Development of Clinical Index for Appropriate Hyperoncotic Albumin Use

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Citation

Abstract
We designed a clinical index to facilitate the appropriate use of hyperoncotic albumin. We judged the use of hyperoncotic albumin as appropriate or inadequate according to pre-administration serum albumin levels. Then, we calculated the monthly rates of appropriate and inadequate use for our entire hospital, each department, and each doctor who ordered hyperoncotic albumin. Both usage rates improved after the results were reported to the doctors and the cases of inadequate usage were examined. On the other hand, both the number of orders for albumin and the total volume of albumin used in the hospital increased during the investigation period. These results indicate that factors other than pre-administration serum albumin levels play an important role in the judgment of albumin use.

INTRODUCTION
The Tokyo Metropolitan Bokutoh Hospital has 729 acute care hospital beds and is located in eastern Tokyo. Since October 2005, the Department of Transfusion Medicine in our hospital has managed albumin products with blood products such as red cell concentrates (RCC), fresh frozen plasma (FFP), platelet concentrates (PC), etc. In Japan, the Japanese Medical Service established the albumin-to-red-cell transfusion ratio (ALB/RCC ratio) for health insurance purposes; ratios under 2.0 are required for transfusion control. The use of 3 g of albumin is defined as 1 unit. Albumin use in our hospital has satisfied the ALB/RCC ratio requirement from 2005 to the present, ranging 1.6–1.8 units (Figure 1A). However, despite conditions of good transfusion control, inadequate use of albumin was noted in some cases in our hospital. Moreover, the amount of albumin used in our hospital did not decrease. Isotonic albumin was used in the emergency department for patients with circulatory blood loss such as massive hemorrhage, severe burns, etc. Therefore, accurately judging the appropriate dosage and reasonable use of albumin is difficult. On the other hand, hyperoncotic albumin is used for relieving colloid oncotic pressure. Many doctors tend to confirm serum albumin levels and plan the dosage of albumin accordingly. However, we decided to allow doctors to promote the proper use of hyperoncotic albumin. Moreover, there are much fewer reports on hyperoncotic albumin use than reports on isotonic albumin use. Therefore, we attempted to create a new clinical index using serum albumin values recorded before hyperoncotic albumin use. We devised a clinical index to calculate the appropriate (pre-administration serum albumin level <2.0 g/dL) and inadequate rate of use (pre-administration serum albumin level >2.6 g/dL) per month, and announce the results to the medical doctors every month.

In this report, we review the influence of this clinical index and its pronouncement on hyperoncotic albumin use in our hospital.

Figure 1

Figure 1A: Trend of the Albumin/RCC ratio in our hospital
METHODS

We studied patients who used 20% or 25% albumin products (Japanese Red Cross Society, Tokyo, Japan) from January 2008 to December 2010. Patients using albumin products for plasmapheresis and babies with hydrops fetalis were excluded from this study. The medical data of patients with hyperoncotic albumin use were reviewed for parameters such as the amount of albumin product used, medical departments, individual medical doctors, and monthly pre-administration serum albumin values.

We classified the patients using hyperoncotic albumin into 3 groups: the inadequate use group (pre-administration serum albumin level >2.6 g/dL), appropriate use group (pre-administration serum albumin level <2.0 g/dL), and the “gray zone” group (pre-administration serum albumin level between 2.1 and 2.5 g/dL).

We calculated the rates of appropriate and inadequate requests among all requests for hyperoncotic albumin use as follows:

Appropriate use rate = number of appropriate requests ÷ all number of requests × 100 (%)

Inadequate use rate = number of inadequate requests ÷ all requests × 100 (%)

At our hospital, appropriate and inadequate use rates are announced monthly at the in-hospital Transfusion Treatment Committee (TTC) meeting. The rates for the entire hospital, each department, and each doctor are reported at this meeting. The usage of hyperoncotic albumin is reported to each departmental director. Repeated cases of inadequate use are presented to the TTC, and the results are reported to the Medical Management Committee attended by medical directors and other medical staff. This reporting system began in April 2010.

Blood transfusion products in Japan

Two units of RCC (280 mL) or 2 units of FFP (120 mL) are derived from 400 mL donated whole blood. In Japan, the Japanese Medical Service established the ALB/RCC ratio for health insurance. Ratios under 2.0 are required for transfusion control. The use of 3 g of albumin is defined as 1 unit. Unfortunately, ALB/RCC ratios have not been evaluated empirically.

In the Japanese Medical Service for health insurance, there is a specific system called the diagnosis and procedure combination (DPC), in which a single medical fee is established for each disease. The DPC system has been in place in our hospital since July 2009.

