Autologous versus allogeneic transfusion: patients' perceptions and experiences

Evidence

Études

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Abstract

Background: Preoperative autologous donation is one way to decrease a patient's exposure to allogeneic blood transfusion. This study was designed to determine patients' perceptions about the autologous blood donation process and their experiences with transfusion.

Methods: To assess patient perception, a questionnaire was administered a few days before surgery to patients undergoing elective cardiac and orthopedic surgery in a Canadian teaching hospital. All patients attending the preoperative autologous donation clinic during a 10-month period were eligible. A convenience sample of patients undergoing the same types of surgery who had not predonated blood were selected from preadmission clinics. Patient charts were reviewed retrospectively to assess actual transfusion practice in all cases.

Results: A total of 80 patients underwent cardiac surgery (40 autologous donors, 40 nondonors) and 73 underwent orthopedic surgery (38 autologous donors, 35 nondonors). Of the autologous donors, 75 (96%) attended all scheduled donation appointments, 73 (93%) said that they were "very likely" or "likely" to predonate again, and 75 (96%) said that they would recommend autologous donation to others. There was little difference in preoperative symptoms between the autologous donors and the nondonors, although the former were more likely than the latter to report that their overall health had remained the same during the month before surgery (30 [75%] v. 21 [52%] for the cardiac surgery patients and 30 [79%] v. 18 [51%] for the orthopedic surgery patients). When the autologous donors were asked what they felt their chances would have been of receiving at least one allogeneic blood transfusion had they not predonated, the median response was 80%. When they were asked what their chances were after predonating their own blood, the median response was 0%. The autologous donors were significantly less likely to receive allogeneic blood transfusions (6 [15%] for cardiac surgery and 3 [8%] for orthopedic surgery) than were the nondonors (14 [35%] for cardiac surgery and 16 [46%] for orthopaedic surgery). They were, however, more likely to receive any transfusion (autologous or allogeneic) than were the nondonors (25 [63%] v. 14 [35%] for cardiac surgery and 31 [81%] v. 16 [46%] for orthopedic surgery).

Interpretation: Patients who underwent preoperative autologous blood donation were positive about the experience and did not report more symptoms than patients who did not donate blood preoperatively. Autologous donors overestimated their chances of receiving allogeneic blood transfusions had they not predonated and underestimated their chances after they had predonated. They were less likely to receive allogeneic transfusions, but more likely to receive any type of transfusion, than were patients who did not predonate.

Concern about the transmission of blood-borne infections such as hepatitis and HIV infection through allogeneic transfusion has increased interest among health care providers and patients in ways to minimize the need for transfusion. Preoperative autologous donation is one of the techniques most commonly used by patients undergoing elective surgery to decrease the need for allogeneic blood

transfusion. A few weeks before surgery patients typically donate 2 to 4 units of their own blood, which is then given back to them intra- or postoperatively as necessary. A recent meta-analysis of 6 randomized controlled trials and 9 cohort studies showed that, although preoperative autologous donation decreased exposure to allogeneic blood, it increased the likelihood of any transfusion (allogeneic or autologous).[1] Others have also made this observation.[2] This association is probably due to the fact that patients who predonate blood have, on average, a lower preoperative hemoglobin concentration than those who do not predonate, and that there tends to be a different "transfusion threshold" for patients who predonate (i.e., in patients with the same hemoglobin concentration, physicians are more likely to transfuse a unit of autologous blood to someone who predonated than they would transfuse a unit of allogeneic blood to a patient who did not predonate blood).[2] The greater use of blood products in autologous donors is therefore of some concern, because blood products, including autologous blood, are associated with adverse effects such as inadvertent mismatch and bacterial infection.[3–5]

Because of concerns about the safety of the actual process of predonation, some patients such as those with severe coronary artery disease or aortic stenosis are often excluded from predonation. Although there are no generally accepted criteria for preoperative autologous donation,[6] restrictions on who can predonate are now being relaxed. Predonation has been shown to be quite safe even in elderly patients with coronary artery disease,[7] but little is known about its effects, in particular fatigue, on patients' quality of life.

