




Prescription of red cell concentrates by emergency physicians

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SUMMARY

OBJECTIVE: To evaluate the adequacy of the prescription of red cell concentrates by emergency physicians.

METHODS: A cross-sectional study based on the survey of transfusion requests records completed by emergency physicians, from May/2018 to April/2019, in an emergency hospital. Adequacy in the indication, volume, and subtype (filtered, irradiated, and washed) of prescribed erythrocytes were evaluated. To compare the qualitative data, we used the χ^2 test. The significance level adopted was 5%.

RESULTS: One thousand and twenty-two transfusions were evaluated. The indication, volume, and subtypes were correct in 72.7%, 45.9%, and 81.6% respectively. Transfusion in symptomatic patients presented superior adequacy when compared to asymptomatic individuals with significant statistical difference (indication: 79.6% vs 67.2%, $p < 0.001$; Volume: 63.5% vs 31.7%, $p < 0.001$; subtype: 85.3% vs 78.7%, $p = 0.006$). Among clinical situations, there were more errors in sepsis (39.7%) and pneumonia (36.3%). More than half of the prescriptions presented excessive volume, raising the risk of circulatory overload, observing that the mean age was 60.6 years. The specific analysis of the prescribed subtypes showed adequacy of 17.9% in the filtered, 1.7% in the irradiated, and none in the washed. Thirty transfusions should have been filtered, but the prescriber did not request the subtype.

CONCLUSION: One hypothesis for the observed inaccuracies is inadequate medical training on the subject, both in undergraduate and medical residency, associated with a lack of continuing education on transfusion protocols. The transfusion Committee received the results of this study with a proposal for continuing education measures on transfusion hemotherapy.

KEYWORDS: Erythrocyte transfusion. Blood transfusion. Emergency treatment. Prescriptions. Transfusion medicine.

INTRODUCTION

Richard Lower conducted, in 1665, in England, the first blood transfusion between animals¹. This procedure, then, was tested in humans in the following decades and is currently one of the most used therapies in the world².

The transfusion of red cell concentrate (RCC) increased survival in different clinical situations and surgical procedures. However, it can be the cause of increased mortality when prescribed without need³.

Recent studies show that a restrictive strategy

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(indicating RCC with lower values of hemoglobin) reduces mortality in severe patients^{4,5}. Transfusion protocols indicate the red blood cell transfusion for patients with a hemoglobin count of less than 7 g/dL in most situations⁶. However, many physicians are unaware of the transfusion protocols or are resistant to apply the restrictive strategy, increasing the risks to patients and the number of RCCs prescribed⁷⁻⁹.

Various transfusion reactions can occur, some potentially lethal, such as anaphylaxis, circulatory overload, and TRALI (transfusion-related acute lung injury)^{10,11}.

RCC transfusion is an important part of therapy in various clinical situations, especially in urgency and emergency scenarios¹²⁻¹⁴. Having knowledge of current protocols is essential for emergency physicians.

The objective of this study is to evaluate the adequacy of RCC prescriptions by physicians of an urgency and emergency hospital.

METHODS

We conducted a cross-sectional study based on a survey of request forms for a hemotherapy procedure. We included patients aged over 13 years treated in the emergency room of the medical clinic of the Central Hospital and Emergency Center of São Bernardo do Campo (HPSC), SP, from May 2018 to April 2019. This is a public municipal hospital that receives urgent and emergency cases and that features a transfusion agency. Forms with incomplete data were excluded from the analysis.

The adequacy of the RCC prescription was based in three distinct forms of analysis: indication of transfusion based on the value of hemoglobin (Hb), the prescribed volume, and choice for the correct subtype (filtered, irradiated, washed). To assess the adequacy of the indication, the prescribed volume, and the choice of RCC subtypes, we used the recommendations by the Brazilian Ministry of Health from 2015¹⁵. To analyze the transfusions indicated for sepsis patients, we used the international guidelines for sepsis management¹⁶.

