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# PEDIATRIC PATIENT SAFETY IN THE ADMINISTRATION OF BLOOD COMPONENTS

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## ABSTRACT

**Objective:** to analyze pediatric patient safety in the administration of blood components.
**Method:** a documentary and retrospective study, developed at a hospital in the Brazilian Midwest region. Data collection took place through medical records and 234 transfusions were identified, performed in 90 patients aged from zero to twelve years old, hospitalized between July and December 2020. An instrument based on good practice guidelines about blood components was used. Descriptive and inferential statistics were used for data analysis.
**Results:** the transfusions were predominantly performed in breastfeeding infants (71.1%). Blood transfusions in critical sectors stood out (86.3%), as well as with indication of a clinical order (87.2%) and prescription of packed red blood cells (75.3%). The Nursing reports identified adverse events (n=05) and incidents (n=13) that were associated with inadequacies between the prescribed and infused volumes and the request and administration time ($p<0.001$), although no notification was formalized in the institution during the period.
**Conclusion:** the administration of blood components presented nonconformities, which results in risk situations for pediatric patients.

**DESCRIPTORS:** Transfusion of blood components. Blood transfusion. Hospitalized child. Patient safety. Pediatric Nursing.

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## SEGURANÇA DO PACIENTE PEDIÁTRICO NA ADMINISTRAÇÃO DE HEMOCOMPONENTES


### RESUMO

**Objetivo:** Analisar a segurança do paciente pediátrico na administração de hemocomponentes.
**Método:** Estudo documental, retrospectivo, desenvolvido em um hospital da região Centro-Oeste do Brasil. A coleta de dados ocorreu através de prontuários e foram identificadas 234 transfusões, realizadas em 90 pacientes de zero a doze anos, internados entre os meses de julho a dezembro de 2020. Utilizou-se instrumento baseado em diretrizes de boas práticas de hemocomponentes. Para a análise foi utilizada estatística descritiva e inferencial.
**Resultados:** As transfusões ocorreram predominantemente em lactentes (71,1%). Sobressaíram hemotransfusões em setores críticos (86,3%), com indicação de ordem clínica (87,2%) e a prescrição de concentrado de hemácias (75,3%). Identificou-se no relatório de enfermagem eventos adversos (n=05) e incidentes (n=13) que se associaram a inadequações entre volume prescrito e infundido e ao tempo de solicitação e administração (p<0,001), embora nenhuma notificação foi formalizada na instituição durante o período.
**Conclusão:** A administração de hemocomponentes apresentou inconformidades, o que resulta em situações de risco ao paciente pediátrico.



**DESCRITORES:** Transfusão de componentes sanguíneos. Transfusão de sangue. Criança hospitalizada. Segurança do paciente. Enfermagem pediátrica.


## SEGURIDAD DE PACIENTES PEDIÁTRICOS AL ADMINISTRAR HEMOCOMPONENTES


### RESUMEN

**Objetivo:** analizar la seguridad de pacientes pediátricos al administrar hemocomponentes.
**Método:** estudio documental y retrospectivo, desarrollado en un hospital de la región Centro-Oeste de Brasil. Los datos se recolectaron a través de historias clínicas y se identificaron 234 transfusiones, realizadas en 90 pacientes de cero a doce años de edad, internados entre los meses de julio y diciembre de 2020. Se empleó un instrumento basado en directrices de buenas prácticas de hemocomponentes. Para el análisis se utilizó estadística descriptiva e inferencial.
**Resultados:** las transfusiones se realizaron predominantemente en lactantes (71,1%). Hubo predominio de transfusiones sanguíneas en sectores críticos (86,3%), con indicación de orden clínico (87,2%) y prescripción de concentrado de glóbulos rojos (75,3%). En los informes de Enfermería se identificaron eventos adversos (n=05) e incidentes (n=13) que estuvieron asociados a inconsistencias entre los volúmenes prescripto e infundido y al tiempo de solicitud y administración (p<0,001), aunque no se formalizó ninguna notificación en la institución durante el período investigado.
**Conclusión:** la administración de hemocomponentes presentó inconformidades, lo que deriva en situaciones de riesgo para los pacientes pediátricos.



