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## SCIENTIFIC ARTICLE

# Transfusional profile in different types of intensive care units<sup>☆</sup>

Ilusca Cardoso de Paula<sup>a</sup>, Luciano Cesar Pontes Azevedo<sup>a</sup>,  
Luiz Fernando dos Reis Falcão<sup>a</sup>, Bruno Franco Mazza<sup>a</sup>,  
Melca Maria Oliveira Barros<sup>b</sup>, Flavio Geraldo Rezende Freitas<sup>a</sup>,  
Flávia Ribeiro Machado<sup>a,\*</sup>

<sup>a</sup> Setor de Terapia Intensiva, Disciplina de Anestesiologia, Dor e Medicina Intensiva da Universidade Federal de São Paulo, São Paulo, SP, Brazil

<sup>b</sup> Disciplina de Hematologia, Universidade Federal de São Paulo, São Paulo, SP, Brazil

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### Abstract

**Background and objectives:** anemia is a common clinical finding in intensive care units. The red blood cell transfusion is the main form of treatment, despite the associated risks. Thus, we proposed to evaluate the profile of transfusional patients in different intensive care units.

**Methods:** prospective analysis of patients admitted in the intensive care units of a tertiary university hospital with an indication for transfusion of packed red blood cells. Demographic profile and transfusional profile were collected, a univariate analysis was done, and the results were considered significant at  $p \leq 0.05$ .

**Results:** 408 transfusions were analyzed in 71 patients. The mean hemoglobin concentration on admission was  $9.7 \pm 2.3$  g/dL and the pre-transfusional concentration was  $6.9 \pm 1.1$  g/dL. The main indications for transfusion were hemoglobin concentration (49%) and active bleeding (32%). The median number of units transfused per episode was 2 (1–2) and the median storage time was 14 (7–21) days. The number of patients transfused with hemoglobin levels greater than 7 g/dL and the number of bags transfused per episode were significantly different among intensive care units. Patients who received three or more transfusions had longer mechanical ventilation time and intensive care unit stay and higher mortality after 60 days. There was an association of mortality with disease severity but not with transfusional characteristics.

**Conclusions:** the practice of blood products transfusion was partially in agreement with the guidelines recommended, although there are differences in behavior between the different profiles of intensive care units. Transfused patients evolved with unfavorable outcomes. Despite the scarcity of blood in blood banks, the mean storage time of the bags was high.

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<sup>☆</sup> Study conducted at Hospital São Paulo, Universidade Federal de São Paulo (Unifesp), São Paulo, SP, Brazil.

\* Corresponding author.

E-mail: [fmachado.dcir@epm.br](mailto:fmachado.dcir@epm.br) (F.R. Machado).

## Introduction

Anemia is a frequent clinical finding in intensive care units (ICU). It has been shown that up to 77% of critically ill patients have anemia during their hospital stay and more than a third of them receive blood transfusions.<sup>1,2</sup> Factors associated with the development of anemia in the ICU include blood loss from obvious bleeding, as the “iatrogenic anemia” caused by the serial blood collection for laboratory tests; invasive procedures; nutritional deficiencies (iron, folic acid and vitamin B12); hemolysis; occult blood loss; and decreased erythropoiesis by reduced release of erythropoietin, mainly by the action of inflammatory cytokines.<sup>3–6</sup>

The red blood cell transfusion is still the main form of treatment for anemia, despite the risks of complications associated with it. Possible complications include transmission of infectious agents, febrile reactions, alloimmunization, acute lung injury, pulmonary edema fluid overload, citrate toxicity, and immunosuppression, with consequent increase in nosocomial infections.<sup>7–11</sup> Thus, blood transfusion became a constant topic of discussion in ICUs, and there is controversy regarding the possible benefits and risks of maintaining lower levels of hemoglobin.<sup>12,13</sup> From the late 1990s, studies with restrictive transfusional strategies in the ICU began to be published. In this sense, Hébert et al. showed no benefit in maintaining hemoglobin (Hb) >10 g/dL, when compared to a group with hemoglobin levels between 7 and 9 g/dL, in patients admitted to intensive care units, with the possible exception of those with acute coronary syndromes.<sup>13</sup> Since its publication, this study guided the transfusional therapy, and the current recommendation is the transfusion of packed red blood cells (pRBC) in critically ill patients with Hb less than 7 g/dL.

