ADQI 12 Figures

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Figure A1. Domains leading to hypoperfusion at both the macro and microcirculatory level.

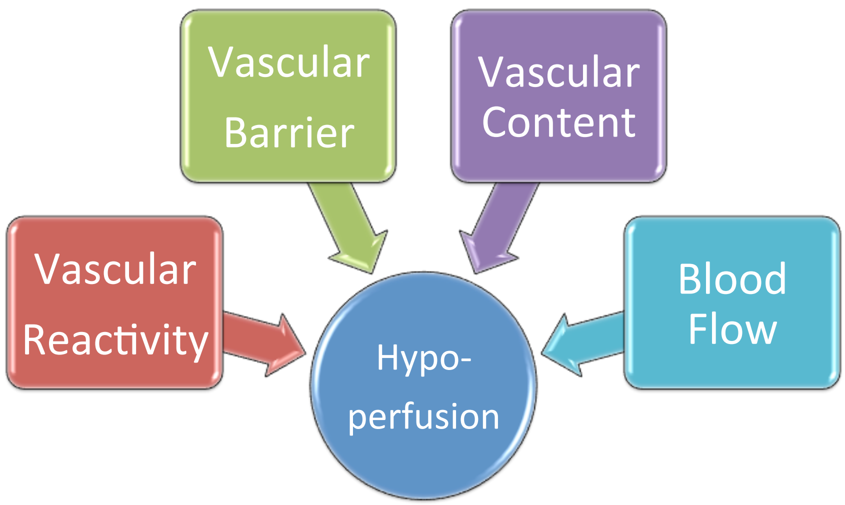

Figure A2. Patient example. In this example, the patient is volume responsive, BUT volume may not be the optimal therapy.

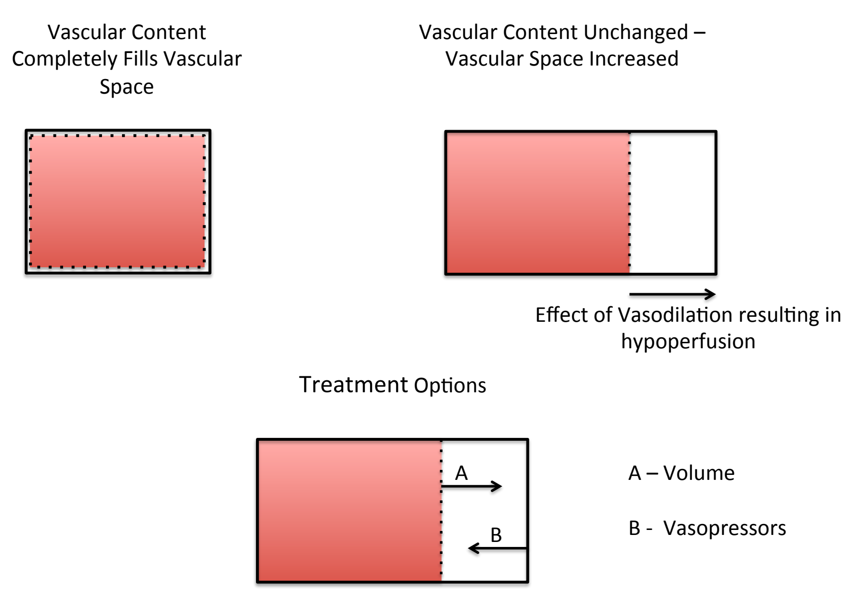

Figure A3. Vascular Components (VC) approach. BF – Blood Flow, vC = Vascular Content, vB = Vascular Barrier, vR = Vascular Reactivity. *Resuscitation and optimisation can involve fluid removal in certain cases.