**DESCRIPTORES:** Transfusión de componentes sanguíneos. Transfusión sanguínea. Niño hospitalizado. Seguridad del paciente. Enfermería pediátrica.

## INTRODUCTION

Despite aging of the population and the change in the demographic pyramid observed in recent years, children and adolescents still represent a significant percentage of Brazilians[1]. Within the health care of the child population, hospitalization represents a safety concern for the patients, in view of its relation to the greater potential for frailty inherent to age itself, which contributes to unsafe conditions within hospital environments and can result in adverse events arising from multiple interventions, with therapeutic use of blood and its components among them[2].

Transfusion therapy (TT) is a world-renowned technique whose use is guided by regulatory standards, resolutions, ordinances and manuals that aim at ensuring good practices in the management of blood components, thus providing increasingly safer care[3–4]. However, most of the documents are based on adult care, which can hinder standardization of the assistance provided to pediatric individuals.

In the administration of blood components there are countless challenges to adapt to teach he child, ranging from the request to the infusion moment. As in the previous assertion, a study conducted in Mexico that assessed whether clinical use of blood in children was indicated according to the guidelines showed that, of the 579 transfusions analyzed, 311 (53.7%) were classified as incorrectly requested and that the prescribed volume was inappropriate in 76 (24.4%)[5].

In Brazil, a research study carried out at a tertiary-level pediatric institute in the Southeast region of the country evaluated the technical characteristics of transfusions based on the guidelines presented by the British Committee for Standards in Hematology, and indicated that 55.1% of the transfusion events were classified as inappropriate in terms of indication, portraying that the clinical and laboratory parameters proposed for this population segment were not being considered[6].

The cited inadequacies suggest that specific requirements and standardization in the therapeutic use of blood in pediatric patients are not adequate to the particularities of this population group. Such inadequacies end up exposing this population to adverse events and situations that deserve special attention, such as propensity to develop hyperkalemia resulting from the rapid infusion of packed red blood cells, which can affect infants and younger children due to increased plasma concentration, as these patients have a lower blood volume for distribution[7].

Faced with a scenario marked by high risk for safety incidents, it becomes necessary to know how patient safety criteria are used during the administration of blood components in pediatric care units. In this context, the question is as follows: How is pediatric patient safety in the administration of blood components presented? To answer this question, the objective was to analyze pediatric patient safety in the administration of blood components.

## METHOD

This is a documentary and retrospective study with a quantitative approach. For better communicating the findings of this research, the descriptions were supported by the recommendations contained in the Portuguese version of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) model[8].

The study was carried out at a private philanthropic hospital located in a capital city from the Brazilian Midwest region. The hospital unit provides health care services, both to users of the Unified Health System (*Sistema* Único *de Saúde*, SUS) and to beneficiaries of agreements, serving the capital city and the inland of the state, in addition to other federative units.

The structure of the hospital in question consists of 101 pediatric beds and an Obstetrics center, which corresponds to 17% of the total beds, which were divided as follows in this research: Critical – pediatric intensive care unit, neonatal intensive care unit, congenital cardiac intensive care unit, surgical center, obstetric center and pediatric emergency room; and Non-critical: wards, burns

ward, conventional neonatal intermediate care unit and pediatric intermediate care unit. In addition, the locus has a transfusion agency that provides hemotherapy assistance to all sectors.

Data collection took place between April and July 2021. The data analyzed correspond to the period from July to December 2020, a time frame that was chosen intentionally. The medical records of children aged from zero to 12 years old who underwent TT in one of the pediatric care units that make up the hospital unit were part of the study.

As inclusion criteria, the blood transfusions were considered were those performed in children of both genders, aged from zero to 12 years old, which took place during consultations in one of the pediatric sectors of hospital care and assisted by the SUS. Transfusions in pediatric patients assisted by the private health network associated with the institution were excluded; as well as in those who did not have any identification of the sector where they received the transfusion; cancer patients, as it is understood that they often need this therapy; and the blood transfusions that occurred in cardiopulmonary bypass (CPB), as exposure of blood to the non-endothelial surface of the circuit can produce a systemic inflammatory response in which substances are released that impair coagulation and the immune response, which would be a confounding variable for the analysis[9].

