

SOME OF THE BEST IV FLUID TRIALS

a short history

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2004	A comparison of albumin and saline for fluid resuscitation in the intensive care unit (SAFE). N Engl J Med 2004. Finfer.	In patients in the ICU, use of either 4 percent albumin or normal saline for fluid resuscitation results in similar outcomes at 28 days.
2008	Sepsis Occurrence in Acutely Ill Patients (SOAP) Investigators: A positive fluid balance is associated with a worse outcome in patients with acute renal failure. Crit Care 2008. Payen.	In this large European multicenter study, a positive fluid balance was an important factor associated with increased 60-day mortality. Outcome among patients treated with RRT was better when RRT was started early in the course of the ICU stay.
2011	Mortality after Fluid Bolus in African Children with Severe Infection (FEAST Trial). N Engl J Med 2011. Maitland.	Fluid boluses significantly increased 48-hour mortality in critically ill children with impaired perfusion in these resource-limited settings in Africa.
2011	Fluid balance, diuretic use, and mortality in acute kidney injury. Clin J Am Soc Nephrol. 2011. Grams. National Heart, Lung, and Blood Institute Acute Respiratory Distress Syndrome Network.	A positive fluid balance after AKI was strongly associated with mortality. Post-AKI diuretic therapy was associated with 60-day patient survival in FACTT patients with ALL; this effect may be mediated by fluid balance.
2012	Assessment of hemodynamic efficacy and safety of 6% hydroxyethylstarch 130/0.4 versus 0.9% NaCl fluid replacement in patients with severe sepsis: the CRYSTMAS study. Crit Care 2012. Guidet.	Significantly less volume was required to achieve HDS for HES vs. NaCl in the initial phase of fluid resuscitation in severe sepsis patients without any difference for adverse events in both groups.
2012	Hydroxyethyl Starch 130/0.4 versus Ringer's Acetate in Severe Sepsis N Eng J Med 2012; 367:124-134. Perner.	Patients with severe sepsis assigned to fluid resuscitation with HES 130/0.42 had an increased risk of death at day 90 and were more likely to require renal-replacement therapy, as compared with those receiving Ringer's acetate.
2012	Hydroxyethyl Starch or Saline for Fluid Resuscitation in Intensive Care (CHEST). NEJM 2012. Myburgh.	In patients in the ICU, there was no significant difference in 90-day mortality between patients resuscitated with 6% HES (130/0.4) or saline. However, more patients who received resuscitation with HES were treated with renal-replacement therapy.
2012	Association between a chloride-liberal vs chloride-restrictive intravenous fluid administration strategy and kidney injury in critically ill adults. JAMA 2012. Yunos.	The implementation of a chloride-restrictive strategy in a tertiary ICU was associated with a significant decrease in the incidence of AKI and use of RRT.



