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Blood center practice and education for blood donors with anemia

Meghan Delaney, Kenneth G. Schellhase, Staci Young, Susan Geiger, Arlene Fink, and Alan E. Mast

From the Puget Sound Blood Center, Seattle, Washington; the Department of Family and Community Medicine and the Department of Cell Biology, Neurobiology and Anatomy, Medical College of Wisconsin, Milwaukee, Wisconsin; the National Anemia Action Council, Milwaukee, Wisconsin; the University of California at Los Angeles, David Geffen School of Medicine, Los Angeles, California; and the Blood Center of Wisconsin, Milwaukee, Wisconsin

Abstract

BACKGROUND—Anemia is an early indicator of many diseases, yet blood donors with low hematocrit (Hct) often receive inadequate information about its medical importance. We sought to understand the types of information that are and should be provided to these donors.

STUDY DESIGN AND METHODS—Two companion studies were performed. The first investigated blood center practices for care of donors with low Hct including deferral length, information provided, and cutoff values used when referring donors for medical attention. The second was a randomized prospective pilot study comparing behavior of deferred donors receiving an “older” pamphlet providing a list of iron-rich foods or a “newer” pamphlet providing descriptions of common causes of anemia and advice for seeking medical attention.

RESULTS—More than 70% of centers defer donors for 1 day. Only 6% defer donors for more than 2 weeks. Most centers provide written and/or verbal information about low Hct. Only 35% have a cutoff value defining significant anemia that requires additional medical attention. In the study of donors with low Hct, significant disease was identified within 3 months after deferral in 2 of 104 subjects: metastatic lung cancer and acute lymphocytic leukemia. Only donors receiving the newer pamphlet reported that it “definitely improved” their ability to speak with their doctor about anemia.

CONCLUSIONS—The diagnosis of anemia in blood donors may be an indicator of significant undiagnosed disease. There are wide variations in how centers care for and educate donors with anemia. Donors with anemia should be provided improved and consistent educational information.

Between 40,000 and 50,000 apparently healthy individuals present to donate blood across the United States each day. Because of the high underlying prevalence of anemia in the United States and the frequent development of iron deficiency anemia in regular blood donors,^{1–5} hematocrit (Hct) and/or hemoglobin (Hb) testing is performed as a screening test to qualify individuals for blood donation. Approximately 10% are not allowed to donate blood because of low Hct (<38%) or low Hb (<12.5 g/dL).^{6,7} This is, by far, the most common cause for deferral from blood donation.^{7–9} Development of successful, new strategies that provide donors with accurate information about the causes and potential treatments for their low Hct could improve donor health, reduce the number of low Hct

Address reprint requests to: Alan E. Mast, Blood Research Institute, Blood Center of Wisconsin, 8727 Watertown Plank Road, Milwaukee, WI 53226-3548; alan.mast@bcw.edu.

CONFLICT OF INTEREST

AEM presents educational talks about anemia for Siemens Corp. The other authors have no conflicts to declare.

deferrals, and have a major impact on the availability of blood. This is difficult to accomplish because of the wide spectrum of potential causes for low Hct and a general consensus that blood centers should not serve as a medical treatment facility that could potentially substitute for the donor's personal physician. Therefore, many blood centers provide donors deferred for low Hct, including those with significant anemia, with only minimal information, such as a list of iron-rich foods, and encourage them to return to donate again the next day. Providing better education to blood donors about the causes of low Hct deferral is a clear opportunity to improve their health and increase the efficiency of blood collection.¹⁰⁻¹²

To address this problem a team of physicians and scientists from the National Anemia Action Council, Blood Center of Wisconsin (BCW), Medical College of Wisconsin, and Puget Sound Blood Center have formed a partnership to improve the health of blood donors deferred for low Hct. We set out to do this by first examining the different strategies blood centers use to care for those deferred for low Hct to assess the types of information provided to donors with anemia and the criteria used for recommending a donor seek additional medical attention. As educational pamphlets have been shown to be useful instructional tools in blood donor education,^{13,14} we assessed the effectiveness of an educational pamphlet our group has developed to motivate donors deferred for low Hct to seek appropriate medical care. This pamphlet provides blood donors with literacy-appropriate information about the reasons for their low Hct deferral.¹⁰

The results of these companion survey studies identify wide variations in current practices among blood centers in the United States and underscore the need for development of effective educational programs about anemia that can be applied in a standardized manner at blood centers across the United States.

