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Longitudinal analysis of return time and factors associated for blood donation in first-time donors volunteers

Análise longitudinal do tempo de retorno e fatores associados para doação de sangue em primodoadores voluntários

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ABSTRACT

Introduction: Different factors related to blood donation can generate situations that affect their return and, when not elucidated and solved, can compromise loyalty to blood centers. **Objective:** The purpose of this paper was to estimate first-time blood donors return time and associated factors. **Method:** Cohort studies were designed after consulting State Blood Center's database in Apucarana, PR, Brazil. Donor medical records were analyzed from January 1, 2005 to June 30, 2009, and their returns were monitored until the year 2011. It was considered as the dependent variable the turnaround time for second donation and its prevalence after the first donation. Anthropometric, clinical and laboratory data were collected, followed by a structured interview. Data were submitted to Kaplan-Meier survival analysis comparing them with the log-rank test. The proportional hazards regression Cox model was used to identify risk factors associated with the return, calculating the proportional risk and interval 95% confidence interval (95%CI). **Results:** 41.5% returned: 26.1% temporarily were unfit and 50.0% fit. Donors who returned more quickly were Rh negative, under 19 years old and with hypotension. The proportional risk for the main impeditive were older age (RP = 0.190; 95%CI 0.071–0.510), farther distance (RP = 0.276; 95%CI 0.124–0.616), arterial hypotension (RP = 0.540; 95%CI 0.385–0.759), risky behavior (RP = 0.533; 95%CI 0.473–0.601), anemia (RP = 0.402; 95%CI 0.348–0.464) and arterial hypertension (RP = 0.377; 95%CI 0.277–0.513). **Conclusions:** This study showed a significant decrease in first-time donors who return to the service for other donations and identified that young people and those who were apt were the groups with the highest frequency of return. Knowledge of the causes of temporary inability to donate provides conditions to encourage those temporary unable to donate to return for future donations.

KEYWORDS: Blood Donors; Blood Centers; Blood Donors Selection; Kaplan-Meier Estimate; First Time Donors

RESUMO

Introdução: Diferentes fatores inerentes à doação de sangue podem gerar situações que intervêm no retorno dos doadores, as quais, quando não elucidadas e não solucionados os problemas delas derivados, comprometem a fidelização aos hemocentros. **Objetivo:** Estimar o tempo de retorno à doação de sangue em primodoadores e fatores associados. **Método:** Estudo de delineamento de coorte por meio da análise do Banco de Dados do Hemonúcleo da Regional de Saúde em Apucarana (PR). Foram analisados os prontuários de doadores no período de 1º de janeiro de 2005 a 30 de junho de 2009, cujos retornos foram acompanhados até o ano de 2011. Considerou-se como variáveis dependentes o tempo de retorno para segunda doação e sua frequência após a primeira doação. Foram coletados dados antropométricos, clínicos e laboratoriais e, em seguida, entrevista estruturada. Os dados foram submetidos à análise de sobrevida de Kaplan-Meier comparando-os pelo teste *log-rank*. O modelo de regressão de risco proporcional de Cox foi utilizado para identificar os fatores de risco associados ao retorno, calculando-se o risco proporcional com intervalo de 95% de confiança (IC95%). **Resultados:** Observou-se uma proporção

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de retorno de 41,5%, sendo 26,1% dos inaptos temporariamente e 50,0% dos aptos. Doadores que retornaram mais rapidamente foram os Rh negativos, idade menor de 19 anos e com hipotensão arterial. Os riscos proporcionais (RP) para fatores impeditivos do retorno estiveram associados a idade mais avançada (RP = 0,190; IC95% 0,071–0,510), procedência mais distante (RP = 0,276; IC95% 0,124–0,616), hipotensão arterial (RP = 0,540; IC95% 0,385–0,759), comportamento de risco (RP = 0,533; IC95% 0,473–0,601), anemia (RP = 0,402; IC95% 0,348–0,464) e hipertensão arterial (RP = 0,377; IC95% 0,277–0,513). **Conclusões:** Este estudo mostrou diminuição significativa de primodoadores que retornam ao serviço para outras doações e identificou que os jovens e aqueles aptos foram os grupos com maior frequência de retorno. O conhecimento das causas de inaptidão temporária propicia condições para incentivar os inaptos temporários a retornarem para doações futuras.