To access the diverse information at the health institution, weekly visits were conducted in the afternoon to the medical archive service (*Serviço de Arquivamento* Médico, SAME), located within the hospital premises. In order to access the records of the pediatric patients who received blood transfusions from July to December 2020, a survey of the transfusions performed and the notifications of adverse events and transfusion reactions in the period of interest was made based on the report issued by the transfusion agency system.

A total of 594 transfusions were performed on 164 patients from July to December. The sample was calculated considering the total number of transfusions in the period of interest using a 95% confidence level and a 5% margin of error, with the recommended number of 234 transfusions for a representative study sample, which could be achieved in 90 medical records of pediatric patients (non-randomized sample). To reach sample size, the children's names were listed in a Microsoft Office Excel spreadsheet and sent to SAME for record searches. The medical records were separated for convenience and randomly by employees from the responsible sector and made available to the researcher in a reserved place.

Collection was in charge of the lead author with the aid of a form where all the information of the pediatric patients described in the following documents was compiled: Transfusion Request – a form required to be completed by the medical professional that contains data on the blood transfusion request; Medical Prescription – a document containing the entire therapeutic guidance required for health treatment; Transfusion report – a description of all actions taken in the administration of blood components written by employees from the transfusion agency; Nursing notes on the transfusion day – a report of all health care provided to the patients by the Nursing team; Adverse event notification form; and Transfusion reactions notification form. The data collected referred only to the period in which the blood component was being administered (from the request time to the time when the infusion was ended) and were recorded directly in a Microsoft Office Excel spreadsheet.

For data surveying, a form prepared by the authors and based on documents about good practices in the blood cycle and national technical standards was used[10]. The aforementioned form is structured in three stages: I. Characterization of the patient; II. Blood component request data: reason for the transfusion, type of request, date, prescription and administration time, type of blood component, volume, and prescribed administration route; III. Infusion process data: ABO/RH of the patient who underwent the transfusion, identification confirmation, whether blood typing was performed at the bedside, measurement of vital signs (blood pressure, heart rate, respiratory rate and temperature)

both before and after, type of access, and blood component infusion time; IV. Adverse event data; V. Types of transfusion reactions; and VI. Immediate outcomes for the patient.

The patient's immediate outcomes were classified according to severity, as per the Manual for the Implementation of the Patient Safety Center in Health Services[11]. This manual considers the following severity degrees: None: there was no consequence for the patient; Grade 1 – Mild: minimal or intermediate harms of short duration without intervention or with minimal intervention (small treatment or observation); Grade 2 – Moderate: long-term morbidity and, consequently, there was need for prolonged hospitalization, or significant disability, or need for medical or surgical intervention to avoid permanent harms, or impairment of an organ or function; Grade 3 – Severe: it implies an immediate threat to life, although no death was attributed; and Grade 4 – Death attributed to the incident.

The incidents identified were also classified considering the inadequacies perceived in relation to the prescribed volume versus the volume received by the patient, as well as referring to the time the request was made until the moment it was administered, that is, if it was answered within the deadline: urgent within three (3) hours, immediate emergency.

The EPIINFO statistical program, version 7.0, was used for data analysis. The data were subjected to descriptive and inferential statistics using Fisher's Exact Test. All ethical precepts involving studies with human beings were respected; the analysis of medical records was authorized by the institution by signing a Data Confidentiality Form and this study was approved by the Research Ethics Committee.

## RESULTS

Initially, the characteristics of the recipients of all 234 transfusions analyzed are presented. Among the 90 children who underwent administration of blood components and, considering the classification proposed by Hockenberry and Wilson (2014), 71.1% (n=64) were breastfeeding infants, 21.1% (n=19) in early childhood and 7.8% (n=07) in middle childhood (Table 1).