Patients participating in preoperative autologous donation programs in the United States during the late 1980s were found to be very positive about their experiences.[8] However, Canadian data about patients' experiences are lacking. There are also no data on the personal resources used by patients in order to predonate or their perceptions about their chances of receiving a blood transfusion. Although it is known from experience with preoperative autologous donation programs in the United States that surgeons tend to play a large role in patients' decisions about predonating,[8–10] the factors motivating patients to participate in Canadian programs have not been investigated.

We investigated patients' perceptions about, and experiences with, preoperative autologous donation, determined the personal resources they used to predonate, evaluated the effect of autologous donation on their quality of life, determined the autologous donors' perception about their chances of receiving allogeneic blood transfusion if they had or had not predonated their own blood, and determined actual transfusion practices (allogeneic and autologous) in patients who predonated and those who did not predonate.

Methods

Patients were eligible if they were over 18 years of age and were undergoing elective open-heart surgery at the University of Ottawa Heart Institute or elective hip or knee arthroplasty at the Ottawa Civic Hospital. Patients attending the autologous predonation clinics between February and November 1996 were approached about the study. During the same period, patients who had not predonated blood were identified in the preadmission clinics. All patients were seen in the preadmission clinics. The decision about whether to predonate autologous blood was made by the surgeons and patients on an individual basis, before the patients were approached to participate in the study.

Autologous donors were asked questions about the predonation process: how they first heard about it, factors motivating their decision to predonate blood, their experience with predonation (including anxiety and pain experienced) and the resources they expended, their willingness to predonate in the future, and what they thought their chances would be of receiving an allogeneic transfusion if they did and did not predonate their blood.

All patients were asked how often 13 symptoms had occurred in the month before surgery. They were also asked to rate their general health and ability to engage in social and work activities using a 5-point Likert scale. Patients who did not predonate were not asked what they thought their chances would be of receiving a transfusion.

After surgery, the charts of all patients were reviewed with the use of a standard data-extraction form to determine the frequency of allogeneic and autologous blood transfusions, preoperative and postoperative hemoglobin levels, the hemoglobin level immediately before transfusion and the length of hospital stay.

The study design received approval from the Research Ethics Committee of the Ottawa Civic Hospital.

Univariate descriptive statistics were performed on the variables unique to the autologous donor group. Comparisons between the donor and nondonor groups were made using the χ^2 test and Student's *t*-test as appropriate.

Results

There were 108 cardiac patients considered for participation in the study. Of these, 26 were excluded because their surgery was rescheduled (n = 4), they could not be contacted (n = 10), there was insufficient time to undertake the survey before their surgery (n = 9), or their surgeon had not yet consented to participate in the study (n = 1). Of the remaining 82 patients, 2 declined to participate. The 80 participating cardiac patients comprised 40 who predonated autologous blood (31 for bypass surgery, 4 for valve replacement, 2 for bypass surgery and valve replacement, and 3 for other cardiac surgery) and 40 who did not predonate blood (26 undergoing bypass surgery, 2 valve replacement, 5 bypass surgery and valve replacement, and 7 other cardiac surgery). Three of the autologous donors and 4 of the nondonors underwent repeat cardiac surgery. The autologous donors were on average 4.5 years younger than the nondonors, although the 2 groups did not differ significantly by American Society of Anesthesiologists class score (Table 1). Of the cardiac patients in the autologous donor group, 12 predonated 2 units of blood, 27 donated 3 units, and 1 patient predonated 1 unit.

In total, 113 orthopedic patients were considered for participation. Thirty-seven were excluded because their surgery was rescheduled (n = 3), they could not be con-

tacted (n = 15), or there was insufficient time to complete the survey before the surgery (n = 19). Of the 76 orthopedic patients approached, 1 refused to participate and 2 could not be interviewed because they were unable to communicate in English or French. The 73 participating orthopedic patients comprised 38 who predonated autologous blood (22 for hip arthroplasty and 16 for knee arthroplasty) and 35 who did not predonate blood (19 undergoing hip arthroplasty and 16 knee arthroplasty). Four patients in each of the 2 groups were having surgery to replace a failing arthroplasty. The autologous donors were on average 8 years younger and had a lower mean American Society of Anesthesiologists class score (indicating better physical status before surgery) than those who did not predonate blood (Table 1). Of the autologous donors 19 predonated 2 units of blood and 18 predonated 3 units.