PALAVRAS-CHAVE: Doadores de Sangue; Bancos de Sangue; Seleção do Doador; Estimativa de Kaplan-Meier; Primodoadores

INTRODUCTION

The biggest challenges of hemotherapy services in Brazil and in the world are to increase blood donation and to maintain the levels of the stocks. In everyday life and in scientific evidence, one can see that the shortage of this biological material in blood banks is due to the substantial global demographic expansion, the aging population, the decrease in the willingness of healthy young people to donate and the incidence of car accidents[1].

The factors that drive people to donate blood are availability of time, ethical values, citizenship, goodwill, altruism, sympathy for someone else's illness, the desire for a cure and the need to comply with a duty expected by society[2]. Other reasons include prior donation, search for free blood tests, the mandatory requirement of military services to take young people to donate blood and the benefit of having the donation day as a paid holiday from work[2,3,4].

Individuals who volunteer to donate blood for the first time and go through the entire donation process are called first-time donors[5]. After the donation, these individuals are added to a list of donors who may be periodically invited by the responsible sector or who may return spontaneously. Studies that analyze the factors associated with the return of first-time donors give us a more accurate view of reality, since these donors have not undergone any previous process. Learning the characteristics inherent in the moment of blood donation can strengthen the strategy to encourage the donors' return. Conversely, when the problems in the donation process are not elucidated or solved, they can hinder donors' loyalty to blood centers and consequently decrease future donations.

Scientific investigations that study donation determinants, as well as the donors' return to blood centers, can support local health policies, the planning of blood donation campaigns, studies that aim to demonstrate donors' characteristics related to clinical eligibility and help understand the factors at play in determining someone's decision to donate blood[6]. Evidence of the factors associated with the return of first-time donors to the blood center for a new donation is still incipient. Understanding these factors is essential in strategies to encourage the return of the donors as well as to make them loyal to the blood center[7].

Therefore, elucidating the aspects that influence the return of blood donors can contribute to the implementation of policies that increase donations and help maintain the assistance provided to the users. In this sense, the objective of this study was to estimate first-time donors' time to return to blood donation and the associated factors among adults in the region of Apucarana, state of Paraná, Brazil.

METHOD

Exploratory cohort study using the database of the Paraná State Hemotherapy and Information System (SHTWEB – available at: http://www.shtweb.pr.gov.br/shtweb), based on the medical records of donors from the blood center (*hemonúcleo*) of the Regional Health District of Apucarana, Brazil, from January 1, 2005, to June 30, 2009. The donors' returns were monitored until 2011. The population studied was composed of first-time blood donors, eligible and temporarily ineligible, aged 18 to 65, to represent the sample universe. Old donors (prior to 2005) and those who donated to other institutions were excluded.

The blood center of the Regional Health District of Apucarana is able to collect, fractionate and distribute the collected blood. It is responsible for the supply of blood and its components to 15 municipalities in the Regional Health District, whose population exceeds 300,000 people[8]. The District has projects to attract donors conducted with various partners and institutions, like elementary and high schools, universities, companies, service clubs, among others.

Dependent variables were the return time for the second donation (average time between the first donation and the return for the second donation) and the prevalence of return in the first year after the first donation. Those who did not return during the follow-up period provided for in the survey were excluded from the analysis.