The adverse events and incidents (Table 2) were extracted from the Nursing records and notes observed in the medical records, as there was no notification of adverse events or transfusion reactions formalized in the institution during the investigated period.

As for the incidents without harms identified, they were classified considering the inadequacies perceived in relation to the volume prescribed *versus* the volume received by the patient; as well as referring to the time the request was made until the moment it was administered, that is, if it was answered within the deadline: urgent within three (3) hours, or emergency if immediate.

In addition, of all 137 incidents found, 20 transfusions presented two simultaneous incidents (volume and time from request to inadequate administration). The absence of records of transfusion of blood components in 36.3% (n=85) of the Nursing reports stands out.

Although there was a case in which the patient evolved to cardiorespiratory arrest (CPA) during the blood transfusion, none of the children died. Among the immediate outcomes in relation to the patients, severity was classified as follows: Grade 1 (Mild) – transfusions that occurred with presence of hyperthermia and emesis; and Grade 3 (Severe) – CPA, which implies immediate threat to life, although no death was attributed to the incidents.

**Table 1** – Demonstration of demographic data, sectors and reason for transfusion in children and association of adverse events and incidents (n=234). Campo Grande, MS, Brazil, 2021.

| Variables | Total n (%) | Presence of adverse events | | p-value* | Incidents without harms | | p-value* |
|---|---|---|---|---|---|---|---|
| | | Yes | No | | Yes | No | |
| Gender | | | | | | | |
| Male | 111 (47.4) | 3 (1.2) | 108 (46.1) | 0.67 | 71 (30.3) | 40 (17.0) | 0.11 |
| Female | 123 (52.6) | 2 (0.8) | 121 (51.7) | | 66 (28.2) | 57 (24.3) | |
| Race | | | | | | | |
| Brown/Black | 127 (54.3) | 1 (0.4) | 121 (51.7) | 0.16 | 73 (31.1) | 54 (23.0) | 0.60 |
| White | 85 (36.3) | 2 (0.8) | 82 (35.0) | | 49 (20.9) | 36 (15.3) | |
| Indigenous | 13 (5.6) | 1 (0.4) | 12 (5.1) | | 10 (4.2) | 3 (1.2) | |
| Unknown | 9 (3.8) | 1 (0.4) | 7 (3.0) | | 5 (2.1) | 4 (1.7) | |
| Sectors | | | | | | | |
| Critical | 202 (86.3) | 5 (2.1) | 197 (84.2) | 1.00 | 113 (48.2) | 89 (38.0) | 0.05 |
| Non-critical | 32 (13) | 0 (0.0) | 32 (13.7) | | 24 (10.2) | 8 (3.4) | |
| Reason for the transfusion | | | | | | | |
| Clinical | 204 (87.2) | 3 (1.2) | 201 (85.9) | 0.12 | 123 (52.5) | 81 (34.6) | <0.001 |
| Surgical | 21 (9) | 2 (0.8) | 19 (8.1) | | 5 (2.1) | 16 (6.8) | |
| Traumatic | 9 (3.8) | 0 (0.0) | 9 (3.8) | | 9 (3.8) | 0 (0.0) | |
| Blood type | | | | | | | |
| $O^+$ | 99 (42.3) | 2 (0.8) | 97 (41.4) | 0.85 | 58 (24.7) | 41 (17.5) | 0.24 |
| $A^+$ | 58 (24.8) | 1 (0.4) | 57 (24.3) | | 40 (17.1) | 18 (7.7) | |
| $O^-$ | 46 (19.7) | 1 (0.4) | 45 (19.2) | | 22 (9.4) | 24 (10.2) | |
| $B^+$ | 25 (10.7) | 1 (0.4) | 24 (10.2) | | 14 (5.9) | 11 (4.7) | |
| $A^-$ | 4 (1.7) | 0 (0.0) | 4 (1.7) | | 1 (0.4) | 3 (1.2) | |
| $AB^+$ | 1 (0.4) | 0 (0.0) | 1 (0.4) | | 1 (0.4) | 0 (0.0) | |
| $B^-$ | 1 (0.4) | 0 (0.0) | 1 (0.4) | | 1 (0.4) | 0 (0.0) | |