We collected data such as age, gender, indication, pretransfusion hemoglobin, prescribed volume, choice of RCC subtype, and previous diseases. The data were entered into an Excel (Microsoft) spreadsheet and analyzed using the Statistical Package for Social Science (SPSS), version 24.0. The qualitative variables were presented in the form of an absolute number

and percentage. For the comparison of the qualitative data, we used the χ^2 test. The significance level adopted was 5%.

This study was approved by the Research Ethics Committee of the Faculty of Medicine of ABC (Decision No.: 3.286.784), CAAE 11199319.2.0000.0082.

RESULTS

A total of 1,044 RCC transfusions were performed during the study period, of which 22 (2.1%) were excluded due to incomplete data. Males received 55.1% of the transfusions (Table 1). The mean age was 60.6 years (minimum of 14, and a maximum of 100 years).

Most transfusions (55.5%) were prescribed based on a laboratory indication (anemia) in asymptomatic patients. The most prevalent clinical indications were: enterorrhagia (40.9%), hemodynamic decompensation (13%), sepsis (12.8%), and lower gastrointestinal bleeding (9.7%) (Table 1). Indications were made with less than 7 g/dL in 69.3% of transfusions. Laboratory criteria had an average Hb of 6.6 g/dL, while the transfusions based on clinical criteria had an average Hb of 6.3 g/dL. The prescriptions were as follows: one pack of RCC for 313 patients, two packs for 588, three packs for 113, and four packs for eight. The average number of packs prescribed based on laboratory indication was 1.8 and, based on clinical indication, 1.9 (Table 1).

A total of 185 specific subtypes of RCC were requested. In 45 transfusions, two or three subtypes were prescribed simultaneously. The subtype most frequently requested was irradiated RCC (119), followed by filtered RCC (56), and washed RCC (10) (Table 1).

The indication for transfusion was correct in 72.7% of the cases evaluated. When performed based on laboratory criteria, the adequacy was 67.2%, and when based on clinical criteria, 76.9% (Table 2). In relation to the clinical reason, sepsis presented adequacy of 60.3%, and pneumonia 63.7%. The other reasons had adequacy over 70%. Adequacy was significantly higher in the group who received transfusions based on clinical criteria, compared to the group based on laboratory indication, with $p < 0.001$ (Figure 1).

Transfusions performed with Hb < 7 g/dL, 7 to 10 g/dL, and > 10 g/dL were correct in 100%, 11.2%, and 0% of cases, respectively (Table 2).

The volume (number of packs) was correct in 45.9% of the transfusions. When one RCC was requested, adequacy was 99%, and when the number was two, it was 27%. All requests for over two RCCs were

TABLE 1. GENERAL CHARACTERISTICS OF TRANSFUSIONS PERFORMED

Variable		N	%
Gender (n=1,022)	Male	563	55.1
	Female	459	44.9
Age (years) (n=1,022)	14 ---20	21	2.1
	20 ---40	123	12.0
	40 ---60	323	31.6
	60 ---80	428	41.9
	80 ---100	127	12.4
Clinical condition (n=455)	Enterorrhagia	186	40.9
	Hemodynamic decompensation	59	13.0
	Sepsis	58	12.8
	Lower gastrointestinal bleeding	44	9.7
	Weaknesses	27	5.9
	Sickle cell disease	16	3.5
	Hematuria	15	3.3
	Acute respiratory failure	12	2.6
	Pneumonia	11	2.4
	Others	27	5.9
Reason (n=1,022)	Laboratory (asymptomatic)	567	55.5
	Clinical (symptomatic)	455	44.5
Pretransfusion Hb (n=1,022)	<7 g/dL	708	69.3
	7 to 10 g/dL	313	30.6
	>10 g/dL	1	0.1
Prescribed volume (n=1,022)	1 CH	313	30.6
	2 CH	588	57.6
	3 CH	113	11.0
	4 CH	8	0.8
RCC subtype (n=185)	Filtered	56	30.3
	Irradiated	119	64.3
	Washed	10	5.4

incorrect (Table 2). The adequacy in the volume prescription based on laboratory criteria was 31.7%, and based on clinical criteria, 63.5%, with a statistically significant difference ($p < 0.001$) (Figure 1).

