

Research Article

Evaluation of Acute Transfusion Reactions in a University Hospital in the Brazilian Midwest

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Abstract

Aim: The present study evaluated acute transfusion reaction in the University Hospital of Goiás between January to June 2014.

Methods: We performed data collection through two different ways. Firstly by an active search for evidence of acute transfusion reaction in transfusion and medical records and secondly by spontaneous reporting.

Results: The rate of acute transfusion reactions analyzed by active search was 10.6‰ in 852 transfusions and 1.8‰ of spontaneous reports in 5440 transfusions, covering an underreporting rate of 47.4%. Allergic reaction was the most common event (n=13,68.4%). The rate of febrile non-hemolytic transfusion reaction was small (n=2,10.5%), the transfusion-associated circulatory overload represented (n=2,10.5%) of the reactions and the hypotensive response rate was (n=1,5.3%).

Conclusion: The results show an improvement of the reports in the Clinical Hospital of Goiás compared to the reports described in the national Haemovigilance in 2014. It is less than ideal and it reflects the situation of the hemotherapy in country, with few reports and a small production of national knowledge on the subject.

Keywords: Blood transfusion; Haemovigilance; Transfusion safety

Introduction

Blood transfusion is a well-established therapy and is essential in several clinical situations; however, this therapy carries some risks to the recipients. Adverse reactions resulting from blood transfusions are known as transfusion reactions, which are classified into acute (when they occur during blood transfusion or within 24 hours after that) or late-onset (when they occur 24 hours after transfusion) [1-3].

To identify, evaluate, and adopt measures to prevent the risks associated with blood transfusions, a hemovigilance system was created; this network-based system receives and analyzes notification data obtained from the blood therapy services and helps to develop strategies aimed at ensuring transfusion safety. Moreover, it evaluates adverse reactions due to the use of blood products through the

epidemiological monitoring of blood donors and through the study of the characteristics of the notifications [4,5].

In Brazil, the hemovigilance program is managed by the National Agency of Sanitary Surveillance (Agencia Nacional de Vigilância Sanitária-ANVISA). On the basis of the Federal Constitution and the regulatory legislation, with a focus on the monitoring of adverse reactions due to the therapeutic use of blood and blood components, this strategy aims to improve the quality of blood products and reduce the risk of new complications. In 2002, a pilot project designated 'Sentinel Hospitals Project' was implemented, and in 2007, this project was extended to all blood transfusion services in Brazil. At present, the system receives reports of transfusion reactions coming from the healthcare services that perform transfusions. The notification of adverse reactions due to blood transfusions is mandatory, and the reporting is performed electronically through ANVISA's Notification System for Transfusion Reactions (NOTIVISA), a web page created by ANVISA [6].

Since its implementation, the Brazilian hemovigilance service has documented an increasing number of notifications, from 160 notifications in 2002 to 9834 in 2013. According to ANVISA data 3,148,629 transfusions were performed in 2013 throughout Brazil and the incidence rate of transfusion reactions was 3.1 per 1,000 transfusions. However, it is estimated that underreporting still occurs in various parts of the country considering the large variation in the notification rate among different regions of Brazil [6]. Therefore,

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the aim of this study was to evaluate the prevalence of immediate transfusion reactions in patients receiving blood transfusions and blood products in the Clinics Hospital of the Federal University of Goiás between September 1, 2013 and February 28, 2014.

Methods

This is an epidemiological and prospective study with a quantitative approach. The data collection initiated after study approval by the Research Ethics Committee of Pontifical Catholic University of Goiás under file no: 490.699 from December 2013.

The study was conducted in a university hospital in the Brazilian Midwest offering several medical specialties and containing 260 beds distributed among the clinical, surgical, pediatrics, and gynecology departments. The medical specialties include hematology, oncology, adult and neonatal intensive care unit, emergency care, and hemodialysis. The number of admissions per month is approximately 1057. The study population data were obtained from patient records archived in this hospital's blood therapy service, from notification of transfusion reactions, and from medical records. The sample size calculation was based on the monthly average of blood transfusions of this hospital in 2013.

The study sample included the first 100 transfusions performed each month between January and June of 2014, totaling 600 transfusions. The data associated with these 600 transfusions were analyzed by assessing the transfusion request forms, the transfusion records of the blood bank, and medical records. In addition, all blood transfusions that involved the spontaneous reporting of transfusion reactions during the study period were evaluated.

A total of 10 transfusions, for which some of the records were not available (blood transfusion request forms, blood bank records, or medical records) were excluded.

The file used for data collection was developed on the basis of the notification form for transfusion reactions available at NOTIVISA and contained information on socio-demographic and clinical characteristics of the recipients and data associated with blood transfusions.

After collection, these data were recorded and analyzed using the statistical package Bioestat version 5.0 [7]. For the descriptive analysis of the variables, simple frequencies and percentages were used. The incidence rate was calculated as the ratio between the numbers of acute transfusion reactions per 1000 blood products transfused.

