

Original Article

Evaluation of the Pattern of Human Albumin Utilization at a University Affiliated Hospital

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Abstract

Background: Albumin is a protein colloidal solution that possesses great value in the clinic, particularly for the resuscitation of critically ill patients. It has accounted for a high percentage of the cost in our center. This study evaluates the appropriateness of albumin usage at Masih Daneshvari Hospital, Tehran, Iran.

Methods: This study evaluated 69 patient charts. Data included patient demographics, ward of admission, primary reasons for prescribing albumin, and details of albumin use. Possible correlations between the appropriateness of albumin usage, the number of albumin vials, and mortality rate were analyzed.

Results: Albumin was prescribed appropriately in 63.8% of patients. Cardiac surgery accounted for 37.3% of all indications. The most prevalent inappropriate indication of used albumin was for mild hypoalbuminemia and nutritional support. There was a significant correlation between the number of used albumin vials and mortality rate. In conclusion, the albumin use in Masih Daneshvari Hospital was not completely in accordance with the accredited references.

Conclusion: Albumin is an expensive medication prescribed unnecessarily for many patients. Using the clinical pharmacist's prepared guideline could minimize the situations where its administration is not needed.

Keywords: Albumin, drug utilization review, therapy

Cite the article as: Talasaz AH, Jahangard-Rafsanjani Z, Ziaie S, Fahimi F. Evaluation of the Pattern of Human Albumin Utilization at a University Affiliated Hospital. *Arch Iran Med.* 2012; **15(2)**: 85 - 87.

Introduction

The World Health Organization has been advocating many interventional strategies including administrative, educational, and regulatory measures for promoting rational drug use and improving the medication management system. These strategies have proven to be successful in leading to better availability of necessary medicines in public health facilities, benefiting poor patients.¹⁻³

As resources are limited, it is essential that the existing ones be appropriately utilized. With the existing drug budget, if rational drug use and improved drug management practices are followed, more people can be served. It is impossible and unnecessary to monitor every medication used in the health system. Interventions regarding high cost and high volume medications should be the main concern, as they would have the most clinical and economic impact. Therefore, it is important to determine the medicinal products that are the most expensive and consume most of the budget and attempt to design a study to investigate their usage patterns. For discovering medications that require higher consideration, ABC analysis is an imperative tool used worldwide.^{4,5} ABC analy-

sis, also known as the 80/20 rule, is a method of classifying items or activities according to their relative importance. The analysis classifies the items into three categories: The first 20% of the items which account for approximately 80% of cumulative value (cost) are category A, 40% are category B items that account for a further 15% of cumulative value, and remaining 40% are C items accounting for a mere 5% of total value.⁶

After doing the analysis in Masih Daneshvari Hospital we realized that one of the medications listed in group A is albumin, which is the second medicine in this group (after ciprofloxacin). Since albumin is an expensive medication, its indiscriminate use should be encouraged.

We decided to perform a drug utilization evaluation (DUE) on albumin, which is mostly used in critically ill patients and as a result may have a more significant impact on the mortality of patients than ciprofloxacin. We evaluated the appropriateness of albumin usage in relationship to the American Society of Hospital Pharmacist (ASHP) protocol and to assess its compliance with this protocol.^{7,8}

Patients and Methods

Data collection

The chart review was conducted at Masih Daneshvari Hospital, Tehran, Iran from April 2008 to April 2009. Albumin administration was evaluated for 69 randomly selected patients who received albumin in different wards. Patients were included more than once if the indication for albumin administration was changed during hospitalization. The main sources for data retrieval were the pharmacy medication files, patients' files (including laboratory data), and nursing files. Age, gender, weight, ward, albumin level, indica-

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Accepted for publication: 22 April 2011

tion, total dose and mortality were recorded for each patient. Contraindications for albumin administration or any caution in its use was also verified. The indications and the circumstances where albumin administration was inappropriate are summarized in Table 1.

Table 1. Conditions where administration of albumin is appropriate or not recommended.⁸

Administration of albumin is appropriate for the following conditions
Hypovolemia (as a last choice in case of failure with crystalloids and non-protein colloids)
Patients in whom fluid and sodium intake is restricted
Hypoproteinemia
Hemorrhagic shock, nonhemorrhagic, or maldistributive shock
Hepatic resection
Thermal injury
Cerebral ischemia/ maintaining cerebral perfusion pressure
Cardiac surgery
Cirrhosis
Nephrotic syndrome
Organ/kidney and liver transplantation
Plasmapheresis
Retroperitoneal surgery
ARDS (acute respiratory distress syndrome)
Severe, necrotizing pancreatitis
Impending hepatorenal syndrome
Administration of albumin is inappropriate for the following conditions
Hypoalbuminemia
Nutritional supplementation
Acute pancreatitis
Chronic pancreatitis
Acute normovolemic hemodilution during surgery
Intradialytic blood pressure support
Ovarian hyperstimulation syndrome
Cardiac failure

Data analysis

Statistical analyses were carried out using SPSS for Windows Release 16 (SPSS Inc., Chicago, USA).