In 188 transfusions (18.4%) there was an error in the prescription of RCC subtype (unnecessarily requested or not requested when indicated). In 158 prescriptions, one or more subtypes were requested with no need, totaling 173 subtypes (Table 1). On the other hand, in 30 transfusions the filtered subtype was not prescribed when there was an indication. Irradiated RCC was prescribed in 119 blood transfusions,

TABLE 2. ADEQUACY OF THE RED CELL CONCENTRATE TRANSFUSION

Variable		Total (N)	Correct (N)	Correct (%)	
Indicated (n=1,022)	Laboratory	567	381	67.2	
	Clinic	455	362	79.6	
Clinical condition (n=455)	Enterorrhagia	186	131	70.4	
	Hemodynamic decompensation	59	57	96.6	
	Sepsis	58	35	60.3	
	Lower gastrointestinal bleeding	44	31	70.5	
	Weaknesses	27	27	100	
	Sickle cell disease	16	15	93.8	
	Hematuria	15	13	86.7	
	Acute respiratory failure	12	11	91.7	
Pretransfusion Hb (n=1,022)	<7 g/dL	708	708	100	
	7 to 10 g/dL	313	35	11.2	
	>10 g/dL	1	0	0	
	Prescribed volume (n=1,022)	1 CH	313	310	99
		2 CH	588	159	27
3 CH		113	0	0	
4 CH		8	0	0	
RCC subtype (n=185)	Filtered	56	10	17.9	
	Irradiated	119	2	1.7	
	Washed	10	0	0	

of which 117 (98.3%) had no need for it. Filtered RCC was prescribed in 56 transfusions and was incorrect in 46 (82.1%) of them. Washed RCC was prescribed ten times, all inappropriately (Table 2). The adequacy of the request for the RCC subtypes in transfusions prescribed based on laboratory and clinical indication was 78.7% and 85.3%, respectively ($p = 0.006$) (Figure 1).

DISCUSSION

A greater number of blood transfusions were performed in asymptomatic patients, situations in which physicians had time to discuss the clinical case with other colleagues or with the hematologist of the hospital transfusion agency. When patients were symptomatic, the main cause was enterorrhagia.

Almost 70% of transfusions occurred in patients with Hb less than 7 g/dL, a trigger that indeed indicates

the need for transfusion in most clinical situations¹⁵. Patients in hospitals that follow a restrictive transfusion trigger (perform transfusions in patients with Hb less than 7 g/dL) receive fewer transfusions than those in hospitals that adopt liberal transfusion strategies¹⁷. Another benefit of the restrictive strategy is the reduction of transfusion reactions in severe patients¹⁸. All transfusions performed with Hb below 7 g/dL were correct; however, only 11.2% of those performed with Hb from 7 to 10 g/dL were appropriate.

The adequacy in the indication was significantly higher in symptomatic patients. There were more errors in cases of sepsis, for which the current guideline recommends transfusion when Hb levels are below 7 g/dL¹⁶. Patients with pneumonia without respiratory insufficiency or mechanical ventilation received unnecessary transfusions in almost 40% of cases.