Note: *p**: Fisher's Exact Test;

**Table 2** – Absolute and relative frequency (%) of the adverse events and incidents recorded in the transfusion procedure records (n=142). Campo Grande, MS, Brazil, 2021.

| Adverse events/Incidents | Frequency | |
|---|---|---|
| | n | % |
| Adverse events presented | | |
| Fever | 3 | 2.1 |
| Cardiopulmonary arrest (CPA) | 1 | 0.7 |
| Emesis | 1 | 0.7 |
| Volume-related incidents | 33 | 23.2 |
| Time-related incidents | 84 | 59.1 |
| Volume- and time-related incidents | 20 | 14.0 |
| **Total** | **142** | **100.0** |

In relation to the requests for blood components shown (Table 3), it is noted that some requests (n=42) used the term “one bag”, not assigning any estimated or specifically required volume for transfusion.

**Table 3** – Association between the safety items in the prescription of blood components, criticality of the sectors and incidence of adverse events or incidents. Campo Grande, MS, Brazil, 2021.

| Variables | Sectors | | p-value* | Presence of adverse events | | p-value* | Incidents | | p-value* |
|---|---|---|---|---|---|---|---|---|---|
| | Critical | Non-critical | | Yes | No | | Yes | No | |
| Type of request | | | | | | | | | |
| Emergency | 3 (1.2) | 1 (0.4) | 0.45 | 0 (0.0) | 4 (1.7) | 0.19 | 1 (0.4) | 3 (1.2) | 0.31 |
| Urgency (3h) | 199 (85.0) | 31 (13.2) | | 5 (2.1) | 225 (96.1) | | 136 (58.1) | 94 (40.1) | |
| Blood component prescribed | | | | | | | | | |
| Red blood cell concentrate | 152 (64.9) | 23 (9.8) | 0.04 | 3 (1.2) | 172 (73.5) | 0.37 | 98 (41.8) | 77 (32.9) | 0.15 |
| Platelet concentrate | 28 (11.9) | 9 (3.8) | | 1 (0.4) | 36 (15.4) | | 27 (11.5) | 10 (4.2) | |
| Fresh frozen plasma | 21 (8.9) | 0 (0.0) | 0.0 | 1 (0.4) | 20 (8.5) | 0.0 | 11 (4.7) | 10 (4.2) | 0.0 |
| Cryoprecipitate | 1 (0.4) | 0 (0.0) | 0.0 | 0 (0.0) | 1 (0.4) | 0.0 | 1 (0.4) | 0 (0.0) | 0.0 |
| Adequate time between request and administration | | | | | | | | | |
| Yes | 117 (50.0) | 12 (6.0) | 0.03 | 4 (1.7) | 125 (53.4) | 0.25 | 32 (13.6) | 97 (41.4) | **<0.001** |
| No | 85 (36.3) | 20 (8.1) | | 1 (0.4) | 104 (44.4) | | 105 (44.8) | 0 (0.0) | |
| Adequacy between prescribed and infused volumes | | | | | | | | | |
| Yes | 161 (68.8) | 20 (8.5) | 0.04 | 4 (1.7) | 177 (75.6) | 0.88 | 86 (36.7) | 95 (40.5) | **<0.001** |
| No | 41 (17.5) | 12 (5.1) | | 1 (0.4) | 52 (22.2) | | 51 (21.7) | 2 (0.8) | |

Note: *p**: Fisher’s Exact Test.

A description of the blood component administration moment with the safety items checked by the transfusion agency professional is presented in Table 4. It was verified that, in both sectors, performing blood typing at the bedside and confirming the patient’s identification were recorded in 98.2% (n=230) of the transfusion reports.

It was also verified that adverse events were present in 2.1% (n=5) in critical sectors. As for the incidents, 82.5% (n=113) happened in critical sectors and 17.5% (n=24) in non-critical sectors.

