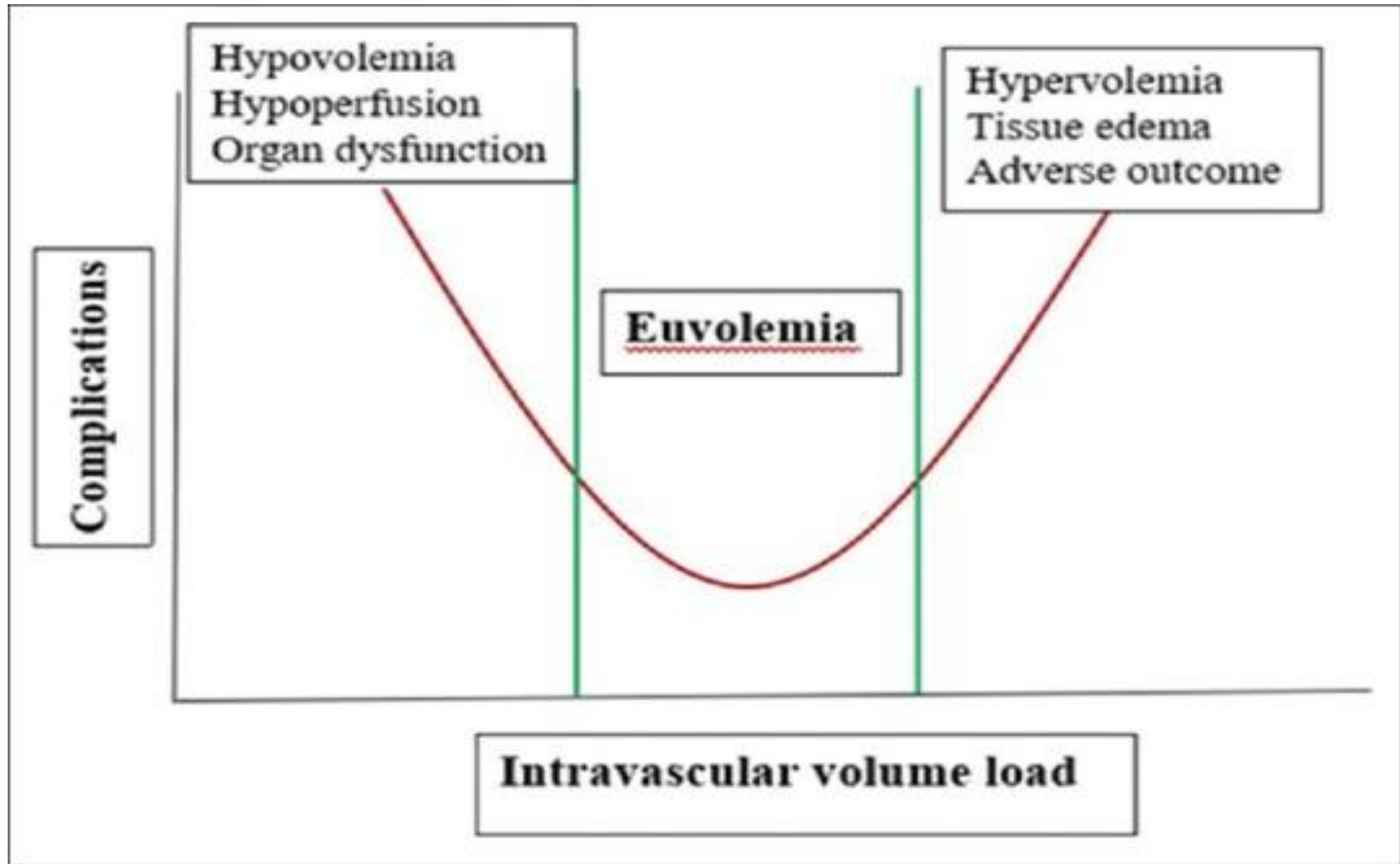
Preoperative hemorrhage Trauma patient

Other preoperative volume loss Fever, diuresis, diarrhea

LIBERAL VERSUS RESTRICTIVE STRATEGIES



- It is well acknowledged that 20% of the circulating volume must be lost before any change from baseline heart rate and blood pressure and these changes may not indicate a change in fluid status.
- General anaesthesia and neuroaxial anaesthesia can cause perioperative hypotension, which is not necessarily indicative of intravascular fluid depletion, but decreased vascular tone.
- Conversely, fluid overload may not manifest until adverse end organ effects are seen.





