

Albumin solutions range from 4% to 25%. The solutions of 5% are near iso-osmotic to that of normal plasma. Higher concentrations (20-25%) are hyperosmotic. Sodium concentrations range from 130-160 mEq/L. Albumin has relatively few direct adverse effects but some long term adverse effects and significantly increased cost compared to crystalloid.¹ Therefore, its use should be used appropriately as with any medication.² A significant amount of research regarding the use and administration of albumin exists but controversial uses remain and needs further investigation.³

Appropriate Use of Albumin:

1. Post paracentesis if > 4L of ascites removed. May use 6-8g of albumin for each liter removed⁴
2. Therapeutic plasmapheresis : Albumin is appropriate if exchange is > 20ml/kg in one session or repeated sessions
3. Spontaneous bacterial peritonitis : Recommended albumin administration of 25% in the amounts of 1.5g/kg day 1 and 1.0g/kg day 3
4. Hepatorenal Syndrome is an appropriate use of albumin both for the diagnosis and treatment as indicated below:
 - a. **Diagnosis:** Part of diagnosis includes lack of improvement in renal function after stopping diuretics and administering 1g/kg of albumin up to 100g for 2 consecutive days.
 - b. **Treatment of Type I HRS:** Albumin infusion of 1g/kg of albumin up to 100g + octreotide and midodrine

Inappropriate Uses of Albumin:

1. Albuminemia > 2.5 g/dl unless indicated above⁵
2. Hypoalbuminemia in the absence of edema or acute hypotension
3. Immediately post-op unless indicated below (see #2 and #3 under controversial uses of albumin)
4. Malnutrition
5. Wound healing
6. Non-hemorrhagic shock
7. Ascites responsive to diuretics
8. Protein-losing enteropathies and malabsorption
9. Acute or chronic pancreatitis
10. Tolerance of hemodialysis
11. Cerebral ischemia
12. Acute normovolemic hemodilution in surgery
13. Ovarian hyperstimulation syndrome
14. No evidence to support its use post kidney transplant
15. **TBI:** SAFE trial suggested that patients with TBI resuscitated with albumin had higher mortality than those resuscitated with saline⁶

Controversial Uses of Albumin:

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1. Hemorrhagic shock- Albumin should be used **2nd choice** when solutions of crystalloids have already been used at maximum doses but should not be considered as replacement for blood products.
2. Major Surgery- As indicated by > 40% of liver resection or extensive intestinal resection when **after volume repletion** the serum albumin is < 2g/dL
3. Heart Surgery- Can be used for hypovolemia as post-op volume expander as a last choice after crystalloids. Guidelines are:
 - a. Replace volume as clinically indicated with 5% albumin up to 3 hrs
 - b. Change to NS after 1500mL of albumin given
4. **Post op liver transplant**- Albumin can be used post liver transplant, in order to control ascites and peripheral edema **and** to replace the loss of ascitic fluid through drainage tubes if:
 - a. Albumin < 2.5 g/dL
 - b. PACWP < 12mmHg if PA cath in place
 - c. Hct > 30%
5. Ascites not responsive to diuretics only if serum albumin is < 2g/dL
6. Cerebral Ischemia or hemorrhage as part of triple H therapy. If Hct is elevated crystalloid should be given as part of hemodilution. Albumin can be given if:
 - a. Aneurysmal subarachnoid hemorrhage
 - i. Goal CVP 6-8 to decrease risk of vasospasm
 - ii. If delayed vasospasm occurs, CVP goal of 8-12
 - b. Acute ischemic stroke or TIA if there is evidence of flow failure
 - c. **Dose** 5% albumin 250ml Q2-4H prn CVP goal; adjust rate of crystalloids by 25% if frequent boluses
7. **Septic Shock** : A meta-analysis regarding the role of albumin as a resuscitation fluid for patients with sepsis concluded that “resuscitation with albumin may result in lower mortality compared with resuscitation with other fluids”. However, there was no survival benefit in a 2014 RCT in NEJM in patients with severe sepsis or septic shock when given albumin vs crystalloid but did show a shorter duration of administration of vasopressor or inotropic agents in the albumin group. In patients with **severe sepsis without shock** mortality appeared to be higher among those treated with albumin but not statistically significant. Therefore, albumin may be beneficial in patients with septic shock.⁷
8. **ALI/ARDS**: The Gordon et al. trial of furosemide with or without albumin in hypoproteinemic patients with acute lung injury conferred no survival benefit but had improved oxygenation, net fluid loss, decreased hypotensive episodes and shock free days with the furosemide plus albumin administration arm.⁸

Calculation of the dose of Albumin to Administer

Dose (g) = (2.5g/dL-actual albumin concentration) X (kg X 0.8)

References:

UHC consortium

Albumin Administration Guidelines

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NEJM 2014

Recommendations *Blood Transfusion 2009*.

¹ Italian Society of Transfusion Medicine and Immunohaematology Working Party: Recommendations for the use of albumin and immunoglobulins. *Blood Transfus* 2009;7:216-234

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⁴ Runyon B Management of adult patients with ascites due to cirrhosis: AASLD practice guidelines. *Hepatology*. 2013 Apr;57(4):1651-3

⁵ Vermeulen LC Jr, Ratko TA, Erstad BL, et al. A paradigm for consensus. The University Hospital Consortium guidelines for the use of albumin, non protein colloid and crystalloid solutions. *Arch Intern Med* 1995; 155 Revised 2010

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⁷ Delaney, AP, Dan A, McCaffrey J, Finfer S. The role of albumin as a resuscitation fluid for patients with sepsis: a systematic review and meta-analysis. *Crit Care Med* 2011;39:386-391

⁸ Martin, GS, Moss, M, Wheeler, AP, et al. A randomized, controlled trial of furosemide with or without albumin in hypoproteinemic patients with acute lung injury. *Crit Care Med* 2005; 33: 1681-1687