Donation candidates were classified according to i) demographics: sex (male/female), age group (up to 19, 20 to 29, 30 to 39, 40 to 49, 50 to 59 and 60 years or more), marital status (married, common-law marriage, divorced, widowed and single); ii) place of origin (municipality of Apucarana, Regional Health District of Apucarana, other districts, other states); iii)

blood condition: clinical eligibility (eligible/ineligible), blood typing and Rh factor (positive and negative ABO system); and iv) causes of ineligibility: anemia, risky behavior, hypotension or hypertension. These variables were independent and information about date of birth, marital status, place of residence and sex was matched with the records of each donor. Data on the causes of ineligibility, blood type and hemotherapy center where the donor made a new donation were retrieved from the SHTWEB program.

Among the characteristics that determined the series of the present study, we considered: individuals weighing 50 kg or more, approved in the three stages performed for safe donation, namely: (a) pre-donation or clinical screening; (b) self-exclusion, spontaneous and confidential, answered by the donor; and (c) serological tests to detect communicable diseases. The screening only considered eligible those volunteers who met the criteria for safe donation, as determined by Resolution of the Collegiate Board of the National Health Surveillance Agency (RDC Anvisa) n. 153, of June 14, 2004[9]. In this stage, anthropometric, clinical and laboratory data were collected and a structured interview with questions related to previous or current diseases, surgeries and vulnerability to sexually transmitted diseases. If restrictions were found, the donor candidate was considered temporarily or definitely ineligible[10].

The clinical measurements were taken by a trained and skilled professional, adopting as parameters for temporary ineligibility due to hypertension values of systolic pressure greater than 140 mmHg and diastolic pressure greater than 90 mmHg, at the time of screening. However, candidates with values greater than 180 mmHg and 100 mmHg for systolic and diastolic, respectively, were excluded, according to the guidelines of the Ministry of Health, Ordinance 1.353, of June 13, 2011[11]. Regarding the eligibility for hypotension, 100 mmHg and 60 mmHg were adopted for systolic and diastolic pressures, respectively. Blood pressure was measured at least 30 min after the last caffeine ingestion or cigarette smoked, using a mercury column sphygmomanometer (Tycos 5097-30, USA) and a Littman Cardiology II stethoscope (USA). Three measurements were taken after 5 min of rest, with intervals of 2 min.

To characterize anemia/low hematocrit, hemoglobin values equal to or less than 12.0 g/dL or hematocrit equal to or less than 38.0%[9] were adopted as the cutoff point. Donors in sexual contact with multiple partners in the last 12 months were classified as having risky behavior; self-exclusions, in which donors understood for themselves that they offered risks to the donation arising from sex in exchange for money or drugs; sex with occasional or unknown partners; sexual violence; sexual intercourse with a person with HIV infection, hepatitis B, hepatitis C or another sexually- or blood-transmitted infection; history of incarceration or mandatory non-home confinement exceeding 72 h; piercing, tattoo or permanent makeup without information about the safety of the procedure; partners of patients in renal replacement therapy program and patients with a history of transfusion of blood products or derivatives; history of accident with biological material that resulted in contact of mucosa and/or injured skin with the said biological material[11].

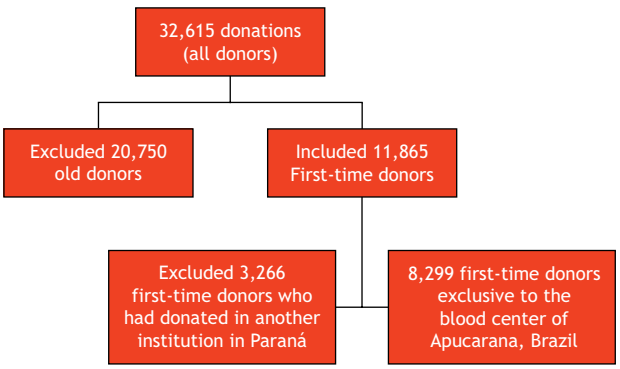
For data analysis, a retrospective cohort of repeated donors was monitored until the end of the data collection, analyzing the time and rate until the last return, according to the independent variables. The time for overall return and according to the categories of the study variables, after the first donation, was estimated by the Kaplan-Meier survival curve, and the comparisons of the variables were determined by the log-rank test. Cox's proportional risk regression model was used to identify the risk factors associated with return after the first donation, calculating the proportional risk and 95% confidence interval (95% CI). In all tests, the significance level of 5% was adopted and all statistical analyses were performed using the SPSS version 19.0 statistical package.