LIBERAL VERSUS RESTRICTIVE STRATEGIES

- More than 5 Lit for a liberal strategy, and less than 3 Lit for a conservative strategy. *J Intensive Care*. 2016;4:27
- The trend is towards increased morbidity and mortality in the liberal fluid groups, particularly those undergoing high risk or major surgery.
- A positive fluid balance has been shown to be associated with increased mortality. *Best Pract Res Clin Anaesthesiol* 2014;28:249–60



GOAL DIRECTED THERAPY

- GDT aims to meet the patient's increased oxygen demand incurred in the perioperative period, by targeted intervention, guided by haemodynamic monitoring.
- Perioperative GDT describes fluid administration, with the aim of optimising a patient's cardiac function and ultimately oxygen delivery.
- It is used for a time limited period, both during and after a surgical intervention.
- The fluid is given with the aim of increasing preload and therefore stroke volume and cardiac output to potentially supranormal targets.

GOAL DIRECTED THERAPY

- GDT evolved mainly focusing on stroke volume optimisation with less invasive cardiac output monitors



- High-risk surgical patients managed with GDT were not at increased risk of treatment related cardiovascular complications. *Crit Care*. 2013;17:209.

ADVANCED ASSESSMENT OF FLUID STATUS



- Clinical examination
- Bedside echocardiography to assess preload, contractility and afterload but due to practical constraints it is more likely to be utilized in the post-operative phase rather than during surgery.
- Cardiac output monitoring and oxygen delivery assessment.
- Pulmonary artery catheter (PAC)
- Trans-esophageal Doppler echocardiography.
- The most commonly used method of cardiac output measurement in intensive care uses pulse contour analysis to indirectly calculate cardiac output *Anesth Analg.* 2014;119:579–87



ADVANCED ASSESSMENT OF FLUID STATUS

- Studies have shown poor correlation between bioimpedance measurements and cardiac output measurements *J Cardiothorac Vasc Anesth.* 2013;27:121–34



FLUID RESPONSIVENESS

- If the heart is able to accommodate the increased volume then stroke volume will increase, otherwise the volume will remain within the venous system.(The Frank-Starling mechanism)
- The total blood volume can theoretically be divided into the unstressed and stressed volumes.
- The unstressed volume is the volume that fills the blood vessels, without causing a rise in pressure.
- The stressed volume is any additional volume, which will cause both a pressure rise and elastic distension of the vessel wall.



FLUID RESPONSIVENESS

- When a fluid challenge is given, the aim is to expand the stressed volume.
- The elastic properties, or compliance of the vessel, determine the resultant degree of distension in response to the fluid challenge.
- Mean systemic filling pressure is defined as the pressure in the vascular system when the heart is stopped and there is no blood flow, conditions which only occur in cardiac arrest.
- It related to the stressed volume and vascular compliance.



FLUID RESPONSIVENESS

- Predictors of fluid responsiveness include high pulse pressure variation, stroke volume variation, vena cava collapsibility index, dynamic passive leg raising test and end occlusion expiratory test
- A patient is deemed fluid responsive if stroke volume or cardiac output increase by at least 10% following a fluid challenge.
- Only 50% of patients admitted to intensive care respond to fluid loading.
- 500 cc N/S median rate of administration 1000 ml/h.
- The rate of 4 ml/kg is the option which most reliably stresses the cardiac system, to differentiate responders from non-responders.

Commonly used volume status measurement techniques



Physical examinations

Mental status

Capillary refill

Extremity temperature

Skin turgor

Skin perfusion

Urine output

Laboratory tests

Fractional excretion of sodium, urea

Blood lactate level

Mixed venous oxygen saturation

Commonly used volume status measurement techniques



Intravascular/cardiac catheterization	CVP
	PAWP
	SVV
	LVEDP
Doppler/echocardiography	LVEDV
	SV
	CO
	CI