MATERIALS AND METHODS

Survey of blood center practice

A 10-question survey was developed to assess the care of donors deferred for low Hct and sent to all America's Blood Centers (ABC) participating blood centers via electronic survey software (SelectSurvey ASP Advanced, ClassApps, Overland Park, KS). Qualitative questions focused on four main topics: the length of deferral for blood donors found to have low Hct, the type of information about low Hct provided to a deferred donor, whether centers refer those with low Hct to their personal physician (and the cutoff threshold for this action), and how information recommending medical consultation for their Hct is provided. These questions were qualified for male donor or female donor responses when appropriate. Respondents were allowed to provide more than one answer to each question and had space for free text comments.

Study and survey of deferred blood donors

Institutional review board approval was obtained from Medical College of Wisconsin and BCW for the deferred blood donor survey. The study was performed at BCW. During the study period BCW used a microhematocrit centrifuge (HemataSTAT, Separation Technologies, Altamonte Springs, FL) for Hct testing to prequalify donors. Testing was performed using a capillary blood sample obtained by fingerstick. Testing was not repeated if the donor had a Hct level of 38%. Demographic data on the blood donors who participated in the survey were drawn from computerized donor files at BCW. Allogeneic whole blood donors, including double red blood cell (RBC) donors, 18 years and older deferred for low Hct at eight fixed donation sites, were sent letters inviting them to participate in the study between December 2008 and March 2009. Letters were sent in the first 14 days of each

month to donors deferred in the previous month. There were three exclusion criteria: 1) those with three or more successful whole blood donations in the previous 12 months were excluded to remove high-intensity donors in which the low Hct likely was caused by frequent blood donation, 2) women less than 50 years old were excluded to remove premenopausal women from the study, and 3) women with a Hct level of 36 or 37% were excluded because this is not considered anemia for women even though they are deferred from donating blood.¹⁵ All of the fixed donation sites were in the greater Milwaukee, Wisconsin area. Donors at other BCW fixed sites and mobile drives were not included because of operational issues unrelated to the study.

Those deferred blood donors responding to the invitation letter were randomized into two groups based on the last digit of their blood donor number. Donors with an even number were sent an informed consent form to sign and return along with the older pamphlet provided to deferred blood donors at BCW. This pamphlet tells donors that in most cases a simple change in diet is sufficient to increase their Hct. It encourages donors to eat foods rich in vitamin C and to avoid caffeine and then provides a list of iron-rich foods. Those with an odd blood donor number were provided an informed consent form to sign and return along with the new educational pamphlet, developed with input from donors deferred for low Hct.¹⁰ The new pamphlet highlights common issues about low Hct deferral, such as the deferral of women with a Hct level of 36 to 37%, even though they do not have anemia. It also has separate sections for common causes of anemia such as iron deficiency and other nutritional deficits; anemia that occurs secondary to chronic disease such as arthritis, diabetes, or kidney disease; and anemia from “invisible” causes, such as gastrointestinal bleeding or cancers. A copy of the new pamphlet is available on-line at: <http://www3.interscience.wiley.com/cgi-bin/fulltext/122578036/sm001.pdf?PLACEBO=IE.pdf>, in the “supporting information” section.

Three months later subjects were mailed a survey assessing their actions and opinions in response to the information in the pamphlet they had received. The survey consisted of 19 questions about the donor’s emotional response to deferral, impressions about the pamphlet they received, responses to the information presented in the pamphlet, and a self-report of any further care-seeking behavior in response to the pamphlet. Responses to both surveys were collated and analyzed using descriptive statistics (Excel, Microsoft Corp., Redmond, WA).

RESULTS

Blood center deferral practice survey

ABC blood centers are geographically dispersed across the United States. The response rate of blood centers to the electronic survey about low Hct deferral was 69% (52/75). Respondents were blood centers of varying sizes: 33% draw 10,000 to 50,000 donors per year; 31% draw 50,001 to 100,000 donors per year; 23% draw 100,001 to 200,000 donors per year; 14% draw more than 200,001 donors per year (Table 1). Responding blood centers reported an overall low Hct deferral rate of 9.0%, 2.5% for male donors and 15.7% for female donors.