The research project was approved by the Research Ethics Committee of the Paraná State Health Department/Hospital do Trabalhador, according to Opinion n. 185/2010, of April 29, 2010.

RESULTS

Out of a total of 32,615 donors from 2005 to 2009, 11,865 first-time donors were selected for the present study, excluding those who were permanently serologically ineligible. Among those selected, we verified, with SHTWEB, that there were 3,266 donors who had donated blood at least once in another center within the state. Therefore, they were not considered first-time donors and were excluded. The study sample, at the end, was composed of 8,299 candidates exclusively from the blood center of the Regional Health District of Apucarana (Figure 1).

The estimated average time for those who returned during the follow-up period was 1,521 days (95% CI 1,499 to 1,542 days). Throughout the study period, the rate of 2005 first-time donors who returned was 50.9%, and this rate decreased over the years (Table 1). The total frequency of return of first-time donors is shown in Figure 2.



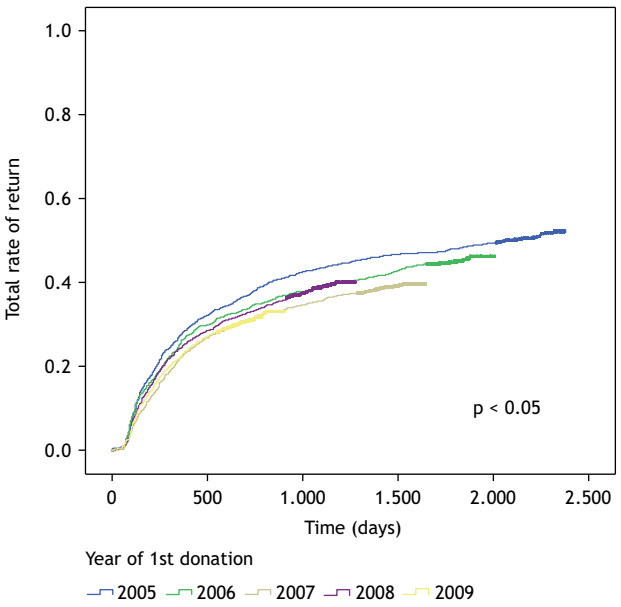
Source: Hemonúcleo de Apucarana (HEMAP)/SHTWEB database.

Figure 1. Flowchart of the study population.

We observed that, within 12 months after the first donation, only 27.8% of the donors from 2005 returned for the second donation and that in the following years there was a small drop in their return, reaching as low as 22.7% in 2009. The trend analysis using the chi-square test has shown a statistically significant decrease (x^2 trend = 12.07; p <0.001) in the rate of return over the years, which in 12 months decreased by 18.0 % in the period (Table 2).

From the results presented in Table 3, we observed that the variables associated with shorter average return times were the youngest age group (1,288 days) in relation to the other age groups, single (1,448 days), temporary ineligibility (1,352 days) days), ineligibility due to hypotension (who returned an average of 1,665 days after donation) and donors with risky behavior (1,719 days). The time for the second donation was longer among B positive donors (1,503 days) (p <0.001) and for the temporarily ineligible due to hypertension (1,938 days). There was a higher frequency of men (42.4%), young people under 19 years old (51.9%), single (44.6%), living in the city of Apucarana (43.3%), with AB negative blood (80.0%), eligible donors (50.0%) and with hypotension as the reason for ineligibility (32.4%). The elderly had the lowest rate of return in the period studied (13.9%), in which there was a significant reduction (p <0.001). The rate of return also decreased for donors of type B positive (43.0%) and for those who were ineligible because of hypertension (19.4%).