Of all 78 autologous donors 37 (47%) had first heard about the technique from their surgeon and 30 (38%) from the media. Forty-five (58%) said that their surgeon suggested they predonate, and 28 (36%) said they raised the possibility themselves. In response to an open-ended question about the main reason for deciding to predonate, 44 (56%) stated that they wanted to avoid infection with HIV, hepatitis virus or other blood-borne pathogens or indicated concerns about the general safety of the blood supply, 22 (28%) indicated that they simply felt safer donating their own blood, 8 (10%) said they decided to predonate because their surgeon had suggested it, and 4 (5%) offered other reasons such as having a rare blood type.

All but 3 of the 78 autologous donors attended each scheduled donation appointment. Sixty-four (82%) of the autologous donors said that they never felt anxious about donating in the month before surgery, 9 (12%) rarely felt anxious, and 5 (6%) sometimes felt anxious. The patients undergoing orthopedic surgery were significantly more likely than those undergoing cardiac surgery to have experienced some anxiety about donating (11 v. 3 patients, p = 0.01). Nevertheless, both groups of autologous donors were considerably less anxious about predonating than they were about their surgery; in total, 56 (72%) indicated that they had experienced some anxiety about their impending surgery during the month preceding it.

Most (61 [78%]) of the autologous donors reported no pain associated with donation, 12 (15%) experienced slight pain, and 5 (6%) had moderate pain. Sixty-four patients (83%) said they did not feel bothered by the side effects of autologous donation, 7 (9%) felt slightly bothered, and 6 (8%) were bothered moderately or quite a bit.

Fifty-eight (74%) of the autologous donors said they were "very likely" and 15 (19%) said they were "likely" to predonate again. Of the 5 who indicated it was unlikely they would predonate again 4 said that predonation was too inconvenient (specifically, it was "too time consuming" [n = 2], "too tiring to keep the appointments and too much travelling" [n = 1] and "more hassle than necessary" [n = 1]), and 1 said they were too old. Almost all (75 [96%]) said they would recommend autologous donation to others; the reasons given by the remaining 3 for not recommending it were "too much trouble," "time consuming, inconvenient, risks are low" and "it's a personal decision, not my business [what others do]." When asked to reflect on their experience, 23 (29%) indicated that something could be done to make the process or experience better; for 14 their complaint had to do with the process not being "streamlined" (i.e., poorly organized or coordinated, poor communication between the hospital and the Red Cross, and inconvenience of having to travel to donate). Another 5 comments were about lengthy waits to donate.

When asked about the personal resources they used in order to predonate, 73 (94%) of the autologous donors said they travelled by car to their donation appointments. The total distance travelled ranged from 5 to 800 km (mean 130 km [standard deviation 181 km], median 45 km). Twenty (26%) travelled more than 100 km to attend their donation appointments. Nine (12%) had to take time off from work, and 11 (14%) had to ask their spouse or a friend to take

Table 1: Characteristics of patients undergoing elective cardiac or orthopedic surgery who did or did not predonate blood

	Cardiac surgery		Orthopedic surgery	
Characteristic	Predonated blood *n = 40*	Did not predonate blood *n = 40*	Predonated blood *n = 38*	Did not predonate blood *n = 35*
Mean age (and SD), yr	59.0 (10.2)†	63.5 (9.6)	63.2 (10.4)‡	71.5 (10.1)
% male	88	80	40	34
Mean American Society of Anesthesiologists class score (and SD)*	3.6 (0.5)	3.8 (0.4)	2.0 (0.6)†¶	2.4 (0.7)§
Mean length of hospital stay (and SD), d	6.7 (1.9)†	8.0 (3.5)	9.0 (2.4)**	12.0 (14.5)

*Score describes physical status of patients undergoing surgery. A lower score is associated with a better status.
†$p \le 0.05$.
‡$p \le 0.001$.
§n = 30.
¶n = 29.
**n = 37; 1 patient did not undergo surgery.

time off from work to accompany them. Sixty-nine (88%) of the patients indicated that, during the period they predonated, they had incurred the cost of additional medications (e.g., iron supplements); the mean cost of medications was $5 (range $1.50 to $12).