**Table 4** – Association between the safety items in the infusion of blood components and occurrence of adverse events and incidents. Campo Grande, MS, Brazil, 2021.

| Variables | Service sector | | p-value* | Adverse events | | p-value* | Incidents | | p-value* |
|---|---|---|---|---|---|---|---|---|---|
| | Critical | Non-critical | | Yes | No | | Yes | No | |
| To whom the procedure was intended | | | | | | | | | |
| Health professionals | 191 (81.2) | 30 (12.8) | | 5 (2.1) | 216 (92.3) | | 127 (54.2) | 94 (40.1) | |
| Health professionals and companions | 3 (1.2) | 2 (0.8) | 0.16 | 0 (0.0) | 5 (2.1) | 1.00 | 5 (2.1) | 0 (0.0) | 0.19 |
| Not explained | 8 (3.4) | 0 (0.0) | | 0 (0.0) | 8 (3.4) | | 5 (2.1) | 3 (1.2) | |
| Vital data before and after the procedure | | | | | | | | | |
| Heart rate before | 195 (83.3) | 31 (13.2) | 1.00 | 5 (2.1) | 221 (94.4) | 1.00 | 131 (55.9) | 95 (40.5) | 0.47 |
| Heart rate after | 170 (72.6) | 30 (12.8) | 0.59 | 4 (1.7) | 196 (83.7) | 0.54 | 116 (49.5) | 84 (35.8) | 0.27 |
| Respiratory rate before | 59 (25.2) | 23 (9.8) | <0.001 | 3 (1.2) | 7 (2.9) | 0.54 | 56 (23.93) | 26 (11.1) | **0.02** |
| Respiratory rate after | 3 (1.28)† | 2 (0.8) | 0.21 | 0 (0.0) | 222 (92.3) | 1.00 | 134 (57.2) | 93 (39.7) | 0.47 |
| Temperature before | 195 (83.3) | 31 (13.2) | 1.00 | 5 (2.1) | 221 (94.0) | 1.00 | 16 (6.8) | 210 (89.7) | 1.00 |
| Temperature after | 163 (69.6) | 27 (11.5) | 1.00 | 3 (1.2) | 185 (79.0) | 0.30 | 113 (48.2) | 75 (32.0) | 0.30 |
| Blood pressure before | 174 (74.3) | 15 (6.41) | <0.001 | 4 (1.7) | 185 (79.9) | 1.00 | 109 (46.5) | 80 (34.1) | 0.61 |
| Blood pressure after | 136 (58.1) | 15 (6.41) | 0.03 | 2 (0.8) | 147 (62.8) | 1.00 | 90 (38.4) | 59 (25.2) | 0.57 |
| Infusion time | | | | | | | | | |
| Adequate | 147 (62.8) | 26 (11.1) | | 3 (1.2) | 170 (72.6) | | 103 (44.0) | 70 (29.9) | |
| Inadequate | 14 (5.98) | 3 (1.2) | 0.30 | 0 (0.0) | 17 (7.2) | 0.49 | 11 (4.7) | 6 (2.5) | 0.62 |
| Not recorded | 41 (17.5) | 3 (1.2) | | 2 (0.8) | 42 (17.9) | | 23 (9.8) | 21 (8.9) | |

Note: *p**: Fisher's Exact Test; † 4 not recorded.

## DISCUSSION

The data obtained in the current study show that infusion therapy in children evidenced significant differences in relation to compliance with some safety items according to the sectors' criticality levels. Considering that the benefits offered by the transfusion of blood components in pediatric patients must outweigh the risks of this therapy, it is emphasized that procedures aimed at patient safety must be in compliance, regardless of the care sector.

The occurrence of blood transfusions in children during hospitalization was frequently observed across different age groups, even in neonatal patients, a group that has particularities such as immaturity of the immune system, low weight and volume restriction, as well as pathologies related to

the perinatal period, which contribute to exposure to septic and hemorrhagic conditions, and multiple blood samples for investigations[12].