2013	Fluid Balance in Patients with Acute Kidney Injury: Emerging Concepts. Nephron Clin Pract 2013. Godin. <i>FO is associated with worse outcomes, including the possibility of decreased renal recovery in critical care patients. It is therefore important to understand that fluid therapy in the critical care unit is a dynamic process.</i>	<i>Efforts should be made to find a balance between giving sufficient fluid therapy to maintain hemodynamic stability and organ perfusion while avoiding overzealous volume administration. This may be achieved by initial goal-directed resuscitation during acute presentation and thereafter aiming for a neutral or slightly negative fluid balance. If fluid therapy is indicated, as in true hypovolemia, crystalloids should be favored. Synthetic colloids should be avoided, considering the extensive data regarding their safety profile and lack of clear clinical benefits. Diuretics should be used as adjunctive therapy in AKI to treat FO and possibly to prevent it; however, they should not be continued if there is no an adequate response. Patients with significant fluid accumulation and who are unresponsive to diuretics should be considered for early initiation of RRT to correct FO.</i>
2013	Effects of Fluid Resuscitation With Colloids vs Crystalloids on Mortality in Critically Ill Patients Presenting With Hypovolemic Shock. The CRISTAL Randomized Trial. JAMA 2013. Annane.	Among ICU patients with hypovolemia, the use of colloids vs crystalloids did not result in a significant difference in 28-day mortality. Although 90-day mortality was lower among patients receiving colloids, this finding should be considered exploratory and requires further study before reaching conclusions about efficacy.
2013	Impact of crystalloids and colloids on coagulation cascade during trauma resuscitation-a literature review. Emergency Medicine and Health Care 2013. Kaczynski.	A literature review has also indicated that none of the studies demonstrated survival or outcome benefit associated with a particular type and volume of administered intravenous fluids. The results are controversial and further research is needed to clarify this issue.
2013	Perioperative Intravenous Fluid Therapy for Adults. Ulster Med J 2013. Mac Sweeney.	In summary, prescribe IV fluids only where necessary, for as short a period as possible, and monitor the patient clinically and biochemically. Use Hartmann's solution, unless there is a specific reason to use saline or dextrose, and seriously consider what advantage the prescription of a colloid will actually provide
2013	Dose and type of crystalloid fluid therapy in adult hospitalized patients. Perioperative Medicine 2013. Smorenberg.	Isotonic and hypertonic crystalloid fluids are the fluids of choice for resuscitation from hypovolemia and shock. The evidence that balanced solutions are superior to unbalanced ones is increasing. Hypertonic saline is effective in mannitol-refractory intracranial hypertension, whereas hypotonic solutions are contraindicated in this condition.
2014	Indications and management of mechanical fluid removal in critical illness. Rosner. Br J Anaesth 2014;113(5):764-771	Mechanical fluid removal should be considered as a therapy for FO



2014	Albumin Replacement in Patients with Severe Sepsis or Septic Shock (ALBIOS study). New Engl J Med 2014. Caironi.	In patients with severe sepsis, albumin replacement in addition to crystalloids, as compared with crystalloids alone, did not improve the rate of survival at 28 and 90 days.
2014	Water balance, acute kidney injury and mortality of intensive care unit patients. J Bras Nefrol 2014. Avila.	Suggests that positive water balance may be used as a potential early biomarker of AKI in these patients (the critically ill)
2014	Albumin Replacement in Patients with Severe Sepsis or Septic Shock (ALBIOS study). New Engl J Med 2014. Caironi.	In patients with severe sepsis, albumin replacement in addition to crystalloids, as compared with crystalloids alone, did not improve the rate of survival at 28 and 90 days.
2015	Passive leg raising: five rules, not a drop of fluid! Crit Care 2015; Monnet.	The Famous 5 Rules!
2015	Fluid and electrolyte overload in critically ill patients: An overview. World J Crit Care Med 2015. Adler.	Fluids are a cornerstone of the management of critically ill patients with systemic inflammatory response syndrome who are at risk of multiple organ dysfunction syndrome. However, as with any therapy, fluids can be associated with harm, such as added or worsening organ dysfunctions. Therefore, patients should be weaned from fluids when possible, sometimes through an active de-resuscitation strategy.
2015	Effect of a Buffered Crystalloid Solution vs Saline on Acute Kidney Injury Among Patients in the Intensive Care Unit (SPLIT Trial). JAMA 2015. Young.	Among patients receiving crystalloid fluid therapy in the ICU, use of a buffered crystalloid compared with saline did not reduce the risk of AKI. Further large randomized clinical trials are needed to assess efficacy in higher-risk populations and to measure clinical outcomes such as mortality.
2015	Postoperative fluid management. World J Crit Care Med 2015. Kayilioglu.	Types of the fluids, amount of the fluid given and timing of the administration are the main topics that determine the fluid management strategy. Assessment of the patient's responsiveness to fluid resuscitation should determine the need of extra volume. Due to lack of evidence that supports central venous pressure (CVP) as an indicator of body fluid needs, we should not make our fluid resuscitation decisions based on CVP levels. On the other hand dynamic measures can be used to determine patient's fluid status. Among all fluid management strategies, goal directed strategy is the most rational approach to maintain optimum fluid balance.