Most blood centers deferred donors found to have low Hct for only 1 day (72% for male donors, 74.5% for female donors), while 18% deferred donors for periods of 3 days to 3 months. Only 6% of centers deferred donors for longer than 2 weeks. Five centers (10%) had staggered or graded deferral time algorithms based on the Hct level; three of these five centers deferred donors for 1 day if the donor was only slightly below the cutoff (Table 1). All five of these centers collected fewer than 200,000 donations per year.

Blood centers had wide variation in how they provided information to blood donors deferred for low Hct. Most centers (92%) provided donors with the deferral time period and asked them to come back again. Only 13% offered follow-up appointments to recheck Hct levels (Table 2). Many centers provided some sort of information about the causes of low Hct and how one may increase it, although the methods used varied: 58% provided verbal information about low iron, 85% provided a written pamphlet about iron-rich foods, 37% provided a written pamphlet of causes of low Hct, and 17% provided a pamphlet recommending iron supplements. Some centers used the Internet for educating donors about low Hct deferrals; 19% used a Web page to provide information about causes and ways to improve low Hct. A few blood centers (10%) offered blood center medical director contact information to discuss their questions about low Hct. One blood center noted that their staff is allowed to use their discretion about which donors needed counseling about low Hct (such as male donors with two or more previous deferrals). Another noted their “Iron for Women” program that provides free iron supplements to female donors with low Hct. A third center indicated that they have held workshops focusing on low Hct deferrals that have been successful in decreasing their prevalence.

Only 35% (18 centers) of blood center respondents had a Hct cutoff value below which male or female donors were recommended to see their physician. The mean value of those that did recommend physician referral was a Hct level of 32.4% (range, 30%–38%) for males and 31.8% (range, 30%–38%) for females. Of the centers that advise donors to seek medical advice, nine centers (17%) provide verbal information and nine centers (17%) provide a handout advising the donor to seek medical care. One of the nine centers provides both written and verbal information, while medical directors at six centers (12%) advise blood donors with low Hct to see their doctor using a written letter or via phone consultation. Some of these 18 centers reported that they provide this information to the donor in multiple ways.

Deferred blood donor study and survey

Letters were sent to all 391 donors who were deferred for low Hct at the study sites during the enrollment period and did not meet study exclusion criteria. Of these, 104 (26.6%) individuals were enrolled in the study and 103 (26.3%) completed the survey. One donor that did not complete the survey died during the 3-month period between study enrollment and receipt of the survey. Of those enrolled, 56.7% received the new pamphlet. There were no significant differences between the groups receiving the old and new pamphlets in regard to their age or Hct values (Table 3).

In the group of respondents there were 47 males (mean age, 59.1 years) and 57 females (mean age, 58.5 years) enrolled in the study (Table 3). All of the subjects had received at least a high school education. Donors enrolled in the study reported good access to medical care with 100 of 103 (97%) having health insurance and 102 of 103 (99%) having a clinic or medical doctor to which they regularly go. The mean Hct value for male subjects was 35.8% (range, 31%–37%). The mean Hct value for female subjects was 34.3% (range, 31%–35%; Table 3).

To assess donor attitudes, a question asked how the donor felt when they were told they could not donate blood; more than 90% indicated they were disappointed, while 14% indicated that they felt like a failure. Many of the donors in both groups sought additional information about low Hct deferral. Fifty percent of each group indicated that they sought information from family members and 50% indicated that they sought information from the Internet. There was no difference between the groups in seeking information on the Internet, even though the new pamphlet recommended a specific Web site with information about blood donation and anemia (<http://www.anemia.org>). Many of the donors tried to increase

their Hct on their own, but there were no significant differences between the two groups in how they tried to do this. The most common responses were change in diet (30 females and 21 males), started taking iron pills (24 females and 19 males), started taking vitamins (17 females and 13 males), and avoided caffeine (nine females and 12 males).