After 12 months of follow-up, the rate of return was higher among men, but without a statistically significant association (p = 0.113), and the widowed first-time donors (33.3%). When analyzing these rates by place of origin, of the total donors residing in the city of Apucarana, 26.7% returned and, in the period, of donors from other Brazilian states, only 11.4% returned in the first year. Negative Rh



Source: Hemonúcleo de Apucarana (HEMAP)/SHTWEB database.

Figure 2. Total rate of return of first-time blood donors according to the year of donation (2005 to 2009) at the Regional Health District of Apucarana, Brazil.

Table 1. Average time for the first return after the first donation and rate of return of first-time donors to the blood center of the Regional Health District of Apucarana, Brazil, from 2005 to June 2011, by year of donation.

Year	Total donors	Returns	Average time in days (95% CI)	Rate of return (%)
2005	1,805	919	1,433 (1,387-1,479)	50.9
2006	1,502	682	1,316 (1,274-1,357)	45.4
2007	1,985	771	1,168 (1,140-1,195)	38.8
2008	1,782	690	916 (894-939)	38.7
2009	1,225	385	703 (686-721)	31.4
Total	8,299	3,447	1,521 (1,499-1,542)	41.5

Source: Hemonúcleo de Apucarana (HEMAP)/SHTWEB database.
95% CI: 95% confidence interval.

Table 2. Rate of return of first-time donors to the blood center of the Regional Health District of Apucarana, Brazil, in the 12 months after the donation, from 2005 to June 2011, by year of donation .

Year	Total donors	Returns	Rate of return (%)
2005	1,805	502	27.8
2006	1,502	396	26.4
2007	1,985	443	22.3
2008	1,782	440	24.7
2009	1,225	278	22.7
Total	8,299	2,059	24.8

Source: Hemonúcleo de Apucarana (HEMAP)/SHTWEB database.
x2 trend = 12.07; p <0.001.

Table 3. Rate and average time for the first return after donation of first-time donors to the blood center of the Regional Health District of Apucarana, Brazil, 2005 to 2011, according to sociodemographic characteristics, origin, blood type and eligibility.

	Total donors	Returns	Average time/days (95% CI)	Rate of return (%)
Sex				
Male	4,479	1,898	1,505 (1,476-1,535)	42.4
Female	3,820	1,549	1,539 (1,507-1,571)	40.5
Age range (years)				
19 or less	2,268	1,177	1,288 (1,245-1,330)	51.9
20 to 29	3,341	1,338	1,559 (1,525-1,592)	40.0
30 to 39	1,505	547	1,634 (1,585-1,684)	36.3
40 to 49	862	294	1,675 (1,611-1,740)	34.1
50 to 59	287	86	1,754 (1,646-1,862)	30.0
60 or more	36	05	2,045 (1,801-2,288)	13.9
Marital status				
Single	4,583	2,044	1,448 (1,419-1,478)	44.6
Married	3,080	1,166	1,611 (1,577-1,646)	37.9
Common-law marriage	316	119	1,592 (1,482-1,701)	37.7
Divorced	237	83	1,636 (1510-1,762)	35.0
Widowed	72	30	1,486 (1,482-1,701)	41.7
Origin				
Apucarana	4,735	2,049	1,448 (1,419-1,478)	43.3
Regional Health District of Apucarana	2,573	1,044	1,611 (1,577-1,646)	40.6
Other districts	926	342	1,592 (1,482-1,701)	36.9
Other states	44	6	1,636 (1,510-1,762)	13.6
Not informed	21	6	1,486 (1,482-1,701)	28.6
Blood type				
A Negative	263	130	1,319 (1,199-1,439)	49.4
A Positive	1,941	965	1,356 (1,311-1,402)	49.7
B Negative	87	49	1,220 (1,010-1,430)	53.3
B Positive	563	242	1,503 (1,421-1,586)	43.0
AB Negative	15	12	557 (247-867)	80.0
AB Positive	185	83	1,458 (1,314-1,603)	44.9
O Negative	337	178	1,282 (1,171-1,392)	52.8
O Positive	2,390	1,178	1,370 (1,329-1,410)	49.3
Not performed	2,518	610	1,869 (1,834-1,903)	24.2
Eligibility				
Eligible	5,361	2,680	1,353 (1,325-1,380)	50.0
Ineligible	2,938	767	1,833 (1,815-1,930)	26.1
Reasons for ineligibility				
Anemia	866	213	1,873 (1,815-1,930)	24.6
Risky behavior	980	307	1,719 (1,829-2,048)	31.3
Hypertension	217	42	1,938 (1,659-1,779)	19.4
Hypotension	105	34	1,665 (1,482-1,847)	32.4
Others	770	171	1,980 (1,847-1,869)	22.2

