



Formulary Flash



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ALBUMIN

Review of Guidelines & Change in Sunrise Ordering

History

A review of Albumin was reported to the Drug Usage Evaluation (DUE) Committee on May 18. **Only 53% of the orders reviewed met the usage criteria currently in place.** This finding is consistent with a review done in 1997 when an FDA recall resulted in an international shortage of albumin products.

The current UHS guidelines (pages 2 & 3) were adopted in an effort to minimize unnecessary use of albumin – which continues to be available only via an allocation method due to intermittent shortages. Current Guidelines for Cardiothoracic Surgery were approved by P&T in 2005 & are listed on page 3. Other (non-UHS) guidelines are listed on page 4.

New evidence and current practice may necessitate an update of the current guidelines which were adapted from a 1995 article in the *Archives of Internal Medicine* Vol 155, Feb 27.

At that time (1997), written orders for albumin required a written indication and faculty approval. But when the order form for albumin was configured in Sunrise, those requirements were not incorporated. Changes in the current ordering process will take effect on June 11.

Results of Latest DUE on Albumin

The review was performed by Kristi Traugott, PharmD, Post-Graduate Year 1 Pharmacy Resident. She randomly selected **30 patients for in-depth review -- out of 240** patients who received albumin from December 1, 2008 to March 12, 2009.

A total of **1632 doses (representing almost 29,500 gm) were ordered on the 240 patients** in the 102-day study for an average of 16 doses & **290 grams per day**. The average use per patient was 123 grams in the large study group and 180 grams per patient in the small study group.

Three services (Medicine, Transplant & Cardio-Thoracic Surgery) accounted for 70% of the albumin ordered on the 30 patients reviewed.

Recommendations

One of the recommendations was to **disseminate information from the DUE and ask for assistance in revising the current guidelines.**

Another recommendation was to **make changes in the ordering requirements in Sunrise.** A summary of the changes is listed here.

Summary of Changes in Sunrise

- **Residents (or other providers) must order albumin on behalf of the faculty attending on the Service following the patient.** This process is identical to what is currently in place for non-formulary and restricted drugs. The hope is that the team members will discuss the use of albumin and any possible alternatives, and minimize the unnecessary use of albumin. This will assure that albumin is available for patients in whom albumin is the best alternative.
- **The “Indication” field is mandatory.** Currently this will be a “free text” field. Later, once new guidelines are approved, the hope is to create a “drop-down” menu with appropriate choices.
- **The dose must be ordered in multiples of the bottle size (except for Pediatrics).** In other words, if a patient requires 1000 mL of 5% albumin, the order will be placed as 500 mL x 2. This will prevent the patient from being charged incorrectly. This process is also identical to what is currently in place for ordering IV potassium chloride, potassium & sodium phosphates as well as other drugs.

UHS GUIDELINES FOR USE OF ALBUMIN

Adapted from the original published guidelines from *Archives of Internal Medicine*, Vol 155, Feb 27, 1995.

These guidelines are presented in an effort to minimize unnecessary use of albumin during an extended shortage that requires monthly allocations