Study subjects were selected such that they all had significant anemia that would warrant a medical examination (males with Hct < 38%, females > 50 years old with Hct < 36%). Study subjects were assessed to see if the informational pamphlets compelled them to see a physician. Receipt of the new pamphlet did not increase the likelihood of a donor having a doctor appointment. Of those receiving the new pamphlet 22 of 59 (37%) sought advice from their doctor about their low Hct deferral, while 17 of 44 (39%) of the donors receiving the old pamphlet did so. Those that did not go to their doctor cited reasons (multiple responses allowed) such as “I did not think it was necessary” (40 subjects), “I treated myself” (26 subjects), and “I returned to donate and my blood count had increased” (24 subjects) as the most likely reasons. Only four subjects indicated that it was too expensive to see their doctor. Of those that went to their doctor, 7 of 22 (32%) subjects receiving the new pamphlet indicated that it “definitely improved” their ability to speak to their doctor about their low Hct deferral, while 0 of 17 (0%) of donors receiving the old pamphlet indicated this. There was a trend for those receiving the new pamphlet to have their doctor perform diagnostic testing to determine the cause of anemia (21 in new group, 10 in old group), however, this did not reach statistical significance (Table 3).

Two of the 104 (1.9%) study subjects had significant disease diagnosed during the 3-month period after their low Hct deferral. A 66-year-old man was deferred with a Hct of 35%. Two and one-half months later he was diagnosed with acute lymphocytic leukemia. He died 5 months after his low Hct deferral and did not complete the study survey. A 63-year-old woman, also deferred with a Hct of 35, completed the survey reporting that she had been diagnosed with Stage IV lung cancer that had metastasized to the liver and bone.

DISCUSSION

Anemia is a common condition that has been recognized by the United States Department of Health and Human Services as a significant public health concern in *Healthy People 2010*.¹⁶ Moreover, anemia is an early indicator of many diseases and is associated with poor outcomes in hospitalized patients.^{17,18} Approximately 10 million individuals donate allogeneic blood in the United States each year. During each encounter with the blood center, the donor receives a Hb and/or Hct test as part of the screening process for donation eligibility. The data presented here demonstrate that the care provided for these donors varies widely at different blood centers across the United States.

It takes approximately 4 days for a reticulocyte to be released from the marrow and develop into a mature RBC. The mean life span of a RBC is 120 days. Thus, it takes at least 30 to 60 days for alterations in diet or the use of iron supplements to increase a donor's Hb. Yet, the vast majority of ABC blood centers surveyed (which account for about 50% of blood donations in the United States), as well as American Red Cross Blood Centers¹⁹ (which account for 40%–50% of blood donations in the United States), defer blood donors with low Hct for only 1 day (24 hours), an inadequate deferral period from a physiological standpoint to allow recovery of blood counts that may occur after dietary changes or iron supplementation.²⁰ We suspect the reasoning behind the short deferral period may be that blood centers do not want to lose donations from donors that have a borderline Hct value and may qualify for donation the following day solely due to random variation in the test results.

For the 28% of blood centers that do not use a 1-day (24-hour) deferral period for all donors with low Hct, there are wide variations in how deferrals are handled. Some blood centers use stricter criteria to determine when a blood donor can return to attempt donation again. These periods range from 3 days to 3 months. Other centers use graded deferral periods that depend on the Hct value to determine deferral length. Although the graded deferral periods or the strict longer deferral periods are likely to have a more rational clinical basis from the perspective of primary care physicians, the algorithms used by the centers are not necessarily grounded in evidence. In fact, there are no nationally recognized evidenced-based guidelines to advise clinicians on the further workup or management of anemia in otherwise healthy, nonpregnant adults.

The methods for communication of information to donors about low Hct deferral were also highly variable. In the fields of health communication and education, the ability to use multiple means of communication may lead to better retention and understanding for different types of learners.^{21,22} Besides the limits on information retention, barriers such as culture, language, literacy, and education may hinder people from understanding health care messages. Messaging that is provided by people of influence such as physicians or celebrities and that which promotes positive behavior change are desirable in health campaigns.²³ Finally, psychological factors are known to play a significant role in blood donor retention and commencement of a donation “career.”²⁴ Although our survey finds that 46% of centers use both written and verbal communication, exploration of other modalities, such as electronic media and connection to support groups or medical consultation, may provide better education to a wider scope of donors. Barriers to health education, coupled with the variations in blood donor counseling found in the survey, support the continued study of blood donor education. This may lead to improvements and standardization of blood donor health education to support healthier blood donors and sustain future blood donation.