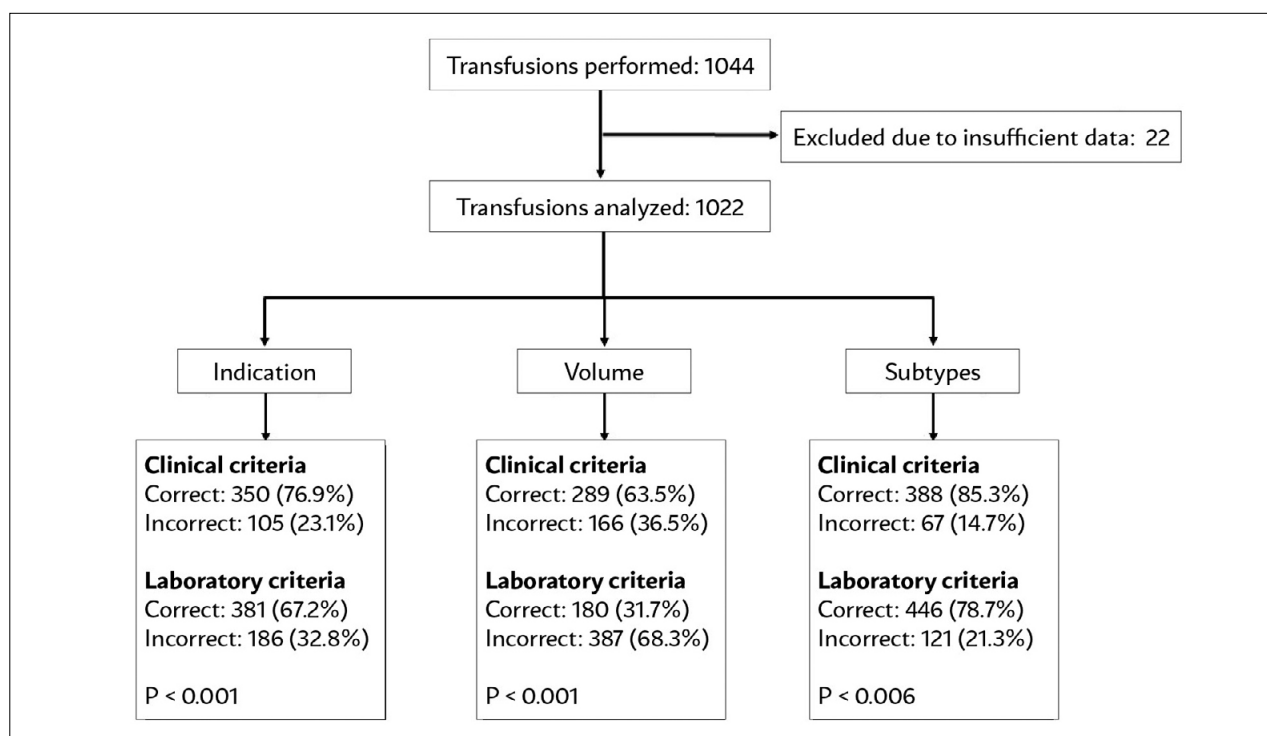
There was excessive volume in 54.1% of prescriptions. All requests for over 2 RCCs were incorrect. The circulatory overload related to a high volume of blood transfusion is one of the most frequent transfusion reactions and presents high mortality¹⁹. In our study, we found that 54.3% of the patients were over 60 years old, increasing, even more, the risk of transfusion reaction. An American cohort study also observed a greater number of transfusions in elderly patients treated in emergency rooms²⁰.

Only 6.5% of the specific subtypes prescribed were adequate. It was also observed that in 30 transfusions filtered RCC was indicated but it was not prescribed. All these situations occurred in patients with hemoglobinopathies (27 with sickle cell disease and three with thalassemia major). Filtered RCC is indicated especially in polytransfused patients, such as those with hemoglobinopathies, to prevent febrile non-hemolytic reaction¹⁵. The prescription of subtypes without need results in increased treatment costs²¹. In some situations, it can increase the wait time for a severe patient due to the preparation time of the subtype²¹. This factor results in an increased risk of death if the transfusion is indicated in emergencies. The washed subtype presents a further complication when unnecessarily requested: it reduces in up to 20% the number of red blood cells, decreasing the transfusion yield²².