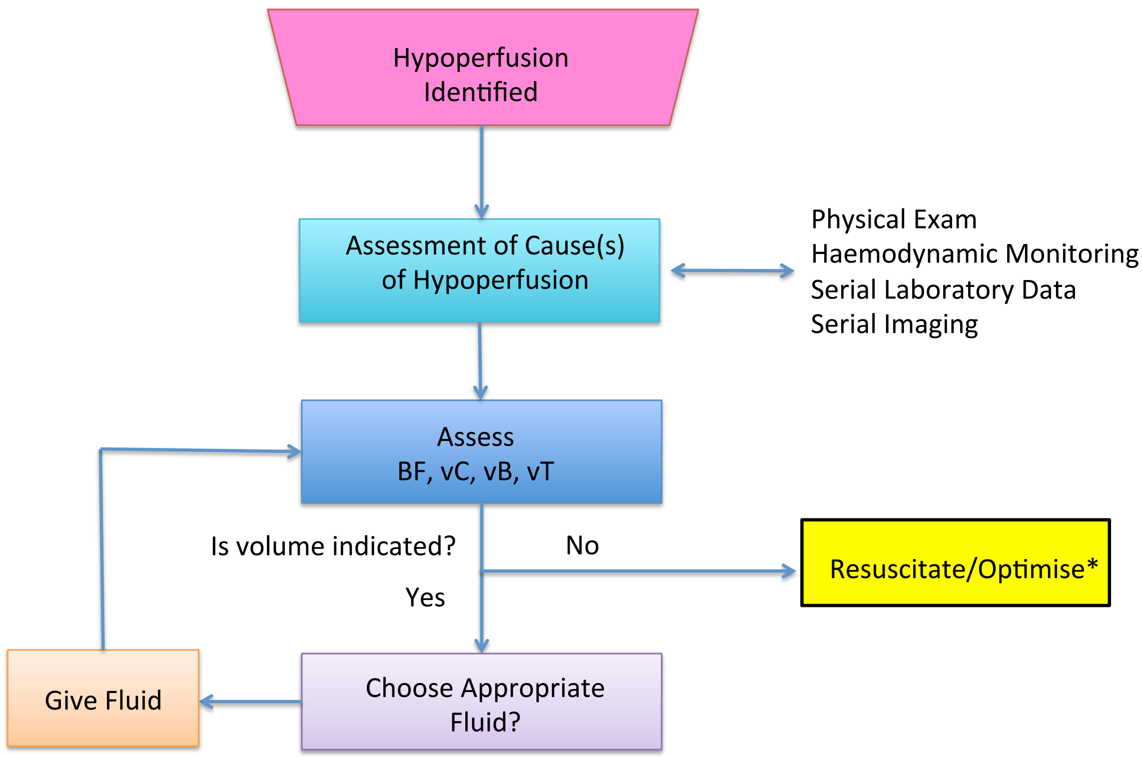

Figure B1. **The revised Starling model in Health**. Key updates to the original model: overall filtration is much less than predicted by the original model as the important forces are the transendothelial pressure difference and the plasma–subglycocalyx oncotic pressure difference. Interstitial oncotic pressure is not a determinant of transvascular filtration. There is no reabsorption of fluid into the intravascular space from the interstitium.