Indication	Current UHS Guideline
Hemorrhagic shock	<p>Crystalloids should be considered the initial resuscitation fluid of choice; colloids are appropriate for resuscitation in conjunction with crystalloids when blood products are not immediately available; on the basis of cost-effectiveness considerations, nonprotein colloids (hetastarch or dextrans) are favored over albumin except in the following cases:</p> <ol style="list-style-type: none"> 1. If sodium restriction is required, the use of 25% albumin, diluted to 5% with D₅W is recommended. 2. If hetastarch /dextran are contraindicated* (see bottom of table), use of 5% albumin is recommended. <p>Crystalloid & colloid solutions should not be considered substitutes for blood or blood components when oxygen-carrying capacity is reduced and/or when replenishment of clotting factors or platelets is required; patients who experience symptoms of shock while undergoing hemodialysis are included in this guideline and should receive crystalloid solutions as the resuscitation fluid of first choice.</p>
Nonhemorrhagic (Maldistributive) Shock	<p>Crystalloids should be considered first-line therapy; the effectiveness of colloid solutions in the treatment of sepsis has not been demonstrated in clinical trials, however, in the presence of capillary leak with pulmonary &/or peripheral edema, or following the administration of at least 2 liters of crystalloid without effect, hetastarch or dextran may be used unless specifically contraindicated * -- in which case albumin may be used.</p>
Hepatic resection	<p>Crystalloid use to maintain effective circulating volume following major hepatic resection (>40% resected) is recommended; the use of hetastarch/dextran and albumin is also appropriate, depending on the function of the residual liver and hemodynamic status; if crystalloids are not used, hetastarch or dextran are recommended as the most cost-effective alternatives.</p>
Thermal injury	<p>Crystalloid solutions should be used for initial fluid resuscitation (within the first 24 hours); colloids should be administered in conjunction with crystalloids if all of the following are true:</p> <ol style="list-style-type: none"> 1. Burns cover > 50% of the patients body surface; 2. At least 24 hours have passed since the burn occurred; 3. Crystalloid therapy has failed to correct hypovolemia. <p>Based on cost-effectiveness considerations, hetastarch or dextran are recommended; if these nonprotein colloids are contraindicated, albumin may be used.</p>
Cerebral ischemia	<p>Colloid solutions have no demonstrated value & should not be used in the treatment of ischemic stroke or subarachnoid hemorrhage, except in patients with hematocrit levels <40% on admission. Patients with elevated hematocrit levels on admission should receive crystalloid solutions to increase intravascular volume, creating a state of hypervolemia and hemodilution (hematocrit levels of approximately 30% to maximize cerebral perfusion). Additional interventions (e.g., blood removal) may be needed in such cases.</p>
Nutritional intervention	<p>Albumin should not be used as a supplemental source of protein calories in patients requiring nutritional intervention.</p> <p>However, patients with diarrhea associated with enteral feeding intolerance may benefit from the administration of albumin if all the following conditions are met:</p> <ol style="list-style-type: none"> 1. Significant diarrhea (> 2 liters per day) occurs; 2. Serum albumin is < 2.0 g/dl; 3. Continued diarrhea occurs despite trial of short-chain peptide and elemental formulas; 4. Other causes of diarrhea have been considered and ruled out.
Cardiac surgery	<p>See updated guidelines (approved in 2005) on page 3</p>
Hyper-bilirubinemia of the newborn	<p>Albumin should not be administered in conjunction with phototherapy, nor should it be used prior to exchange transfusion. It has been used with mixed results as an adjuvant to exchange transfusions and should be administered only with concurrent transfusion of blood. Crystalloids & nonprotein colloids do not have bilirubin-binding properties and should not be considered as alternatives to albumin.</p>
Nephrotic syndrome	<p>Short-term albumin use, in conjunction with diuretic therapy, is appropriate for patients with acute, severe peripheral or pulmonary edema.</p>