Relatively few blood centers (35%) provide instructions for donors to see a doctor even if they have a very low Hct. For those centers that recommend medical consultation, the threshold varies from Hct levels of 30% to 38%. The method of communication about medical consultation also varies among blood centers. There is insufficient evidence to recommend screening otherwise healthy adults for anemia, but an incidental finding of anemia in an apparently healthy adult should not be ignored, as demonstrated by the two deferred donors in this study that were subsequently diagnosed with cancer. A prudent clinician would perform a relevant history and physical examination, consider repeating the Hb and/or Hct to verify the diagnosis of anemia, and also consider further testing to look for underlying causes of the anemia. Since only a minority of blood centers report a policy of advising deferred donors to seek physician consultation for low Hct, there are many missed opportunities for timely diagnosis and appropriate clinical intervention for anemic donors.

Although there is substantial variation in communication practices and Hct thresholds for advising that the blood donor take further action, there are some enlightening examples of blood center programs and directives that may lead to improved health education. These include staggered Hct thresholds to provide deferral periods to allow recovery of iron stores and Hb in frequent donors with anemia caused by blood donation and novel programs, such as the “Iron for Women” program employed at one center.

We performed a randomized controlled pilot study that enrolled a limited number (104) of deferred blood donors to determine if a newly designed informational pamphlet¹⁰ aids donors in understanding and seeking medical advice about their low Hct deferral when compared to an older pamphlet. The survey of these donors found that many deferred donors, regardless of the pamphlet received, are very disappointed when their Hct is not

high enough to donate blood. Consistent with this, many of the deferred donors actively sought information about how to increase their Hct through dietary changes, vitamins, and iron supplementation demonstrating a willingness of donors to change their behavior to increase their Hct so they can donate blood again. This suggests that focused educational programs that provide accurate information about the reasons for low Hct deferral can be successful as a health education tool used by blood centers. Although donors with three or more successful donations in the previous 12 months were excluded, a limitation of this study is that its design required donors to respond to a letter inviting them to participate, which favors enrollment of more committed blood donors rather than first-time or infrequent donors. This led to selection bias in favor of donors that are highly motivated to make changes to increase their Hct.

There was a trend for those that received the new pamphlet to state that it definitely improved their ability to talk to their physician about anemia. Consistent with this finding, there also was a trend for those receiving the new pamphlet to be more likely to have laboratory testing to determine the cause of their anemia ordered by their physician. It is possible that these trends result from the new pamphlet providing donors accurate background information about anemia such that they can advocate for themselves. However, the small study numbers and small differences between the two groups led to insufficient statistical power to be confident about this conclusion. Although this pilot study also did not have sufficient power to compare rates of serious illness in blood donors found to have low Hct and the general population, it is intriguing that 2 of the 104 donors enrolled in the study had significant disease: chronic lymphocytic leukemia and Stage IV lung cancer diagnosed within 3 months after their attempt to donate blood. It is possible that earlier detection of such severe disease at the time of Hb deferral would not have impacted treatment options for these two individuals, yet there are likely additional donors with treatable disease that was not diagnosed in the 3-month follow-up period of this study. While these instances of severe disease may have been more common in this pilot study than would be seen in a larger study because of random variation in their occurrence, they suggest that a significant number of people attempting to donate blood have serious unrecognized medical disease and warrant further evaluation. The mechanism to initially identify these donors at blood centers exists now without need for additional testing or adding significant burden to the blood center—what is needed is that the information about the Hct values already collected must be acted upon in a clinically appropriate manner.