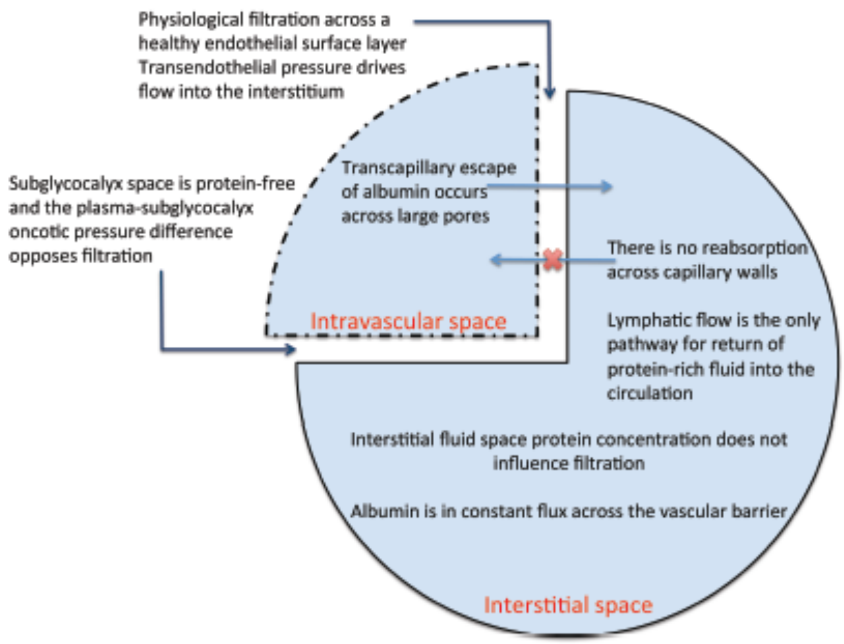

Figure B2. **The revised Starling model during critical illness.** Loss of the glycocalyx; reduction in the effective circulating intravascular volume; and, expansion of the interstitial space occur. Infusion of colloid solution increases the plasma volume, while infusion of crystalloid increases intravascular volume – filtration remains low in both cases when capillary pressures are low. Conversely, oedema occurs regardless of fluid type when capillary pressures are supranormal.

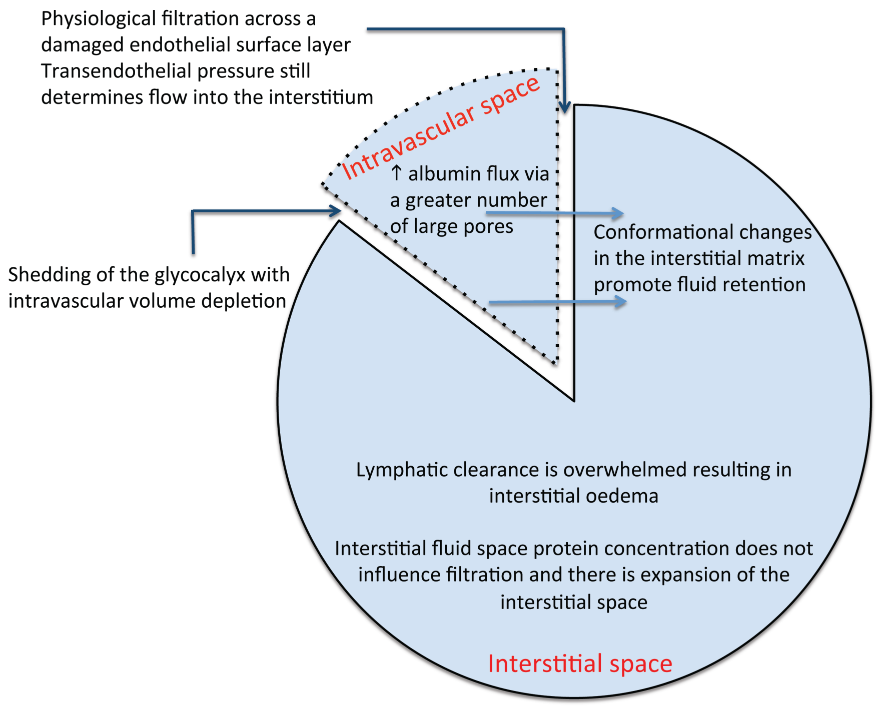

Figure B3. **Network of studies evaluating 'fluid choice' in critical care.** The network approach allows indirect comparisons in addition to the conventional direct comparisons. Each of circles represents a particular type of fluid studied either in randomized or in observational comparisons. The size of the circle represents the number of patients that received that specific fluid across multiple trials. As shown, trials have typically compared saline with colloids (HES or Albumin suspended in saline) but have not compared crystalloids with each other. Numbers adjacent to the lines represent studies performing direct pair-wise comparisons, while arrows represent the direction of significant superiority in the Network Meta-analysis. Finally, the dotted line represents observational comparisons.