The proportion of autologous donors who stated that, in the month before surgery, they had symptoms "some of the time," "often" or "always" did not differ significantly between those undergoing cardiac surgery and those undergoing orthopedic surgery, except for chest pain/angina, which was more common among the cardiac surgery patients ($p < 0.001$). Among the cardiac and orthopedic surgery patients, there were few significant differences in symptoms between those who predonated blood and those who did not (Table 2). In terms of general health, the proportion of all autologous donors who reported that their health was "somewhat worse" or "much worse" than a month before surgery was significantly lower than the proportion of nondonors (Table 2). Among the cardiac surgery patients, those who predonated blood were less likely than those who did not predonate to report that their health interfered with their social activities or normal work and daily activities during the month before surgery.

When the autologous donors were asked about what they felt their chances would be of receiving allogeneic blood perioperatively, the responses in both surgical groups were virtually identical (Table 3). For the 74 patients who answered the question "If you had not donated your own blood before surgery what do you think your chances would have been of receiving a blood transfusion of someone else's blood during or after surgery?" the mean and median response was 67% and 80% respectively. This fell to 5% and

Table 2: Symptoms reported by patients as occurring sometimes, often or always in the month before surgery and perceptions about health

	Surgical group; no. (and %) of patients			
	Cardiac surgery		Orthopedic surgery	
Symptom/health perception	Predonated blood	Did not predonate blood	Predonated blood	Did not predonate blood
Fatigue, lack of energy	26 (65)	26 (65)	21 (55)	20 (57)
Inability to do much	12 (30)*	22 (55)	15 (39)	19 (54)
Chest pain/angina	13 (32)*	22 (55)	0 (0)	2 (6)
Feeling run down/out of sorts	6 (15)†	17 (42)	7 (18)	5 (14)
Difficulty sleeping	14 (35)	16 (40)	13 (34)	14 (40)
Feeling cold	8 (20)	12 (30)	8 (21)	4 (11)
Trouble concentrating	5 (12)	12 (30)	4 (11)	7 (20)
Weakness	8 (20)	9 (22)	4 (11)	4 (11)
Lightheadedness/dizziness	9 (22)	9 (22)	4 (11)	2 (6)
Headache	5 (12)	9 (22)	4 (11)	6 (17)
Poor appetite	0 (0)*	5 (12)	0 (0)	0 (0)
Need for bed rest	2 (5)	5 (12)	3 (8)	2 (7)§
Anxiety about surgery	18 (45)	21 (52)	17 (45)	14 (40)
General health now v. month ago				
Much better/somewhat better	0 (0)	3 (8)	1 (3)	6 (17)
Same	30 (75)	21 (52)	30 (79)	18 (51)
Somewhat worse/much worse	10 (25)*	16 (40)	7 (18)*	11 (31)
Health interfered with social activities in past month				
Not at all	27 (68)	10 (25)	17 (45)	10 (29)
Slightly	7 (18)	9 (22)	10 (26)	12 (34)
Moderately/quite a bit/extremely	6 (15)‡	21 (52)	11 (29)	13 (37)
Health interfered with normal work and daily activities in past month				
Not at all	22 (55)	8 (20)	16 (42)	10 (29)
Slightly	8 (20)	12 (30)	10 (26)	9 (26)
Moderately/quite a bit/ extremely	10 (25)†	20 (50)	12 (32)	16 (46)

*$p \leq 0.05$.
†$p \leq 0.01$.
‡$p \leq 0.001$.
§Data missing in 5 cases.

0% respectively for the 77 patients who indicated what they felt their chances were now that they had predonated blood. Thirty-nine (53%) of the 74 respondents said that they thought their chance of receiving an allogeneic blood transfusion was 80% or greater if they had not predonated. By predonating, 28 of these 39 patients thought their chance of receiving an allogeneic transfusion had been reduced to 0%. When all of the autologous donors were asked whether they were less concerned about the surgery now that they had predonated their blood, 34 (44%) said "no," 27 (35%) were now "a little less concerned," 9 (12%) were "quite a bit less concerned," and 8 (10%) were "much less concerned."