Therefore, there is great interest in the understanding of transfusional therapy in intensive care and the impact of anemia on the progression and prognosis of these patients. Nevertheless, in Brazilian hospitals, there are few the studies evaluating transfusional practice, clinical characteristics and outcome of these patients.<sup>14–16</sup> Thus, the aim of this study was to evaluate the transfusional profile of different ICUs within a tertiary university hospital with analysis of indications and criteria for transfusion. We also sought to determine the number of pRBC units received, its mean storage time and possible correlations with morbidity and mortality.

## Methods

In this study, patients older than 18 years and with indication for transfusion of pRBC units by the attending physician, being hospitalized in five ICUs (general-SUS, general-supplementary health, internal medicine, cardiology and pneumology) of a tertiary university hospital between October 1 and November 30, 2005 were included. No exclusion criteria were used. The study was approved by the Ethics in Research Committee under number 1534/04 without the need to collecting informed consent, for this paper deals with data registry without intervention.

The initial screening was done by the request of transfusion records of the hospital blood bank. All patients admitted to the ICUs for whom pRBC units were administered during

this period were included. Two physicians responsible for the study recorded the following demographic data: age, gender, diagnosis of ICU stay, and presence of comorbidities. For assessment of the severity, Physiology and Acute Chronic Health Evaluation II (APACHE II)<sup>17</sup> index for ICU admission and the Sequential Organ Failure Assessment (SOFA)<sup>18</sup> were used on the day of transfusion and seven days later. Regarding data directly related to transfusions, we registered the indication for transfusion, ICU admission and pre-transfusional hemoglobin, storage time of each bag, presence of transfusional reactions and number of pRBC units transfused in the same transfusional episode, as well as the total number of bags received by the patient.

The group of transfused patients was followed prospectively with regard to morbidity and mortality until hospital discharge, or 60 days after the first transfusion. Occurrence of infectious (as documented or suspected infection, severe sepsis, septic shock), respiratory (acute respiratory distress syndrome) and renal (acute renal failure) complications were recorded, as well as the duration of mechanical ventilation and of vasopressor use, time of ICU stay, and survival after 28 and 60 days of transfusion. As part of the analysis of morbidity,  $\Delta$  SOFA was calculated, corresponding to SOFA of 7th day minus SOFA of day zero. This finding was categorized according to the variation occurred in terms of worsening or no change ( $\Delta \geq 0$ ) and improvement ( $\Delta < 0$ ).

Data were presented descriptively. Continuous variables were expressed as mean and standard deviation, or median and percentile 25–75%, according to normalcy; the categorical variables were expressed as a percentage. The normalcy of continuous variables was assessed using the Kolmogorov–Smirnov test. Demographic findings and transfusional characteristics of different ICUs, as well as the relationship with the number of bags, storage time and the risk factors for mortality were analyzed using the chi-square test (for categorical variables), Student’s *t* test/ANOVA (for parametric continuous variables) or Mann–Whitney/Kruskal–Wallis test (for nonparametric continuous variables). The correlations among quantitative variables were tested by Spearman correlation. The variable “total number of transfused bags” was categorized using, as a cutoff point, the value obtained in the receiver operator characteristics (ROC) curve for mortality after 60 days. To analyze the storage time, we used the median value found in the sample. The analysis was performed using SPSS (Statistical Package for Social Sciences) program and the results were considered significant at  $p \leq 0.05$ .

## Results

Seventy-one patients were included in the five ICUs participating in the study, totaling 241 episodes of transfusion and 408 pRBC units. **Table 1** shows the global demographics of the patients and their division by ICUs. The median age of patients was 63 (43–73) years and 53% were female. Most patients (84%) had comorbidities at ICU admission and in 14% of these, prior diagnosis of chronic coronary insufficiency was present.

**Table 2** describes the general data and the data of each unit relating to transfusional characteristics. The median hemoglobin value that triggered the transfusion was 6.8

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