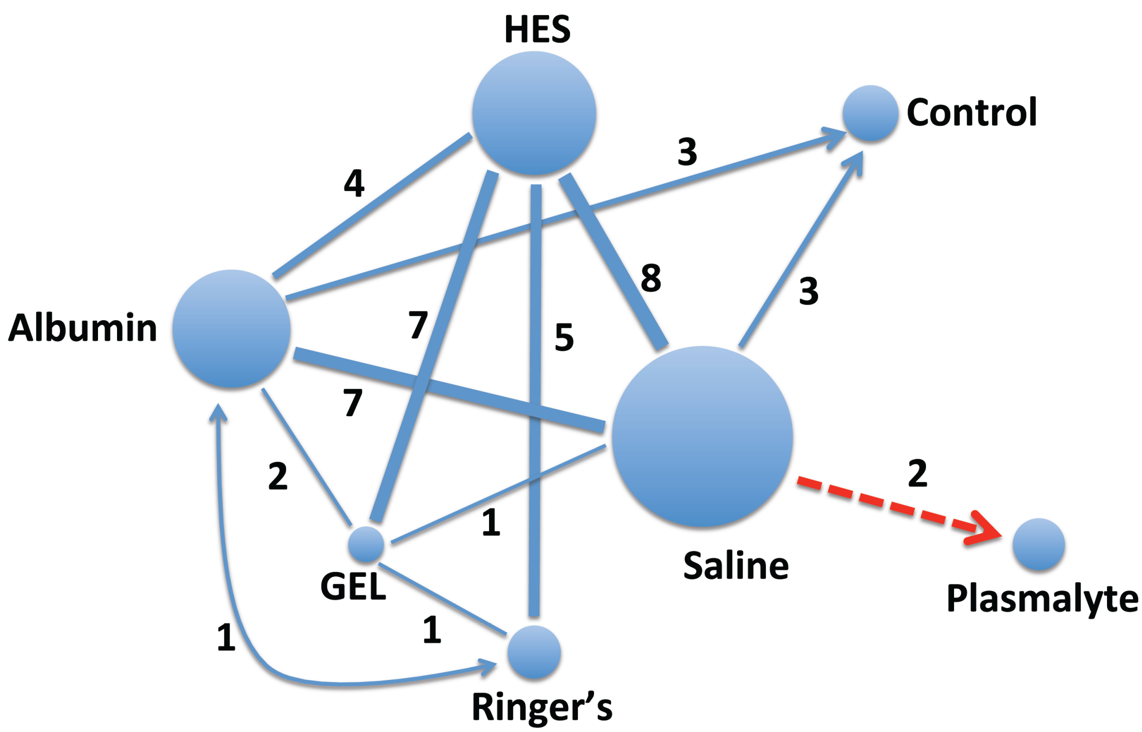

Figure C1. **Relationship between the different stages of fluid resuscitation.**

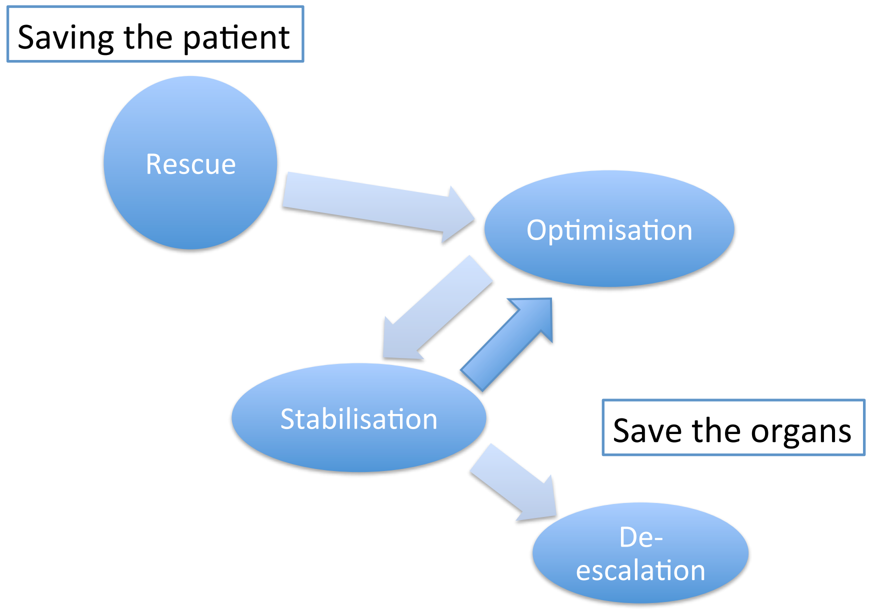

Figure C2. **Patients' volume status at different stages of resuscitation**

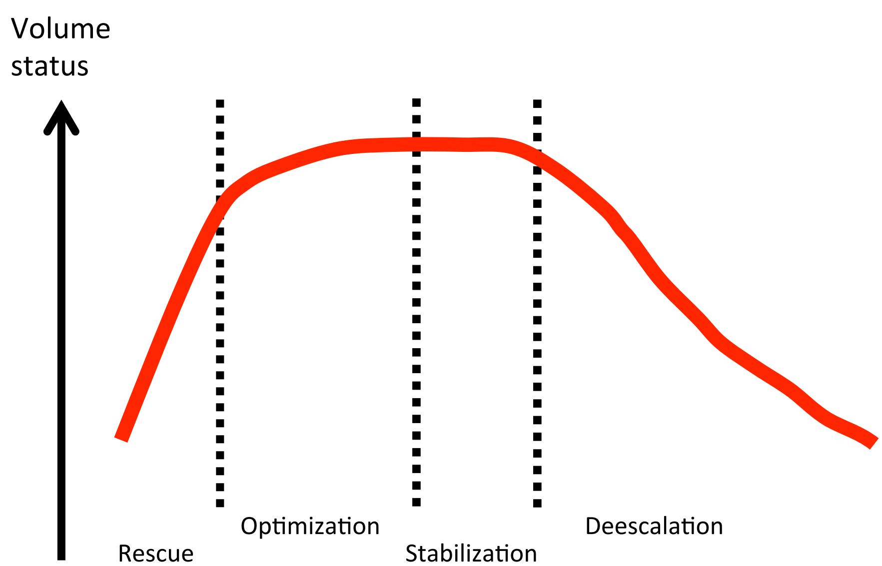

Figure C3. Minimum and desirable monitoring set at each stage of fluid therapy.

Minimum Monitoring Requirement	Rescue	Optimisation	Stabilisation	De-escalation
Blood Pressure				
Heart Rate				
Lactate/Arterial Blood Gases				
Capillary Refill/ Pulse volume				
Altered Mental Status				
Urine Output				
Fluid balance				

Optimum Monitoring	Rescue	Optimisation	Stabilisation	De-escalation
Echo/Doppler				
CVP Monitoring				
$ScvO_2$				
Cardiac Output				
Signs of Fluid Responsiveness				
Fluid Challenge				

Figure D1. **Trajectories of Fluid Balance and Management.** A patient's planned fluid balance trajectory correlates with the phases of resuscitation. A typical fluid balance pathway is depicted by scenario 1. Fluid balance may increase through initial salvage and optimisation (A) until attainment of initial treatment goals. After a period of stabilisation (B), de-escalation (C) may encompass fluid removal to return the patient to net euvolemia. In select situations the planned fluid balance trajectory may differ. For example, in acute decompensated heart failure, the patient may enter salvage and optimisation with a relatively high fluid balance, but may require more rapid fluid removal during de-escalation. (Scenario 2, red line)
In other situations, fluid removal efforts during de-escalation may fail, prompting escalation of fluid management interventions. (Scenario 3).