Table 3: Perceptions of patients who predonated blood about their likelihood of receiving allogeneic blood transfusions peri- or postoperatively

	Surgical group; perceived likelihood, %	
Variable	Cardiac surgery	Orthopedic surgery
Without preoperative autologous donation	*n = 38*	*n = 36*
Mean (and SD)	66 (35)	68 (36)
Median (and range)	80 (1–100)	80 (3–100)
With preoperative autologous donation	*n = 39*	*n = 38*
Mean (and SD)	5 (17)	5 (17)
Median (and range)	0 (1–100)	0 (0–100)

The mean hemoglobin level immediately before surgery was 17 g/L lower in the autologous donor group than in the nondonor group, for both cardiac and orthopedic surgery patients (Table 4). The mean hemoglobin level remained lower in the autologous donor group than in the nondonor group in the immediate postoperative period and throughout the first postoperative day, although the magnitude of the difference decreased over time. By discharge, the hemoglobin levels did not differ significantly between the 2 groups.

Compared with the nondonors, the autologous donors were significantly less likely to receive allogeneic blood transfusions yet were significantly more likely to receive any transfusion (allogeneic or autologous) (Table 4). The mean number of allogeneic or total (combined allogeneic and autologous) units transfused did not differ significantly between patients who predonated and those who did not, except for the orthopedic surgery patients, of whom the autologous donors received a significantly lower mean number of allogeneic units than did the nondonors. The mean hemoglobin values at which patients were transfused postoperatively ranged from 75 to 88 g/L (Table 4).

Table 4: Hemoglobin levels and transfusions received

	Cardiac surgery				Orthopedic surgery			
Variable	Predonated blood		Did not predonate blood		Predonated blood*		Did not predonate blood	
Mean hemoglobin level (and SD), g/L								
Before surgery	124 (13)	*n* = 38	140 (13)	*n* = 35	116 (14)	*n* = 35	134 (12)	*n* = 31
Immediately after surgery	95 (13)	*n* = 40	103 (16)	*n* = 40	93 (15)	*n* = 37	103 (16)	*n* = 35
Day 1 after surgery	97 (13)	*n* = 40	105 (16)	*n* = 40	90 (11)	*n* = 37	97 (12)	*n* = 33
At discharge	96 (10)	*n* = 40	100 (16)	*n* = 40	101 (10)	*n* = 37	99 (12)	*n* = 35
Mean hemoglobin level before transfusion† (and SD), g/L								
Allogeneic	82 (9)	*n* = 5	80 (7)	*n* = 8	75 (13)	*n* = 3‡	88 (8)	*n* = 11
Autologous	86 (10)	*n* = 2	NA		84 (10)	*n* = 21	NA	
Type of transfusion received, no. (and %) of patients								
Allogeneic	6 (15)‡		14 (35)		3 (8)¶		16 (46)	
Autologous	25 (63)		NA		30 (81)		NA	
Either	25 (63)§		14 (35)		30 (81)§		16 (46)	
Mean no. of units transfused (and SD) among all patients								
Allogeneic	0.7 (2.2)		1.0 (2.0)		0.2 (0.7)§		1.4 (2.4)	
Autologous	1.4 (1.2)		NA		1.8 (1.1)		NA	
Either	2.1 (2.9)		1.0 (2.0)		2.1 (1.3)		1.4 (2.4)	
Mean no. of units transfused (and SD) among patients receiving transfusion								
Allogeneic	4.7 (4.0)	*n* = 6	2.9 (2.4)	*n* = 14	2.3 (0.6)	*n* = 3‡	3.1 (2.8)	*n* = 16
Autologous	2.2 (0.8)	*n* = 25	NA		2.3 (0.5)	*n* = 30	NA	
Either	3.3 (3.0)	*n* = 25	2.9 (2.4)	*n* = 14	2.6 (0.9)	*n* = 30	3.1 (2.8)	*n* = 16

*1 patient did not undergo surgery.
†Only patients who had postoperative transfusions were included.
‡$p \leq 0.05$.
§$p \leq 0.01$.
¶$p \leq 0.001$.

Interpretation

The autologous blood donors in our study were very positive about predonation. They did not report more symptoms than the nondonors, and in some instances they actually reported fewer symptoms. The patients who predonated blood had a lower preoperative hemoglobin level than those who did not predonate and were less likely to receive allogeneic blood. They were, however, more likely than the other patients to receive any blood transfusion. The autologous donors overestimated considerably their chances of receiving allogeneic transfusions if they had not predonated blood.