2015	Intravenous balanced solutions: from physiology to clinical evidence. Malbrain, Ceroni et al. Anaesthesiology Intensive Therapy 2015. ISSN 0209-1712	The type of fluid, the dose, the rate of administration, the timing and the duration of the treatment are all equally important. Intravenous balanced solutions have potentially several physiologically relevant advantages, although the actual translation of such rationale into clinically relevant outcomes is still unclear. Moreover, the "ideal" intravenous balanced solution including all the characteristics necessary for such definition (least effect on acid-base, and electrolyte content equal to that of plasma), has instead of have not yet become available. Whether or not the use of intravenous balanced solutions is beneficial in high-risk patient categories (sepsis, trauma, burns), when exposed to larger amounts of fluids or when at higher risk of AKI, still needs to be investigated. Moreover, further research on the potential mechanisms underlying the clinical effects observed on specific types of crystalloid solutions is warranted.
2016	Restricting volumes of resuscitation fluid in adults with septic shock after initial management: the CLASSIC randomised, parallel-group, multicentre feasibility trial. Intensive Care Med 2016. Hjortrup.	A protocol restricting resuscitation fluid successfully reduced volumes of resuscitation fluid compared with a standard care protocol in adult ICU patients with septic shock. The patient-centred outcomes all pointed towards benefit with fluid restriction, but our trial was not powered to show differences in these exploratory outcomes.
2016	Passive Leg Raising in Intensive Care Medicine. Chin Med J 2016. He.	PLR is a potential and attractive method for assessing fluid status in critically ill patients. Before the era of "PLR for fluid responsiveness," more attention should be paid and more education should be provided regarding the details of PLR in clinical practice.
2016	Fluid overload in the ICU: evaluation and management. BMC Nephrology 2016;17:109 Claire-Del Granado.	In critically ill patients, fluid overload is related to increased mortality and also lead to several complications like pulmonary edema, cardiac failure, delayed wound healing, tissue breakdown, and impaired bowel function. Therefore, the evaluation of volume status is crucial in the early management of critically ill patients. Diuretics are frequently used as an initial therapy; however, due to their limited effectiveness the use of continuous renal replacement techniques are often required for fluid overload treatment. Successful fluid overload treatment depends on precise assessment of individual volume status, understanding the principles of fluid management with ultrafiltration, and clear treatment goals.
2016	A rational approach to fluid therapy in sepsis. Br J Anaesth 2016. Marik.	Data suggest that a physiologic, haemodynamically guided conservative approach to fluid therapy in patients with sepsis would be prudent and would likely reduce the morbidity and improve the outcome of this disease.



2016	The Use of Fluids in Sepsis. Cureus 2016. Avila.	It is well established that fluid resuscitation is a central component of sepsis management; however, to date there is no consensus as to the ideal composition of fluid used for resuscitation. In this review, we discuss the progression of clinical research comparing various fluids, as well as the historical background behind fluid selection for volume resuscitation. We conclude that the use of balanced fluids, such as Ringer's Lactate, seems very promising but further research is needed to confirm their role.
2017	Early fluid loading for septic patients: Any safety limit needed? Chinese Journal of Traumatology 2017. Gong.	Fluid loading is fundamental for assessing and reversing hypovolemia in patients with sepsis and septic shock. Recently, a priority was often given to hemodynamic stability rather than organ function alternation in our practices of early fluid resuscitation for sepsis. However, practices of aggressive fluid loading, especially those far beyond recommendations of current guidelines, were risk potential to administrate excessive fluids to septic patients, which was highly associated with worse outcomes. Therefore, a safety limit will be a big step forward to fluid optimization for septic patients.
2018	Balanced Crystalloids versus Saline in Critically Ill Adults (SMART). N Engl J Med 2018. Semler.	Among critically ill adults, the use of balanced crystalloids for intravenous fluid administration resulted in a lower rate of the composite outcome of death from any cause, new renal-replacement therapy, or persistent renal dysfunction than the use of saline.

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