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ESICM 2025 Guideline on Fluid Therapy in Adult Critically Ill Patients

The European Society of Intensive Care Medicine (ESICM) convened an international panel of experts to develop evidence-based guidelines on fluid resuscitation volumes for adult critically ill patients with circulatory failure. This guideline represents Part 2 of a three-part series on fluid management, focusing specifically on resuscitation fluid volumes, while Part 1 addresses fluid types and Part 3 covers fluid removal during de-escalation.

The primary goal of fluid therapy is to increase stroke volume and cardiac output, thereby improving systemic blood flow and tissue perfusion. However, the appropriate volume of resuscitation fluids varies considerably depending on the underlying pathophysiology of circulatory failure, clinical context, and practice settings.

Sepsis and Septic Shock

Fluid resuscitation remains a cornerstone of septic shock management, with treatment conceptualised in four phases: initial resuscitation, optimisation, stabilisation, and recovery. The initial phase represents the salvage period when patients are first identified as being in shock and haemodynamic monitoring is not yet applied, typically covering the first one to six hours of treatment and usually completed within three hours in high-income countries.

The Surviving Sepsis Campaign guidelines have historically suggested administering at least 30 ml/kg of crystalloids within the first three hours. However, this recommendation was based primarily on observational data rather than randomised controlled trials, and its appropriateness has been questioned. The ESICM panel found no trials specifically comparing 30 ml/kg to other volumes, resulting in very low certainty of evidence. Current practice in recent trials shows clinicians typically administer a mean or median of 1-3 litres (or 20-35 ml/kg) within 3-6 hours, though with wide variability ranging from 500 ml to 5 litres.

The panel issued a conditional recommendation suggesting administration of up to 30 ml/kg of intravenous crystalloids during the initial phase, with critical caveats. Adjustments should be based on clinical context, including the origin of sepsis, cardiovascular comorbidities, and presence or absence of fluid losses. Clinicians should assess patients clinically and consider fluid responsiveness testing when possible before administering additional crystalloids, recognising that some patients may require more or less than 30 ml/kg.

Evidence from low- and middle-income countries (LMICs) suggests caution with large fluid volumes in resource-limited settings. A trial in Zambia found higher mortality with protocol-based care, including larger fluid volumes, compared to standard care. A pediatric trial in sub-Saharan Africa showed increased mortality with fluid boluses. These differences may reflect resource constraints, limited access to mechanical ventilation and monitoring, or patient population variations, warranting careful consideration in similar contexts.

During the optimisation phase, when haemodynamic monitoring becomes available, the panel addressed two key questions: whether to use systematic restrictive versus liberal strategies, and whether to employ individualised approaches.

Recent meta-analyses including 13 trials with over 4,000 patients found no difference in mortality, serious adverse events, duration of mechanical ventilation, vasopressor-free days, or need for renal replacement therapy between approaches. The certainty of evidence was moderate for mortality. The landmark CLASSIC and CLOVERS trials contributed most patients to these analyses. Both groups in CLASSIC received relatively high cumulative fluid volumes (approximately 10-12 litres), potentially attenuating intervention effects. Based on this evidence, the panel made no recommendation for or against systematic restrictive or liberal fluid administration during optimisation.

For individualised approaches, the panel suggested their use over non-individualised strategies, though with very low certainty of evidence. Individualisation involves monitored fluid administration via fluid challenges aimed at improving preload and reversing tissue hypoperfusion. Key components include systematic fluid responsiveness assessment, consideration of haemodynamic phenotypes and selection of appropriate resuscitation targets. Eight trials comparing fluid responsiveness assessment with usual care showed no statistically significant differences in mortality, ventilator-free days, or renal replacement therapy need, though the evidence was limited and heterogeneous.

Haemorrhagic Shock

For penetrating trauma, the panel suggested a restrictive fluid resuscitation strategy as part of permissive hypotension compared to liberal strategies before definitive haemorrhage control. This recommendation carries moderate certainty of evidence. A meta-analysis of three trials with 831 penetrating trauma patients showed reduced mortality with permissive hypotension. The target systolic blood pressure is typically around 80-90 mmHg or mean arterial pressure of 50-60 mmHg.