In this research, clinical indications were predominant, as shown in a study carried out at a maternity hospital in Fortaleza (CE) with the objective of identifying the number of blood transfusions performed in newborns, which highlighted anemia (80.7%)[13]. A similar research study, carried out by analyzing transfusion requests in a general hospital from the inland of São Paulo (SP) in three sectors (emergency room, ward and intensive care unit), showed that most of the transfusions were due to clinical indication (n=165; 79%) and that the most frequent locus was the intensive care unit (69.6%)[14].

In relation to the critical sectors, an integrative review study pointed out that transfusions are a common practice in premature infants hospitalized in neonatal intensive care units[15]. Another study, carried out at a University Hospital in Mexico with the objective of evaluating the use of blood components in pediatric patients, showed that among 579 transfusions performed in a four-year period, 201 (34.7%) were performed on infants and preschool children, with 187 (32.3%) of them in a pediatric intensive care unit[5]. These findings corroborate data from this research and confirm that the critical sectors are the main requesters of blood components, which requires a careful, cautious and individualized analysis when choosing this therapy.

Red blood cell concentrate was the most prescribed blood component, as was also found in a cohort study that analyzed transfusion practices in hospitalized children in 11 hospitals from the United States and pointed out red blood cells as the most transfused blood component, which resulted in the recording of 4,644 blood component transfusion events[16].

Choice of the blood component in children is based on laboratory and clinical findings, in which the most common reasons for blood transfusions are associated with prematurity, respiratory complications, hemorrhagic shock, anemia, sepsis, hereditary hematological factors and even outcomes derived from traumas[16]. Although there are best practice guidelines published for the transfusion of blood and blood components, clinical decisions for transfusion can be challenging and must be considered on an individual basis.

Another challenge in the TT of pediatric patients is adequacy between the prescribed and administered volumes, which resulted in a statistically significant difference. Some factors contributed to the nonconformities verified during the research, for example, incompleteness of the information and lack of a specific field that allows filling in the child's weight in the request form.

Weight is one of the items that must be considered when prescribing any blood component, as the volume occupied by cells and plasma in the vascular system, called blood volume, has an 8% variation in older children and an 8.5% to 9% variation in neonates, which is precisely calculated based on each individual's body weight[10]. Therefore, knowing the weight (in kilograms) can be characterized as a safety barrier, as there are unfavorable outcomes associated with volume overload in this population, which may exert an impact on longer mechanical ventilation (MV), prolonged hospitalization and even mortality risk[17]. Thus, in addition to the laboratory and clinical findings, it is also important to consider the weight of the child to be transfused, regardless of the blood component to be requested and that it should be a mandatory field in the request form, not being restricted to the patient's medical record.

TT requires strict surveillance throughout the transfusion process, with emphasis on the administration moment, a phase marked by repercussions of different magnitudes on the patient, as it is the conclusion of all stages aimed at safety of the procedure. The reality found in this study depicts that a professional performs the installation of the blood component and does not remain until the end of the infusion (transfusion agency technician), with the monitoring performed by a health professional (nursing technician, nurse, or even physician) working in the childcare sector. Such division of tasks may have contributed to the absence of records and to the occurrence of adverse events and incidents verified in the analysis of the medical charts.

The adverse events and incidents identified in this research are similar to the results of a study developed in northeastern Mexico, which analyzed the prevalence of correct and incorrect use of blood components in pediatric patients, identifying inadequacies related to the prescribed volume in 24.4% (n=76) and to the infusion volume and time in 1.3% (n=4)[5]. A multicenter analysis that compared and contrasted the reporting trends of pediatric and adult patient safety events showed notified incidents such as delayed transfusion initiation and inappropriate volumes[18].

Another evidenced fact corresponded to whom the procedure was oriented and/or explained to, showing the professional's difficulty involving the family and/or companion in this care, which can be a strategy that expands the communication measures and, consequently, safety in this therapy. This is what a research study carried out in pediatric clinical-surgical hospitalization units of three hospitals in Porto Alegre/Rio Grande do Sul points out, in which it was possible to recognize how the integration between health professionals and companions/relatives can qualify the assistance provided, and therefore patient safety, through effective communication between those involved in the context of the care to be provided to hospitalized children[19].