Source: Hemonúcleo de Apucarana (HEMAP)/SHTWEB database.
95% CI: 95% confidence interval.

factor donors were the ones that most returned (36.8%). Types O (35.0%) and A (30.4%) were the most representative. The rate of return was 30.4% for the eligible and 14.6% for the ineligible.

As shown in Table 4, the analysis of the variables in Cox's regression model of proportional risk has demonstrated – in terms of return – that the association of sex (p = 0.109),

Table 4. Factors associated with the return to donation of first-time donors using the Cox regression model.

Factors	Proportional risk	CI95% Exp(B)		p value
		Lower	Higher	
Sex			0.109	
Female	1.000	-	-	-
Male	0.944	0.879	1.013	0.109
Age range (years)			<0.001	
19 or -	1.000	-	-	-
20 to 29	0.675	0.622	0.734	<0.001
30 to 39	0.602	0.534	0.680	<0.001
40 to 49	0.584	0.503	0.678	<0.001
50 to 59	0.543	0.427	0.690	<0.001
60 or +	0.190	0.071	0.510	0.001
Marital status			0.113	
Married	1.000	-	-	-
Common-law marriage	0.994	0.821	1.204	0.954
Divorced	1.139	0.909	1.427	0.257
Widowed	1.534	1.055	2.231	0.025
Single	1.062	0.969	1.164	0.196
Origin			0.073	
Apucarana	1.000	-	-	-
Regional Health District of Apucarana	0.934	0.866	1.007	0.073
Other districts	0.794	0.707	0.891	<0.001
Another state	0.276	0.124	0.616	0.002
Reason for ineligibility			<0.001	
Eligible	1.000	-	-	-
Hypotension	0.540	0.385	0.759	<0.001
Risky behavior	0.533	0.473	0.601	<0.001
Anemia	0.402	0.348	0.464	<0.001
Hypertension	0.377	0.277	0.513	<0.001
Other	0.375	0.321	0.438	<0.001

Source: Hemonúcleo de Apucarana (HEMAP)/SHTWEB database.
PR: Proportional Risk; 95% CI: 95% confidence interval.

marital status (p = 0.113) and donors living in the municipality of Apucarana had no statistical difference (p = 0.073). The first return was significantly associated with the dependent variables of age group and causes of ineligibility (p <0.001). All age ranges over 19 years old presented the lowest proportional risk values, and this was the donor category with the highest frequency of return.

Concerning the origin, we found that donors under the Regional Health District were more likely to return than donors living in municipalities under other health districts or other states. All reasons for ineligibility were less likely to return than eligible donors. In relation to ineligible donors, the proportional risk increased in individuals with hypotension and risky behavior. Donors with low hematocrit and those with hypertension had lower rates of return when compared to those who returned due to other reasons for ineligibility, hypotension and risky behavior.

DISCUSSION

The survival analysis model used in this study to verify the rate of return of first-time donors is of great use in blood banks, because it provides information on population subgroups that are more or less likely to return, as well as the time for a new donation. Consequently, this knowledge enables donor loyalty-building strategies.

Lourençon et al.[12] compared different models for a study on donor return, including the model of the Kaplan-Meier curves, which was validated and considered suitable for that type of study.