When comparing the group that received transfusions based on clinical criteria (symptomatic) with the group that received it based on laboratory criteria (asymptomatic), we observed that the indication, the calculation for volume, and the choice of subtypes presented higher adequacy in the symptomatic group, with a statistically significant difference in the three analyses.

A hypothesis that justifies the inaccuracies observed is the inadequate medical training on the

FIGURE 1. ADEQUACY OF TRANSFUSION COMPARING LABORATORY AND CLINICAL INDICATIONS



subject, both in undergraduate programs and in medical residency. Associated with this, is the lack of continuing education of emergency physicians on transfusion protocols. Since the need to improve the indications for transfusion of red cell concentrate was observed, the hospital transfusion committee received the results of this study with the proposal for measures of continuing education on transfusion hemotherapy. Continuing education is proven to improve the knowledge of the physicians on hemotherapy^{23,24}. The lack of knowledge of transfusion protocols increases the risks to patients, making training necessary²⁵.

The strengths of this study were the number of transfusions evaluated, the analysis of the requests made specifically by emergency physicians of the medical clinic, a small percentage of loss (2.1%), and the availability of an official guide on the indications for transfusion by the Brazilian Ministry of Health, in addition to international guidelines for comparison of the results.

As to the limitations, one can cite the retrospective design of the study and the absence of details on the clinical history in the request form for the hemotherapy procedure.

CONCLUSION

Transfusions in asymptomatic patients require caution. The protocols for transfusion in sepsis and in patients with respiratory diseases without respiratory failure should be discussed. In relation to the excessive volume of packs prescribed, only in severe cases, such as hemorrhagic hypovolemic shock, a greater number of packs must be requested. The knowledge of subtypes must also be emphasized, because of the lack of prescription when there is an indication increases transfusion risks, while unnecessary prescriptions also present complications. In case of doubt, the issue should be discussed with the hemotherapist of the transfusion agency.

RESUMO

OBJETIVO: Avaliar a adequação da prescrição de concentrados de hemácias por médicos emergencistas.

MÉTODOS: Estudo transversal por levantamento de fichas de requisição de transfusões preenchidas por médicos emergencistas, no período de maio de 2018 a abril de 2019, em um hospital de emergências. Foram avaliadas as adequações na indicação, volume e subtipo (filtradas, irradiadas e lavadas) de hemácias prescritas. Para comparação dos dados qualitativos, utilizamos o teste de χ^2 . O nível de significância adotado foi de 5%.

RESULTADOS: Foram avaliadas 1.022 transfusões. A indicação, o volume e os subtipos estavam corretos em 72,7%, 45,9% e 81,6%, respectivamente. A transfusão prescrita em pacientes sintomáticos apresentou adequação superior quando comparada aos assintomáticos, com diferença estatística significativa (indicação: 79,6% vs 67,2% – $p < 0,001$; volume: 63,5% vs 31,7% – $p < 0,001$; subtipo: 85,3% vs 78,7% – $p = 0,006$). Entre as situações clínicas, ocorreram mais erros na sepse (39,7%) e pneumonia (36,3%). Mais da metade das prescrições apresentavam volume excessivo, elevando o risco de sobrecarga circulatória, observando-se que a média da idade foi 60,6 anos. A análise específica dos subtipos prescritos apresentou adequação de 17,9% nas filtradas, 1,7% nas irradiadas e nenhuma das lavadas. Trinta transfusões deveriam ter sido filtradas, porém o prescritor não solicitou o subtipo.

CONCLUSÃO: Uma hipótese para as incorreções observadas é a formação médica inadequada sobre o assunto, tanto na graduação como na residência médica, associada à falta de atualização nos protocolos transfusionais. O comitê transfusional recebeu os resultados deste estudo com proposta de medidas de educação permanente sobre hemoterapia transfusional.

PALAVRAS-CHAVE: Transfusão de eritrócitos. Transfusão de sangue. Tratamento de emergência. Prescrições. Medicina transfusional.

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