Results

Between January and June of 2014, 5,440 blood products were transfused in the various clinics of HC/UFG, and Red Blood Cell (RBC) were the most used products, totaling 2,749 (50.5%). This study evaluated 590 blood transfusions by an active search of 846 blood products, which corresponded to approximately 15.7% of the total number of blood products used in the period (5,440).

During the evaluation of blood transfusions by active search, we found reports of Acute Transfusion Reactions (ATRs) in the medical records of 9 patients, with an incidence rate of 10.6‰ in the 846 blood products transfused. Ten ATRs were spontaneously reported and the incidence rate was 1.8‰ in the 5,440 blood products transfused. The sum of the spontaneous reports and those found by active search yielded an incidence rate of 3.5 ATRs per 1000 blood transfusions in 5,440 transfusions performed. Considering that not all transfusions were evaluated by active search and that this method of evaluation identified RTAs that were not notified to the blood bank (n=9), the under reporting rate was 47.4%.

The 19 ATRs evaluated involved the use of 31 blood products and the RBC was the product most strongly associated with ATRs (n=19,61.3%), followed by Fresh Frozen Plasma (FFP) (n=5,16.1%), pooled platelet concentrates (n=4,12.9%), and apheresis platelet concentrated (n=3,9.7%). Cryoprecipitates were not associated with ATRs. For 9 ATRs (47.4%), more than one blood product was involved (Table 1).

In the transfusions in which ATRs were notified, 43% of blood products were leuko reduced, 21% of the patients received pre-medication to prevent allergic reactions, and 36.8% had exhibited ATRs in the past.

Table 1: Description of the ATRs notified by transfusion patients in the HC/UFG between January 1, 2014 and June 30, 2014.

Patient	ATR	Symptoms	Age	Clinical diagnosis	Severity	Blood component transfused
1	FNHR	Fever and chills	28	Aplastic anemia	Mild	2 units of RBC
2	Allergic reaction	Chills, urticaria, nausea, and dyspnea	25	Neoplasia	Mild	Pool of 5 units of PC
3	Allergic reaction	Urticaria, nausea, and swelling of the eyelids	25	Neoplasia	Mild	Pool of 5 units of PC
4	Allergic reaction	Urticaria and pruritus	58	Neoplasia	Mild	2 units of RBC
5	FNHR	Fever and dyspnea	58	Neoplasia	Mild	2 units of RBC
6	Hypotension	Hypotension, vomiting, and flushing	50	Acute anemia	Mild	2 units of RBC
7	Allergic reaction	Urticaria and pruritus	13.0	Acute anemia	Mild	1 unit of RBC and 3 units of FFP
8	TACO	Hypertension	45	Chronic anemia	Mild	2 units of RBC
9	Not identified	Vomiting	28	Acute anemia	Mild	1 unit of RBC
10	TACO	Hypertension, dyspnea, and tachycardia	58	Acute anemia	Moderate	1 unit of RBC and 1 unit of FFP
11	Allergic reaction	Urticaria, dyspnea, and pruritus	28	Aplastic anemia	Mild	1 unit of APC and 2 units of RBC
12	Allergic reaction	Tremor, back pain, dyspnea	79	Coagulation disorders	Severe	1 unit of FFP
13	Allergic reaction	Urticaria	22	Neoplasia	Mild	1 unit of APC
14	Allergic reaction	Chills, tremors, hypertension, and tachycardia	63	Neoplasia	Moderate	Pool of 5 units of PC
15	Allergic reaction	Urticaria	15	Hemolytic anemia	Moderate	2 units of RBC
16	Allergic reaction	Urticaria	23	Neoplasia	Mild	1 unit of APC
17	Allergic reaction	Urticaria and pruritus	63	Acute anemia	Mild	1 unit of RBC
18	Allergic reaction	Urticaria, hypertension, dyspnea, anaphylactic shock, swelling of the eyelids, pruritus	23	Neoplasia	Severe	1 unit of RBC
19	Allergic reaction	Urticaria	25	Neoplasia	Moderate	Pool of 5 units of PC

Discussion

According to ANVISA, to date, the exact number of transfusions performed in Brazil and the exact number of healthcare services that perform transfusions are not known. Therefore, much of the information on transfusion therapy in Brazil is based on estimates retrieved from the international literature and/or from calculations estimated using Data SUS data [6].

Brazil has a geographical area of more than 8 million square kilometers and is divided into 5 regions, in addition to the Federal District. These regions have very distinct socioeconomic characteristics: the south and southeast regions and the Federal District had the best development indexes and the highest reporting rates, estimated at 2.9‰ in 2,199,095 transfusions performed in 2013. By contrast, the north, northeast, and Midwest regions had a reporting rate of 1.84‰ in 949,535 transfusions performed in 2013 [6].