The decrease in the rate of return of first-time donors in the 12 months after donation was significant in the present study, with an average decrease of 18.0% in donors when analyzing the last and the first year of the study. This decrease reveals that donors are failing to return for a new donation, and this means a reduction in annual donations that may affect the supply to the population. However, when there is no return from the first-time volunteer, the blood center periodically invites them for a new donation. Following the same methodology, Martelli et al.[13], in a study with first-time donors, considered that the causes related to different ineligibilities are similar to those of the population in general.

Schereiber et al.[14] found similar values regarding failure to return in six years after the first donation: 63.0% of male first-time donors and 60.0% of female. A study done at the Public Blood Center of Recife, state of Pernambuco, Brazil, also found some similarities, however it also found that men become repeated donors with a significantly higher frequency than women, since women tend to adopt a more sporadic donation frequency[5]. This frequency was also observed in female donors from Apucarana, but within a reasonable period of time, although this time is likely to be longer in women: 60 days for men and 90 days for women[11].

The first age group analyzed comprised first-time donors aged 19 or younger. Considering that young people above 18 years old were included, we noticed that this group, despite its limited range, was significant and represented by 2,268 people (27.0% of the study sample). This result deserves attention because it suggests that a substantial part of the population starts the blood donation cycle as soon as the legislation allows, which means that these people can be a reservoir of donors in a specific population. Furthermore, we also observed that younger first-time donors return to the blood center more quickly, thus corroborating previous evidence[15]. Research by Notari et al.[15] in Americans argued that people aged 16 and 17 have a high rate of return, possibly because of greater media influence and campaigns in schools. Therefore, efforts to implement actions aimed at this target can greatly contribute to the increase of blood stocks in blood centers.

In the case of Brazil, with the authorization for minors under 18 to become donors[11], campaigns should raise awareness of children and teenagers about the importance of donation. However, the educational approach must consider risky behavior for sexually transmitted diseases, as well as the prevention of these risky conditions, enabling safe donation with full use of the blood components. Zago, Silveira and Dumith[16] verified a group of donors and found that younger individuals may not have sufficient awareness and/or maturity to recognize the importance of regular donations, despite being healthier and probably more educated, which means specific incentives aimed at donor loyalty-building are needed. The high rate of return in this age group, observed in the various studies and also in this one, is also explained by factors that extrapolate altruistic feelings, like the search for free blood tests and the obligation of military services to encourage young people to donate blood.

Geographical distance is one of the determining factors for donor return. The data obtained reveal that residents in the institution's own municipality or nearby had a higher frequency of return than those who lived farther away (81.5%). However, Schlumpf et al.[17] suggested that 62.0% of donors do not return to the same collection center. In this sense, it can be considered that donors are more likely to become loyal if they live in the municipality where the blood center is located. For Santos and Stipp[2], the origin of the donor is an important indicator that should be considered by the hemotherapy service when planning strategies for their return.

Considering the years that followed the first donation, the results have shown a rate of return of first-time donors between 22.7% and 27.8%. It found that 50.0% of those eligible for the first donation returned, in contrast to temporarily ineligible donors, whose rate of return was only 26.1%. Custer et al.[18] found similar values, since 47.0% of eligible first-time donors and 25.0% of temporarily ineligible returned for later donation. Misje, Bosnes and Heier[19], in Norway, have shown a 36.0% rate of return in a follow-up period of 4 to 6 years after the first donation. In American candidates, Schreiber et al.[14] found 32.0% of return among first-time donors and only 8.0% of regular donors. It is observed that return rates are low both for eligible and ineligible donors. However, one could expect eligible donors to have a higher rate, since they have already gone through the donation process and know the health conditions required for that. Regarding ineligible donors, during the study period the researchers found that temporary ineligibility greatly discouraged return for later donation.

When the main causes of ineligibility selected for the survival analysis were verified, it was noted that hypertension is the cause of the lowest rate and the longest average return time. This can be explained by the fact that hypertensive donors are older citizens who are usually referred for follow-up right away. According to clinical criteria, they are usually advised not to donate anymore, which prevents their return.