Indication	Current UHS Guideline
Organ transplantation	<ul style="list-style-type: none"> • Albumin &/or nonprotein colloid administration have not been demonstrated conclusively effective during &/or after renal transplantation surgery. • Albumin may be useful for postoperative liver transplant patients in the control of ascites and peripheral edema if all of the conditions are met: <ol style="list-style-type: none"> 1. Serum albumin is < 2.5 g/dl; 2. Pulmonary capillary wedge pressure is < 12 mm Hg; 3. Hematocrit is > 30% In these cases, albumin may also be used to replace ascitic fluid lost through drainage catheters following liver transplantation.
Plasmapheresis	Albumin, in conjunction with large-volume plasma exchange, is appropriate. Large-volume plasma exchange is defined as > 20ml/kg in one session, or more than 20ml/kg in repeated sessions. Crystalloid solutions and albumin/crystalloid combination should be considered as cost-effective alternatives for smaller volume exchanges.
<p>Indications with limited or inconclusive evidence in which colloid use is considered appropriate:</p> <ul style="list-style-type: none"> • Granulocytapheresis -- nonprotein colloid solution is appropriate as a sedimenting agent for donation of granulocytes and for acute cytoreduction in chronic myelogenous leukemia (chronic granulocytic leukemia). • Stem cell cryopreservation -- nonprotein colloid solution is appropriate as part of a cryopreservation solution for frozen storage of hematopoietic stem cells. • Pretreatment of Dacron aortic grafts -- albumin is appropriate to make grafts impervious to blood before insertion. • Red blood separation for major blood type incompatible bone marrow transplantation -- nonprotein colloids are appropriate. 	
<p>Indications with limited or inconclusive evidence in which albumin use is considered inappropriate:</p> <ul style="list-style-type: none"> • severe hypoalbuminemia • impending hepatorenal syndrome • increasing drug efficacy • uncomplicated pancreatitis. 	

* Relative contraindications to the use of nonprotein colloids include, but may not be limited to the following:

1. Previous hypersensitivity to the components of the solution.
2. Underlying bleeding disorders.
3. Risk of serious intracranial hemorrhage
4. Renal failure with either oliguria or anuria

**Guidelines for Albumin Use for Volume Expansion by Cardiothoracic Surgery
Submitted by A. J. Carpenter, MD, PhD, Director, Cardiothoracic Surgery
Approved by Pharmacy & Therapeutics Committee in March 2005**

- Patients undergoing cardiopulmonary bypass have marked dilution of intravascular colloid oncotic pressure
- During the early postoperative period, these patients typically require significant volume replacement due to peripheral vasodilation
- The best volume expander in this setting is albumin, and it is essential that the albumin be immediately available when needed
- **Guidelines for the use of albumin in the post-cardiopulmonary bypass patient** are as follows:
 1. Replace volume as clinically indicated with **5% albumin** given through a fluid warmer **during the early post-operative period (up to 3 hours)**
 2. If large volumes are required, **change to normal saline after 1500 mL of albumin** have been given
- It is essential that albumin be in the PYXIS with “over-ride” authorization in order to have the fluid immediately available

**Guidelines provided by the University Health System's
Group Purchasing Organization – Med Assets
(Adapted from the *Handbook of Evidence-Based Critical Care*)**

Suggested uses of exogenous albumin:

1. Patients who fail mannitol &/or hetastarch for hypotension during dialysis.
2. Large volume paracentesis (greater than 3 liters), combined with loop diuretic in cirrhotic patients with refractory ascites.
3. Nephrotic patients with anasarca resistant to other therapies.
4. Uncontrolled intracranial pressure who fail hypertonic saline treatment.
5. Third line choice for post-operative cardiac surgery volume expansion.

Alternative Therapies:

A. Crystalloids:

Used for fluid resuscitation. Because they are isotonic, they do not cause water to move into or out of the intracellular compartment. Electrolytes and water partition themselves in a manner similar to the body's extravascular water content. The effects are relatively short lived and within 2 hours, less than 20% of the infused fluid remains in the intravascular space. Excessive administration may lead to pulmonary and generalized tissue edema.

1. **Normal Saline:** Only crystalloid that can be mixed with blood. Patients may develop a hyperchloremic metabolic acidosis and / or hypernatremia.
2. **Lactated Ringer's:** More physiologic electrolyte composition than NS and contains lactate which is converted to bicarb to limit acidosis.

B. Non-Protein Colloids:

Because of their high molecular weights, colloids help to draw fluid from the extravascular compartments and into the intravascular space.

Hetastarch (Hespan®): Longer half life than albumin (2 days versus 8 hours). Maximum limit of administration is 1500ml because it can cause thrombocytopenia. It may be a better choice than albumin in hypotensive dialysis patients.