The rationale for restrictive approaches includes that lower blood pressure may slow bleeding rates, reduce hydrostatic pressure in injured vessels, preventing clot dislodgement, and limit dilutional coagulopathy and hypothermia. However, most evidence comes from a single 1994 trial contributing 72% of the meta-analysis weight, indicating need for updated research given significant advances in trauma care.

For blunt trauma, similar principles apply. The panel suggested restrictive fluid resuscitation with permissive hypotension before definitive haemorrhage control, though with lower certainty of evidence given only two trials included mixed trauma types without ability to perform blunt trauma-specific meta-analysis. For both penetrating and blunt trauma, these recommendations do not apply to intraoperative management or after haemorrhage control, and insufficient data exist for patients with associated traumatic brain injury, who may require higher blood pressure targets to ensure adequate cerebral perfusion.

For haemorrhagic shock from non-traumatic causes, the panel issued an ungraded best practice statement that fluid administration should be guided by haemodynamic and biochemical parameters within the context of the primary disease state. Target parameters include correction of metabolic acidosis, hypothermia, platelet counts, and coagulation factors. Evidence includes small trials in upper gastrointestinal haemorrhage and postpartum haemorrhage showing potential benefits of conservative approaches, though with limited data precluding formal graded recommendations.

Obstructive Shock

For circulatory failure due to acute pulmonary embolism, fluid management remains controversial. While de-obstruction through thrombolytic therapy is the primary treatment, haemodynamic support is essential before substantial improvement occurs. However, fluid administration risks worsening right ventricular function, particularly in the presence of severe right heart congestion.

The panel reviewed nine studies with 456 human patients, though only 13 patients in one study were actually in shock. Evidence suggests fluid resuscitation may not be beneficial when severe right heart congestion is present, detectable through surrogate markers including central venous pressure exceeding 10 mmHg, echocardiographic findings of right ventricular dilation exceeding left ventricular size, or clinical examination showing elevated jugular venous pressure or hepatomegaly. The panel issued an ungraded best practice statement recommending caution with fluid administration, with decisions based on measured surrogate markers of right heart congestion.

Cardiac tamponade represents life-threatening cardiac compression from increased pericardial pressure due to fluid, solid, or gas accumulation. Traditional teaching suggests fluid boluses could maintain systemic venous return and prevent right ventricular diastolic collapse. However, evidence from 88 patients receiving 500 ml fluid boluses showed variable responses: only 47% were fluid responders with increased cardiac output, while 22% showed no change, and 31% experienced decreased cardiac output. Predictors of favourable response included low baseline systolic blood pressure and cardiac index. The panel recommended fluids be given cautiously, only as a temporary measure until definitive pericardial drainage, emphasising that fluid administration must not delay definitive management.

Left-Sided Cardiogenic Shock

For circulatory failure due to left-sided cardiogenic shock, fluid management differs fundamentally from other shock types. Unlike hypovolaemic or septic shock where fluid resuscitation is critical, fluid administration in cardiogenic shock can exacerbate heart failure and worsen pulmonary oedema. The panel issued an ungraded best practice statement that fluid resuscitation should not be the primary treatment. While some patients may benefit from cautious fluid challenges, the high risk of inducing or worsening pulmonary congestion precludes widespread use as an initial haemodynamic intervention. When fluids are administered, close monitoring for pulmonary edema is essential. A tailored, case-by-case approach is recommended rather than universal fluid administration.

The guideline made four conditional recommendations, four ungraded best practice statements, and no recommendations for two questions due

to insufficient evidence. Overall evidence certainty was predominantly very low to low, with moderate certainty only for specific aspects of septic shock optimisation and traumatic haemorrhagic shock. The panel identified substantial knowledge gaps requiring future research, including well-designed randomised trials assessing optimal fluid volumes in sepsis initial resuscitation, individualised approaches based on patient characteristics, specific blood pressure targets for different trauma types, and fluid management strategies for obstructive shock aetiologies.

Source: Intensive Care Medicine

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Published on : Wed, 29 Oct 2025