The category of temporarily ineligible influences the likelihood of future donor return. The influences that prevent return are not yet satisfactorily understood[20]. In this study, there was a smaller chance of return from ineligible donors (for any of the ineligibility reasons) when compared to cases of eligible donors. Anemia or low hematocrit was the second reason with the lowest rate of return. This result is similar to that found in a study carried out at the Blood Centers of the Pacific and the University of California at San Francisco, according to which 29.0% of the first-time donors who were ineligible because of this reason made a second donation[18]. Despite this refusal, investment in initiatives aimed at the return of these donors should be emphasized, since they leave the hemotherapy service with referral to treat the reason for their ineligibility. The screening professional advises donors about iron supplement replacement, adequate food and blood pressure control, although this is not the role of the blood center. The period for fixing these conditions is short and the donor is oriented to return to the health center for further exams.

The time gap between the date they become aware of their ineligibility and the subsequent donation depends mainly on the reason for the ineligibility. This interval that can range from a day to a year. In cases of fluctuating blood pressure, only one day is recommended, since this may be a momentary episode condition and donors can come back as soon as their blood pressures stabilizes[7,9]. Donors with hypotension as the reason for ineligibility should not be ruled out, since the survival analysis reveals that these candidates take less time to return. That's because this reason is common among younger age groups, or those who are more likely to return.

Our results have shown that the variables of sex, marital status, blood type and Rh factor were not associated with the return of first-time donors. Corroborating our results, Owbny et al.[21], in a similar epidemiological design, differed only in relation to blood types. According to the authors, donors whose blood is Rh negative return more frequently and can repeat up to six more donations than Rh positive factor, perhaps because they are called by the blood center. The rarity of Rh-negative blood is a target for campaigns to attract these donors in order to maintain a blood supply for emergencies. In contrast, in a study by Notari et al.[15], O-type donors returned more often. The justification for this difference is based on the center's ambitious effort to recruit a higher percentage of O-type donors and ensure the transfusion of more compatible blood systems. Once we know the blood type and Rh factor in the rate of return, blood banks can create a strategy to send social media reminders to volunteers inviting them to a new donation, targeted according to the demand for specific blood types.

According to Godin et al.[4], people who have donated blood at some point in their lives are more likely to donate again in a short period of time, usually within six months. Therefore, past donor experience should be taken into account when recruiting donors. For hemotherapy centers, attracting temporarily ineligible donors and those who have already donated at least once may be strategies to expedite the return of donors and establish a regular behavior, as pointed out by Schreiber et al.[14].

CONCLUSIONS

This first-time donor return study emphasizes the importance of immediate donor recruitment, since there is a significant trend of decrease in return in the first year after donation. The regression analysis enabled us to conclude that age, origin and causes of ineligibility are associated with donors' failure to return. According to the results of the first-time donors who returned for their second donation, we found that most returned to the same center, half of the eligible ones did not return and young donors returned more quickly for a new donation and at a higher rate than other age groups.

Temporary ineligibility does not prevent donors from returning and, as long as properly reassessed, once they become eligible, they may become regular and loyal donors. Furthermore, early voluntary return of eligible donors provides the hemotherapy center with positive information about the possibility of turning a donor into a regular donor. In this sense, this analysis indicates the need to review the recruitment strategies used by many blood centers. Finally, knowledge of the causes of temporary ineligibility enables us to encourage temporarily ineligible donors to return for future donations and, thus, contribute to maintaining the blood bank stocks of blood components.

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Authors' collaboration

Di Colli L - Conception, planning (study design), data acquisition, analysis and interpretation and writing of the paper. Di Colli LM - Structuring, work analysis and final review. Matsuo T - Data analysis and interpretation. Amorim JSC - Analysis, interpretation and writing of the paper. All authors approved the final draft of the paper.

Conflict of interest

The authors report that there is no potential conflict of interest with peers and institutions, nor political or financial conflicts in this study.