Results

We included 69 patient charts in the study. Of these 69 patients, 62.3% were male and 37.7% were female. The Intensive Care Unit (ICU) was responsible for the highest albumin consumption (49.3%), followed by the Cardiac Care Unit (CCU) with 14.5%. An overview of the number of studied patients per ward and albumin indication is shown in Table 2. A total of 63.8% of the albumin administrations were in concordance with the ASHP protocol, among which cardiac surgery with 37.7% was recorded as the most frequent reason for albumin usage. Other indications were septic shock, nephritic syndrome, restrictions in fluids or sodium intake, cirrhosis, transplantation, and plasmapheresis. In 36.2% of cases, albumin indication was not clear for us. Hypoalbuminemia (36.2%) and nutritional supplementation (24.4%) were the two most frequent reasons for inappropriate albumin use. Among all studied patients, 24.6% had renal failure, 7.2% had hepatic disorder, and 4.3% had both hepatic and renal failure.

Significant correlation was found between the number of albumin vials used with mortality rate ($P < 0.01$).

Table 2. Patients' sites of care and indications for albumin use.

Albumin use	N (%)
Cardiac surgery	26 (37.7)
Septic shock	6 (8.7)
Restrictions on fluids and salts	6 (8.7)
Transplantation	2 (2.9)
Plasmapheresis	2 (2.9)
Cirrhosis	1 (1.4)
Nephrotic syndrome	1 (1.4)
None	25 (36.2)
Ward	
ICU	34 (49.3)
CCU	10 (14.5)
Post CCU	6 (8.7)
Internal	6 (8.7)
Surgery	4 (5.8)
Tuberculosis	4 (5.8)
Transplantation	3 (4.3)
Emergency	1 (1.4)
Pediatrics	1 (1.4)

Discussion

Albumin was inappropriately prescribed for 36.2% of hospitalized patients. Hypoalbuminemia and nutritional supplementations accounted for the most prevalent situations where albumin was not indicated. Human albumin is not recommended for use as a supplemental caloric protein source in patients requiring nutritional support.⁹⁻¹¹ Iatrogenic elevation of serum albumin concentrations above 4 g/dL may increase the overall catabolic rate. In general, oral, enteral, and/or parenteral nutrition with amino acids and adequate calories should improve imbalances between the rates of albumin synthesis and metabolism. However, patients with diarrhea associated with enteral feeding intolerance may benefit from parenteral administration of human albumin if they have severe diarrhea (more than 2 L daily) and a serum albumin concentration of less than 2 g/dL, or if diarrhea occurs despite a trial of short-peptide and elemental formulas, and other causes of diarrhea have been excluded.^{12,13} As an agent for the purpose of hypoalbuminemia correction, albumin may relieve edema associated with hypoproteinemia (to varying degrees) by increasing colloid osmotic pressure and producing diuresis. The use of albumin in patients with severe hypoalbuminemia simply in an attempt to increase serum albumin concentrations to within the normal range (i.e., the patient does not exhibit manifestations of hypovolemia) cannot be recommended based on current evidence; instead, the cause of the underlying hypoalbuminemia should be identified and treated.¹⁴

A limited number of large, randomized, controlled studies have evaluated the appropriate use of this agent.¹⁵⁻¹⁸ Various meta-analyses and small clinical trials have attempted to address this issue. These studies vary in design and endpoints, limiting their application to clinical practice.

The major limitation is often the small number of subjects enrolled in these trials and the heterogeneity of the patient popula-

tions described in the meta-analyses.¹⁹⁻²¹

However, the results of these studies must be incorporated with other clinical criteria associated with patients' conditions and care. DUE, although time consuming, has proven to be a useful instrument to initiate discussions among clinicians and pharmacists in order to obtain high standards of drug utilizations in hospitals.²² DUE, together with a close follow up of consumption patterns, has been proven to be an efficient method for the evaluation of prescribed drugs, probably leading to a better quality of drug treatment and possibly giving rise to important savings.²³ Albumin is an expensive colloidal solution and its proper administration is of high value, in particular it is widely used in the ICU (49.3% in our study) where its administration should be justified because of its vast application as a nutritional support agent. In this study, we found a significant correlation between the number of albumin vials and patient mortality. Hospitals should make their decisions based on usage patterns, where albumin use is most prevalent, and discuss with clinicians in these high-use areas the appropriate use of albumin. Meanwhile, it is logical to use the ASHP protocol to determine the appropriateness of albumin therapy in patients not only to reduce the complications and mortality in patients, but also to lessen the cost of therapy. It is recommended to have the protocol in each hospital and manage the patients based on that guideline.

In conclusion, the administration of albumin in our hospital was not completely in accordance with guidelines. The importance of this statement became more tangible when we came to the conclusion that there was a statistically significant relationship between the number of albumin vials ordered and the mortality rate of patients. Therefore, meeting with relevant health care professionals to illustrate the guidelines could be helpful in improving the appropriate administration of this critical and precious medication.

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