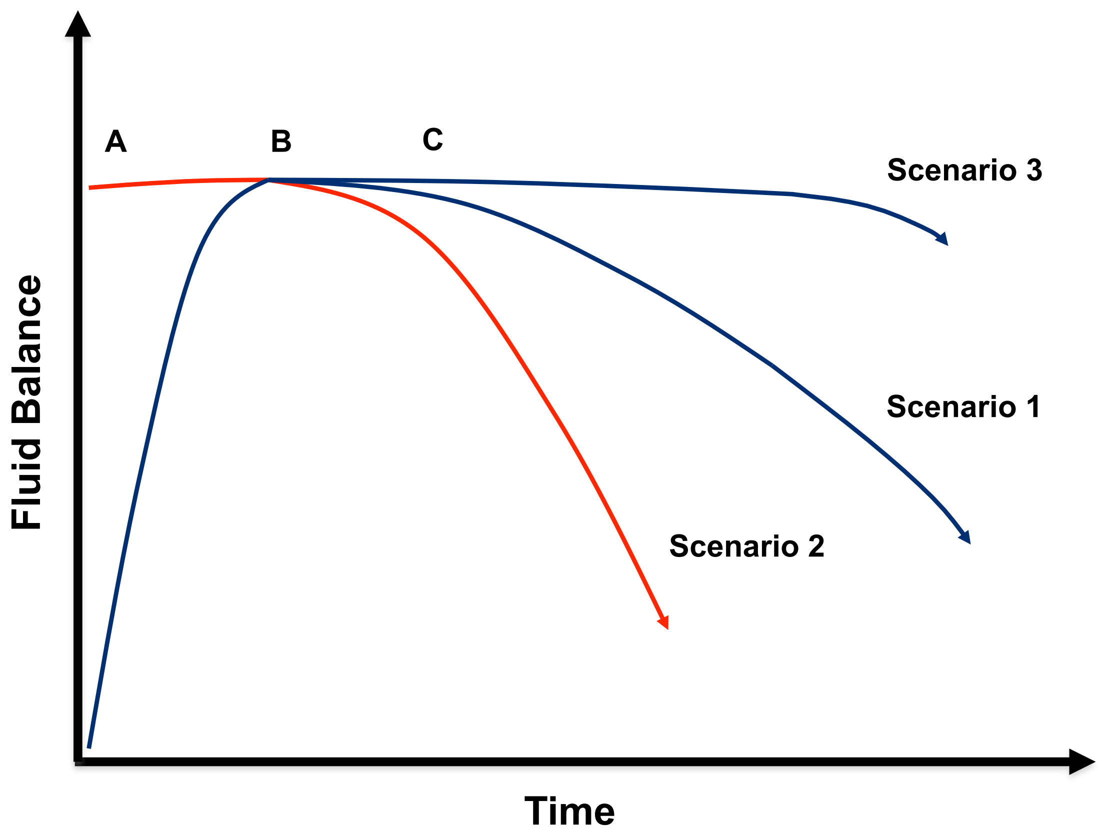

Figure D2. **Fluid balance trajectory.** Clinical care encompasses adherence to an intended fluid balance trajectory. Deviation from the trajectory (either above or below the intended pathway) should prompt adjustments in fluid management strategies.