STATISTICS

We compared these rates before and after the announcement of the clinical index and the start of the DPC system using t-tests. Data are expressed as means ± standard errors. All statistical procedures were conducted using SPSS version 14.0 (SPSS Inc., Chicago, IL, USA), and the level of significance was set at p < 0.05.

RESULTS

The ALB/RCC ratio in our hospital over time is shown in Figure 1A. In all years, the ALB/RCC ratio in our hospital was ≤2.0, as required by the Japanese Medical Service. However, the inadequate use rate in 2008 was approximately 20% (Figure 1B). Therefore, we attempted to examine the effect of the monthly announcements of adequate and inadequate use rates on hyperoncotic albumin infusion.
However, there were no changes in the number of hospital patients, operations, or the number applied to DPC (Figure 3). In addition, there were no significant relationships between the number of albumin preparations and the number of inpatients (correlation coefficient = -0.178) or the number of surgeries performed (correlation coefficient = -0.001).

There were also no significant relationships between the amount of albumin transfused and the number of inpatients (correlation coefficient = -0.093) or the number of surgeries performed (correlation coefficient = 0.095).

**Figure 3**

![Figure 3](image)

**Figure 4**

![Figure 4](image)

After the announcement of the clinical index, 2 patients received isotonic albumin infusion instead of hypertonic albumin.

During the observation period, the departments that requested the most hyperoncotic albumin preparations were the departments of internal medicine, surgery, and tertiary care (Figure 4). After the announcement of the clinical index, inadequate use at the tertiary care center decreased to zero, whereas inadequate use at the departments of internal medicine and surgery was variable and did not decrease.

**Figure 5**

![Figure 5](image)

**Figure 6**

![Figure 6](image)

Table 1. Influence of reporting clinical index and albumin use to doctors

<table>
<thead>
<tr>
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<th>Before (n = 15)</th>
<th>After (n = 21)</th>
<th>t</th>
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<tr>
<td>Rate of appropriate use</td>
<td></td>
<td></td>
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<tr>
<td>(%)</td>
<td>39.3 ± 8.4</td>
<td>52.5 ± 11.1</td>
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<tr>
<td>Rate of inadequate use</td>
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<tr>
<td>(%)</td>
<td>22.5 ± 6.6</td>
<td>14.4 ± 6.7</td>
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<tr>
<td>Number of orders for</td>
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<td>0.027**</td>
</tr>
<tr>
<td>albumin (n)</td>
<td>41.0 ± 13.7</td>
<td>59.6 ± 16.0</td>
<td></td>
</tr>
<tr>
<td>Number of 20% albumin</td>
<td></td>
<td></td>
<td>0.001**</td>
</tr>
<tr>
<td>bottles (n)</td>
<td>119.8 ± 35.9</td>
<td>151.5 ± 45.5</td>
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</table>

After the announcement of the clinical index, 2 patients received isotonic albumin infusion instead of hypertonic albumin.
DISCUSSION

CLINICAL INDEX AND ALBUMIN USE

We promoted the clinical index for hyperoncotic albumin preparations because many infused albumin products were being used in our hospital (Figure 1B). Previous papers support albumin infusion for hypoalbuminemia (Cochrane Injuries Group, 1998; Finfer S et al., 2006). One of the Saline versus Albumin Fluid Evaluation (SAFE) studies reports that albumin use exceeding 2.6 g/dL is associated with poor outcomes (Finfer S et al., 2006). Therefore, we defined the inadequate use of albumin infusion as pre-administration serum albumin levels >2.6 g/dL.

Meanwhile, pre-administration serum albumin levels <2.0 g/dL might cause clinical problems such as edema, ascites, etc., on the basis of hypoalbuminemia. In this study, we defined the adequate use of albumin infusion as this particular serum albumin value.

The initiation of the clinical index with the DPC system improved the use of albumin infusion, as shown in Figure 1. We speculate that doctors considered the use of albumin infusion from either a scientific (i.e., the announcement of the clinical index) or economic (i.e., the induction of the DPC system) perspective. However, the total number of albumin infusions did not improve despite a lack of changes in the number of inpatients, surgeries, and the initiation of the DPC system (Figures 1B-3). Hypoalbuminemia without clinical manifestation is not appropriate for albumin infusion (Cochrane Injuries Group, 1998). Therefore, we plan to publish clinical papers on albumin infusion as well as clinical index in the future.

LIMITATIONS

Because this study was neither prospective nor randomized, the level of evidence is low. However, clinicians worldwide worry about the excess use of hyperoncotic albumin. Therefore, our clinical index might be a key method for improving adequate hyperoncotic albumin use.

CONCLUSION

This new clinical index for hyperoncotic albumin infusion might improve usage with respect to pre-administration serum albumin levels.

References

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