Previous studies have shown that preoperative autologous donation is associated with a low frequency of major medical problems such as syncope, stroke and myocardial infarction.[11] Our study showed that, in general, patients who predonate blood have a low frequency of symptoms that might be related to autologous donation (e.g., lightheadedness and fatigue). Surprisingly, among the cardiac surgery patients, those who predonated blood were less likely than the nondonors to indicate that their health interfered with their social and work activities in the month before surgery. This association persisted after we controlled for the age of the cardiac surgery patients. It is possible that the process of predonation made patients feel psychologically better and more in control of their lives. Alternatively, it is possible that more patients in healthier condition were selected for preoperative autologous donation.

Our study indicated that predonation was well tolerated, but it also highlighted some of its disadvantages. Twenty patients travelled more than 100 km in order to predonate blood. In addition, the autologous donors were more likely than the nondonors to receive any transfusion, thus being exposed to the complications of hemolytic transfusion reaction and bacterial infection. In our study the mean hemoglobin levels before surgery in all groups were compatible with existing guidelines regarding transfusion;[12,13] this suggests that the greater use of transfusion in the autologous donation group was not due to an excessively liberal transfusion threshold. In fact, among the orthopedic surgery patients, the mean hemoglobin level at which allogeneic blood was transfused was lower in the group who predonated blood than in the group who did not. It is most likely that the greater frequency of transfusion among the autologous donors occurred because the predonation left them with a lower preoperative hemoglobin level than that in patients who did not predonate. The mean time between donation of the last unit of autologous blood and surgery was 8 days. One small randomized trial has suggested that the preoperative hemoglobin level will be higher if the time between the last donation and surgery is lengthened and the interval between donations is shortened.[14] Because autologous blood can be stored for 35 days, and most patients in our study donated 2 or 3 units of blood, it should be feasible for all patients to donate their last unit of blood at least 2 weeks before surgery.

Many of the autologous donors in our study had an unrealistic perception that their chances of receiving allogeneic blood would be high if they had not predonated, whereas their perception that their chances of receiving allogeneic blood after predonation was more realistic. Thus, on average, patients overestimated considerably the absolute benefit of autologous predonation (reducing the exposure to allogeneic blood). It would be interesting to determine whether providing patients with detailed information about the likelihood of transfusion and its side effects (hepatitis, HIV infection, bacterial infection, hemolytic transfusion reaction), both with and without predonation, would alter their perception about the value of predonation.

Our study did have limitations. The cardiac and orthopedic surgery patients who predonated blood were younger than their nondonor counterparts, and among the orthopedic surgery patients those who predonated blood had a more favourable American Society of Anesthesiologists class score than those who did not predonate. Other information on the patients' health status (e.g., presence of anemia, respiratory and cardiac disabilities) was not collected, so there may have been a selection bias resulting in the autologous donors being younger and healthier. We were unable to determine why the nondonors chose not to predonate or their perceptions about the risks of allogeneic and autologous transfusion. We also could not determine the reasons for transfusion or the frequency with which other methods of minimizing exposure to allogeneic blood (e.g., aprotinin) were used. We did not consider reasons for predonating blood other than to avoid hepatitis, HIV infection and other blood-borne infections. Other reasons include the possibility that allogeneic transfusion increases the risk of postoperative infections because of its immunosuppressive effect (this is controversial[15,16]) and the beneficial effect of autologous donation on conservation of a scarce blood supply. Although our study demonstrated that there was a cost to patients choosing to predonate blood (e.g., inconvenience, time, travel costs, expense of additional medication), we did not consider the costs associated with administering the preoperative autologous donation program by the hospital, physician fees for conducting assessments of prospective autologous donors, and the procurement, processing and storage of the blood by the Red Cross.

Future areas of research include studies to determine whether (a) other autologous donors experience an improvement in the perception about their overall health and their social and work activities, (b) other patients also have unrealistically high perceptions about their chances of receiving allogeneic transfusions and (c) informing patients about their chances of receiving a transfusion and the frequency of side-effects from allogeneic transfusions affects their decision to predonate blood.

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