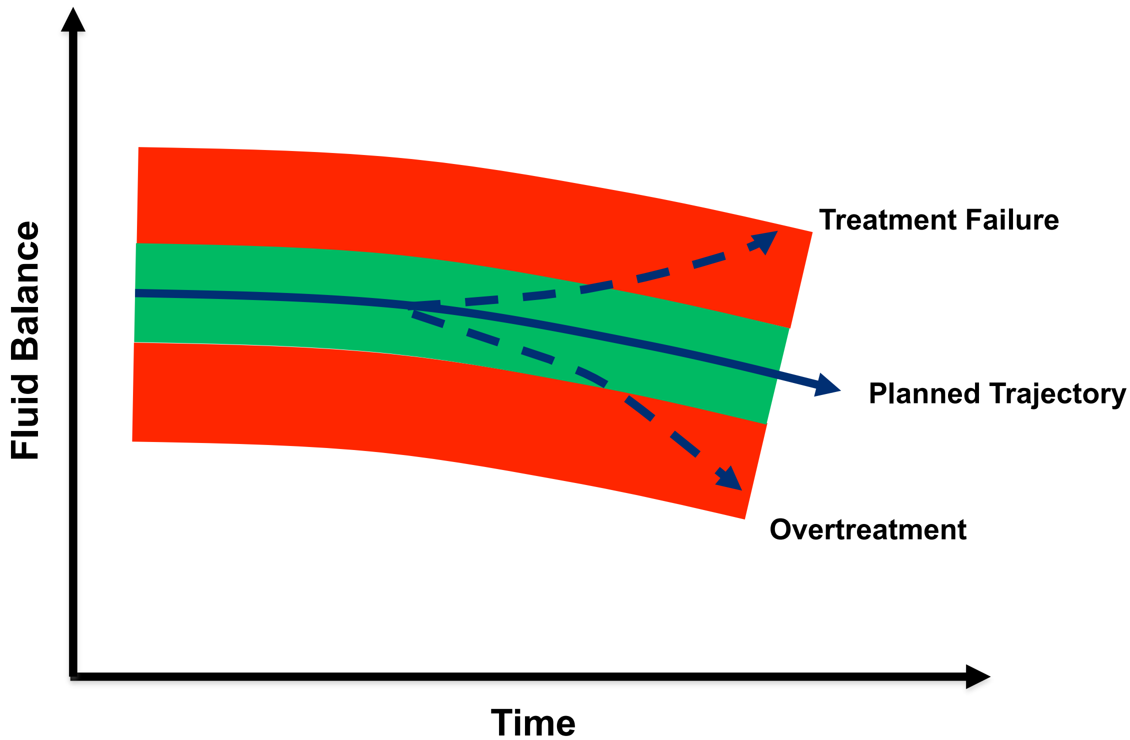

Figure E1. **Pathways in fluid management.** Each patient has an optimal fluid balance that can be disturbed in critical illness. In some cases, patients may become fluid overloaded as a consequence of aggressive fluid resuscitation. In other situations, patients may present with fluid overload, such as in acute decompensated heart failure. In any event, therapies to reverse the fluid overload are required to restore optimum fluid balance. Mechanical fluid removal should be considered when emergent and rapid fluid removal is needed or when pharmacological therapies have failed.

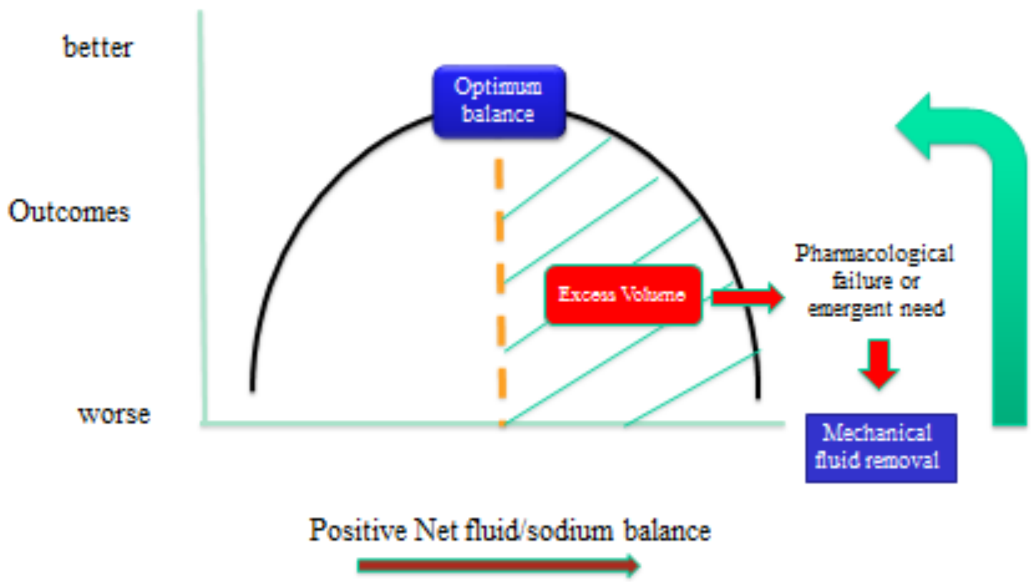

Figure E2. **Fluid management strategies in critical illness: the place of mechanical fluid removal.** Once hypovolaemia has been corrected, fluid overload needs to be avoided. If clinically significant fluid overload occurs or is anticipated, it needs to be quantified. Early mechanical fluid removal should be considered if specific indications exist. During therapy, haemodynamic and intravascular volume status should be monitored and fluid removal rate and fluid balance targets reassessed regularly aiming for clinical stability and tolerance of fluid removal. Within this pathway RRT should be considered at any point if additional solute clearance is necessary. **Abbreviations**: ECMO – Extra-corporeal membrane oxygenation; FB - Fluid Balance; RRT- Renal replacement therapy; UF- Ultrafiltration

