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Transfusion practices in a neonatal intensive care unit in a city in Brazil

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A B S T R A C T

Objective: Newborn infants are the most heavily transfused population inside intensive care units. The hemoglobin level used to indicate the need of transfusions is not well established. The aim of this study was to evaluate transfusional practices in newborns in the neonatal intensive care units of one specific city.

Methods: Red blood cell transfusion practices of all transfused newborns in all five of the neonatal intensive care units of the city were analyzed. Data are reported as descriptive statistics, including numbers and percentages and means and standard deviation. Univariate analysis, followed by stepwise logistic regression was performed in respect to transfusional data and outcomes.

Results: A total of 949 patients were admitted to the intensive care units during the 12-month study period with 20.9% receiving at least one transfusion, most (62.4%) of whom received more than one transfusion. The mean number of transfusions per infant was 2.7 ± 2.16; in the liberal transfusion group the mean number was 1.59 ± 1.63 and in the restrictive group it was 1.08 ± 1.51. The mean hemoglobin and hematocrit levels were 9.0 g/dL (± 1.4 g/dL) and 27.4% (± 4.3%), respectively. The most common indications for blood transfusions were sepsis and prematurity.

Conclusion: This study shows that the characteristics and the transfusion practices for newborns admitted in the neonatal intensive care units of Juiz de Fora are similar to recent pubications. There was no significant reduction in the number of transfusions per child in the restrictive group compared to the liberal group. Restrictive transfusions are an independent risk factor for peri-intraventricular hemorrhages and death.

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Introduction

According to data for 2011 of the Brazilian National Health Service (SUS), very low birth weight newborns represent 32.0% of all childhood mortality. Cross-sectional studies show that they are the most transfused age group in tertiary care facilities. Forty-five to 85% of premature newborns in a neonatal intensive care unit (NICU) receive at least one blood transfusion during hospital stay, making them the population group that is most at risk to transfusion-related adverse effects and complications.[1–6]

The fast growth of the newborn infant, the erythropoietin and iron deficiency inherent to this age group, the low erythropoiesis, the shorter life span of fetal hemoglobin, the oxidative hemolysis that occurs due to sepsis and, especially, iatrogenic loss due to frequent blood sampling are the main factors contributing to the need to transfuse.[2,7]

Despite being a widely used practice, there is still a lack of scientific evidence in regards to the decision of when to transfuse RBCs. Each day more evidence appears about the association of RBC transfusions with morbidity and mortality in the newborn infant, such as changes in cellular immune response, especially T-cell mediated response, necrotizing enterocolitis, retinopathy of the premature infant, bronchopulmonary dysplasia, intraventricular hemorrhage and even death.[7–16]

The number of papers addressing this issue is increasing with an attempt to compare liberal and restrictive transfusion practices, in order to reduce the frequency of transfusions and, consequently, the occurrence of adverse effects.[7,17–19] For this, authors are trying to find clinical variables that may be correlated to the need of RBC transfusions in the neonatal population, as well as risk factors and adverse effects associated with transfusion procedures.[5–7]

Thus, the aim of this study was to gain knowledge on transfusional practices in the NICUs of the city of Juiz de Fora by evaluating the clinical and transfusional characteristics related to this procedure.

Methods

Study design

A cross-sectional study was performed between January 1st and July 31st 2011 and January 1st and July 31st 2012. All medical records of newborn infants that received RBC transfusions in all five NICUs of the city were reviewed.

The study was submitted to and approved by the Ethics Committee of the Universidade Federal de Juiz de Fora (# 337/2011).

All studied NICUs are referral centers for high-risk pregnancy. Two only provide care for National Healthcare Service patients, two only accept private health insurance patients and the other provides care for both systems. The five units have a total of 70 beds.

The following data were gathered from patient's medical records by filling in a questionnaire designed for this study: number of births in each center, maternal, neonatal,

Table 1 – Cut-off levels for hemoglobin (g/dL) in the absence of respiratory support.	
Post-gestational age	Level (g/dL)
1st week	10.0
2nd week	8.5
3rd week	7.5

clinical and demographic characteristics of each case, number of newborn infants that received at least one in-hospital RBC transfusion, number of RBC transfusions that were performed on Days 1–14, Days 15–28 and after Day 28 of hospital stay until hospital discharge, volume of blood transfused, volume of blood drawn for laboratory tests, hemoglobin and hematocrit levels before transfusion and the indication that led to the need of transfusion.

Patient population

All newborn infants that were admitted to one of the five NICUs and that received at least one RBC transfusion were included in this study. However, infants with the following conditions were excluded: death within the first 24 h. after birth, newborns submitted to an exchange transfusion protocol, hemolytic disease of any etiology and major congenital anomalies.

Data collection

Statistical analysis was performed using data derived from the research protocol, with the aim of identifying clinical conditions related to RBC transfusions within the target population. Demographic and clinical variables were reported as descriptive statistics. Continuous variables were described by means and standard deviation and categorical variables as numbers and percentages, as appropriate.

Cut-off hemoglobin levels, believed to be safe for transfusions, were established to evaluate transfusional practices based on the 2011 Cochrane Database for Systematic Reviews (Table 1).[18] Infants receiving transfusions when their hemoglobin was above the cut-off level were allocated to the liberal group and those receiving transfusions when their hemoglobin was below the cut-off level were allocated to the restrictive group. The mean numbers of transfusions per newborn in each group were calculated.

Univariate analysis was then performed comparing the liberal and restrictive groups in respect to transfusion variables (mean hemoglobin level, mean hematocrit level, mean number of transfusions per infant) and relevant neonatal outcomes (mechanical ventilation, intra-ventricular hemorrhage, bronchopulmonary dysplasia, necrotizing enterocolitis, retinopathy of the premature and death). Correlations were identified using the chi-square test for categorical variables and t-test for continuous variables. Statistically relevant variables were submitted to a stepwise logistic regression model to show which transfusional variables are independently related to these outcomes.

Data analysis was performed using the Statistical Package for Social Sciences computer software (version 15.0) for