The importance of the Nursing team in the administration of blood components is highlighted, as shown in the study that aimed at evaluating these professionals' knowledge in the face of transfusion reactions at a hospital in the state of Pernambuco, concluding that the competent performance of Nursing is an essential requirement in blood transfusions, with a view to preventing possible complications and transfusion reactions, as these professionals not only administer and monitor the transfusions, but also need to know their indications, guide and clarify doubts about this procedure and be able to detect any type of adverse event[20].

In this sense, it becomes necessary that, in relation to the infusion act within the health professionals' surveillance system, companions are also included in this care through an instructional approach on events that may arise from transfusions, aiming to contribute to the early identification of adverse events and minimization of risks involving this health care.

Another relevant point to be noted refers to the consent form to receive a transfusion of blood components. Although it is not a mandatory practice, its use in pediatric patients can be considered an important tool in the care provided, as parents would be aware of the care management strategies their children are being subjected to, even from the point of view of ethics and bioethics involving the transfusion of blood components[21].

Among the pediatric patient safety items in TT, verification of vital signs before and immediately after the transfusion stands out, given its potential for the early identification of systemic changes. The pediatric population has significantly different parameters when compared to adult patients, with variability even in the pediatric group of neonates, infants, children in early childhood and adolescents.

Vital data are characterized as an important hemodynamic stability indicator, which may suggest repercussions associated with the infusion process that need to be immediately interrupted or intermediated, in order to avoid more serious outcomes for the patients. As an example, the non-hemolytic febrile reaction (NHRF) is mentioned, which is characterized by the presence of fever (temperature ≥38°C), with an increase of at least 1°C in relation to the pre-transfusion value; as well as the transfusion-related hypotensive reaction (HYPOT), where in children under 1 year of age or with a body weight of less than 12 kg there is a drop greater than 25% in the baseline value of systolic, diastolic or mean blood pressure[4]. In this sense, monitoring the vital signs before, during and after the infusion can be presented as an objective, non-invasive, fast and effective indicator to promote pediatric patient safety in the infusion of blood components.

In this perspective, it should be noted that research studies on the recording of vital signs after transfusions in this population segment is still incipient, perhaps justified by the lack of records, as was the case in this research. The non-recording of the transfusion of blood components in the Nursing reports perceived in this research shows failures in communication due to the absence of a description of the care provided. Also concerning the requests for blood components observed in this research, it should be noted that the term “one bag” was used in certain situations, thus not specifying the volume considered or described for the transfusion, which in the case of pediatric patients, where the doses are especially weight-dependent, may represent a risk condition and be considered a prescriber’s fault.

The results obtained in this study aim at contributing to the reflection about safe practices in transfusion therapy in children, so that the professionals involved in this type of health care review the weaknesses of the process and can improve their actions to provide safe care to pediatric patients. However, among the limitations of this research, the fact that it was developed in a single hospital service for pediatric care stands out. Another limitation is the fact that the data were collected based on records in medical charts that are performed by professionals who live immersed in the intense routine of performing countless functions, which may not faithfully portray the reality of the service provided, but only flaws in the documentary record, such as lack of notification of adverse events and scarcity of information in the Nursing notes.

## CONCLUSION

Blood transfusions in children neglected some patient safety items, with emphasis in volume, component request time, family involvement in care and verification of vital signs. In addition, prescription failures due to dose omission (volume to be infused) stand out; as well as absence of Nursing records in relation to the end of the component infusion and the fact that there were no incidents or adverse events reported during the investigated period, which is incompatible with what was identified in the review of medical records.

The data point to the need to implement and improve the records of the infusion act, highlighting the Nursing notes, possible transfusion reactions and incident and adverse event reports, as well as including the child’s weight field for proper indication of the volume prescribed in a standard institutional form. In addition, with a view to increasing patient safety, it becomes necessary to strengthen professional/companion relationships, providing better monitoring in care.

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## NOTES

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### CONTRIBUTION OF AUTHORITY
Study design: Santos MM, Souza VS.
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Data analysis and interpretation: Santos MM.
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### CONFLICT OF INTEREST
There is no conflict of interest.



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