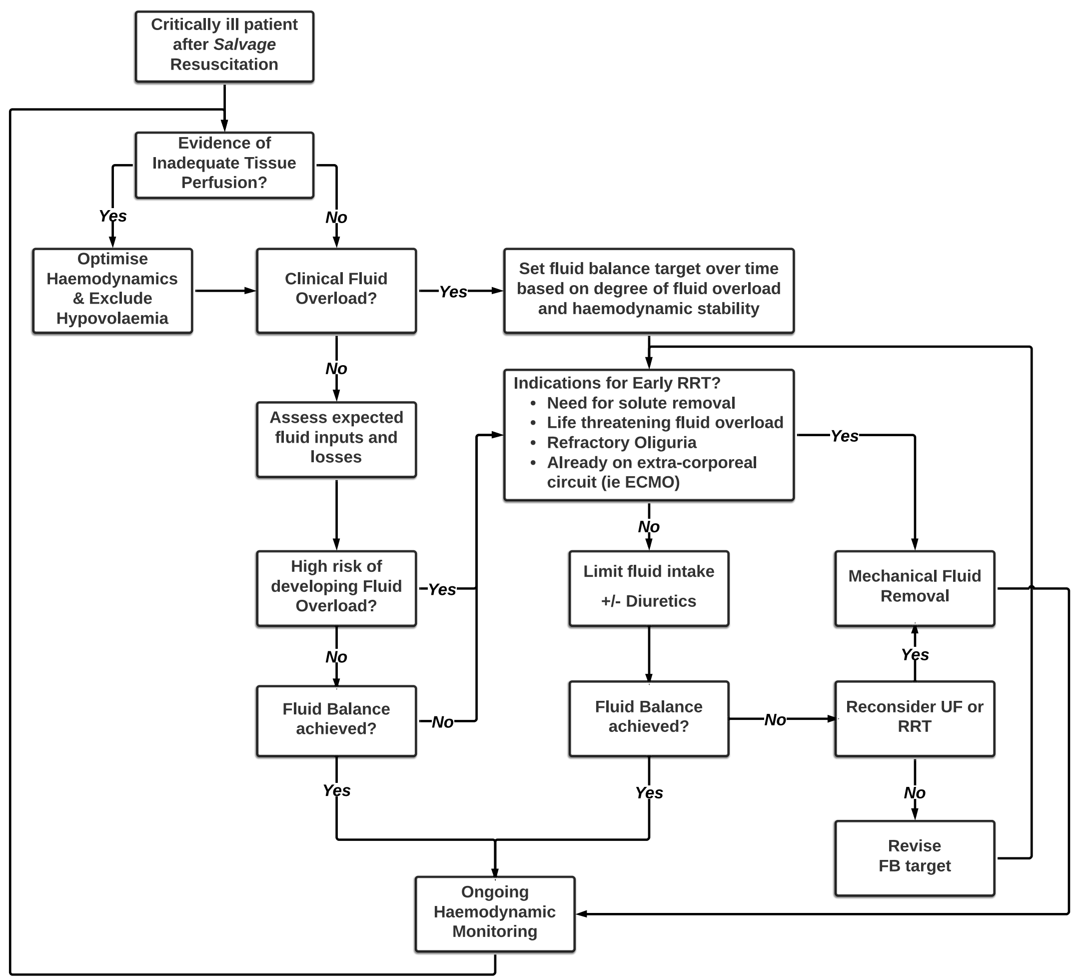

Figure E3. **Figure 3: Rate of mechanical fluid removal.** Examples of patients with fluid overload as a result of disease or fluid resuscitation requiring mechanical fluid management to illustrate how different rates of fluid removal are appropriate to different clinical settings. Rapid early fluid removal may be indicated in cardio-renal syndrome (**A**), but a slower removal than required for haemodynamic tolerability after resolution of pulmonary oedema. Patients with single organ renal failure (**B**) may tolerate more rapid fluid removal than patients with acute kidney injury complicating severe sepsis (**C**) or septic shock (**D**). In septic shock mechanical fluid removal may at first be targeted to limit the accumulation of further fluid until clinical stabilization allows slow resolution of accumulated fluid excess.