To estimate the under reporting rate in Brazil, ANVISA uses the expected incidence rate of 3 ATRs per 1000 transfusions performed, as reported in the French literature [6]. Our study found an incidence rate of 3.5‰, which is higher than the average rate estimated by ANVISA and by the National Blood Collection and Utilization Survey (NBCUS) from the U.S. at 2.6 ATRs per 1000 blood products transfused. However, the rate obtained in the present study corroborates the results of another U.S. notification service, which reported an incidence rate of 3.7 ATRs per 1000 blood products transfused [8]. The hospital where the study was conducted is a University Hospital and is part of the network of sentinel hospitals; therefore, it participates in the hemovigilance program since its inception, and this fact may have contributed to the higher incidence rates obtained compared with those reported in the surrounding cities.

In Switzerland, the notification of transfusion reactions became mandatory in 1998 and the notification rates have increased steadily since then. A study conducted in a Swiss university hospital during a 5-year period reported an incidence rate of 4.19 ATRs per 1000 blood products transfused [9]. In Namibia, Africa, a national hemovigilance service was introduced in 2008. A study conducted in this country in 2011 found notification rates of transfusion reactions of 0.8‰ in 10,338 blood components transfused whereas the estimated rate was 11.5‰ in 2,284 blood products transfused [10]. These data, as well as those found in Brazil, suggest the presence of a correlation between socioeconomic development and the notification rate of transfusion reactions, i.e., the less developed is the country, the larger is the under reporting rate.

The number of notifications submitted to Serious Hazard of Transfusion (SHOT), a blood surveillance service in the UK, has continuously increased. This increase is encouraging because it reflects the adherence of transfusion services to the adoption of hemovigilance systems. However, the number of reports per hospital varies greatly. This rate varied between 0‰ and 6.8‰ blood products transfused in the UK and between 0.20‰ and 7.07‰ in Canada, indicating that even in developed countries, under reporting still occurs [11,12].

According to the American Association of Blood Banks (AABB), underreporting also occurs in the U.S., where in 2008, the incidence rates of adverse reactions associated with transfusion considering the different national programs varied between 2.6‰ in the NBCUS program and 3.7‰ in the other programs [8].

An interesting finding of the present study was the few occurrences of Febrile Non-Hemolytic Transfusion Reactions (FNHR), which are one of the most common reactions reported. The use of leukocyte filters in most transfusions evaluated in 61.1% (n=259) of the RBC and in 97.8% (n=262) of the platelet concentrates can be an explanation because the incidence rates of FNHR decrease considerably when the leukoreduction of blood components is performed before blood storage or even before transfusion [13].

However, even in countries that have implemented universal leukoreduction, the frequency of FNHR is higher than that found in our study and corresponded to 58.6% of the ATRs reported in Switzerland [9], 33.3% in Japan [14], 36.1% in the U.S. [15], but only 10.5% in our study. These results suggest that, in addition to the use of leukocyte filters, FNHR is also under diagnosed, which contribute to its low frequency in this study. The FNHR is identified by exclusion because the observed signs and symptoms may be due to illnesses or other transfusion reactions [3].

Allergic reactions were the most common ATR (n=13,68.4%), corroborating data from others studies [6,14-16]. Among the patients who developed allergic transfusion reactions, 6 (50%) received pre-transfusion medications as a preventive therapy and, of these, 5 exhibited mild allergic reaction and 1 had a moderate allergic reaction.

Transfusion-Associated Circulatory Overload (TACO) was observed in 10.5% (n=2) of the cases, and this percentage was higher than that registered in ANVISA's report in 2014, wherein the mean rate of TACO was 3.4% between 2007 and 2013 in Brazil. In the present study, no cases of hemolytic reaction, non-immune hemolysis, transfusion-associated bacterial sepsis, and Transfusion-Related Acute Lung Injury (TRALI) were notified and no reports of these complications were found.

In a study conducted in this hospital in 2005, bacterial contamination was reported in 0.4% of the 2000 platelet concentrates analyzed, and none of these concentrates were used in transfusions [17]. In Brazil, in 2012, 14 transfusion reactions due to bacterial contamination of the blood bag were notified to ANVISA, with one death and an annual incidence rate of 2.41 per 100,000 platelet transfusions [6]. Other study reported the rate of one case of bacterial sepsis per 2000 to 3000 platelet transfusions [18]. To date, bacterial sepsis is the infectious transfusion reaction most commonly associated with death by blood transfusion in the United States [19].

The average rate of notification of distinct ATRs due to FNHR and allergic reactions has reached almost 6% and may indicate the need to invest in more accurate diagnoses of transfusion reactions [6].

With regard to reaction severity, 13 reactions were mild, 4 were moderate, and 2 were severe. No transfusion-associated death was reported, and several studies have shown that mild ATRs are the most common [6,9,12,14,15].

Conclusion

The results of the present study indicate that the difference in the incidence rate of ATRs by active search (10.6‰) and spontaneous reporting (1.8‰) demonstrates the occurrence of underreporting in this hospital and reflects the status of blood therapy in distinct regions of Brazil. In addition, despite the government investments to increase the awareness among professionals and healthcare services to fully adhere to the hemovigilance program implemented in Brazil as well as the increase in the number of reporting institutions and notifications, the underreporting rate is still high.

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