There is a tremendous and unrealized opportunity to improve the blood supply and the health of blood donors through development and standardization of care for blood donors deferred for low Hct. We have shown that there is wide variation in how blood centers treat deferred donors, with most centers deferring these donors for only 1 day. Moreover, the uneven deferral practices are not evidence based. There is a need for blood centers to work toward standardized care for donors with low Hct. We have also tested the ability of a new educational pamphlet to influence appropriate donors to respond to a low Hct deferral and seek medical care. A multifaceted approach to donor care may consist of enhanced educational programs, repeat Hct testing, iron supplementation, and providing ferritin values. However, which programs are most effective for improved donor health needs further in-depth study. Besides taking on the additional role of public health practice, blood centers that are attentive to donor health will produce a healthier donor population that is able to donate blood with less frequent deferral than currently occurs.

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ABBREVIATIONS

ABC	America's Blood Centers
BCW	Blood Center of Wisconsin

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TABLE 1

Characteristics of blood center respondents and their low Hct deferrals

Characteristic	All blood centers (%)	Blood center respondents by size (number of donors/year)					
		10,001–50,000	50,001–100,000	100,001–200,000	>200,001		
Responded to survey (%)	52 (69)	17	16	12	7		
Percentage of donors deferred per year	9.0	9.7	8.9	8.0	9.7		
Defined deferral period (males or females, unless specified)							
1 day (or 24 hr)	38 (73)	14	10	9	6		
3 days	1 (2)	0	1	0	0		
7 days	2 (4)	1	1	0	0		
14 days	3 (6)	0	1	1	0		
21 days	1 (2)	0	1	0	0		
28 days	1 (2)	0	1	0	0		
21 days (female), 3 months (male)	1 (2)	0	0	0	1		
Graded deferral period (males or females)							
2 weeks for each 3/10 of a point	1 (2)	0	0	1	0		
37% = 1-day deferral; 36% or less = 4-week deferral	1 (2)	0	0	1	0		
Standard is 2 weeks; if Hb <10.5 g/dL then 2 months	1 (2)	0	1	0	0		
<12.5 = 1 day; <12.0 = 2 weeks; <10.5 = 8 weeks	1 (2)	1	0	0	0		
Those that are 1 to 2 points below acceptable are eligible to donate in 24 hr. Those that are 3 to 6 points below normal are eligible after 1 week.	1 (2)	1	0	0	0		

TABLE 2

Information provided to blood donor regarding deferral for low Hct and/or Hb: (a) methods of information distribution provided to deferred blood donors and (b) types of information provided to deferred blood donors—multiple answers were acceptable

Type of information	Number of blood centers (%)
<i>a. Methods of information distribution provided to blood donor</i>	
Verbal only	3 (6)
Written only	3 (6)
Verbal plus written	24 (46)
Verbal plus other	1 (2)
Verbal plus written plus electronic	7 (13)
Verbal plus written plus other	11 (21)
Verbal plus written plus electronic plus other	3 (6)
<i>b. Types of information provided to deferred blood donors</i>	
Verbal information	
Blood center provides the deferral period time period and asks donor to come back again.	48 (92)
Blood center provides information about ways donors can increase their Hb and/or Hct.	30 (58)
Written information	
Blood center provides a handout describing iron-rich foods or other simple ways to increase their Hb and/or Hct.	44 (85)
Blood center provides a handout that recommends that donors with low Hb and/or Hct consider using iron supplements.	9 (17)
Blood center provides a handout that describes different causes of low Hb and/or Hct.	17 (33)
Electronic information	
Blood center has a specific page on their Web site that describes causes of low Hb and/or Hct and ways to increase it.	10 (19)
Other information or services offered	
Blood center offers follow-up appointments to check Hb and/or Hct.	7 (13)
Blood center offers contact information for our center's medical director to further discuss the low Hb and/or Hct deferral with the donor.	5 (10)
Blood center sends a reminder card and then follow-up call when the deferral has expired and that they can now return.	1 (2)
Blood center offers an "Iron for Women" program that provides free supplements to eligible women.	1 (2)
Blood center staff mention iron supplements but recommend they see their doctor before taking them.	1 (2)
Blood center recommends follow up with doctor before any therapy.	1 (2)
Blood center staff is more likely to suggest to contact blood center doctor when donor is known frequent donor male with two or more recent Hct deferrals.	1 (2)

TABLE 3

Demographic characteristics of deferred donors

Demographic	Old pamphlet	New pamphlet	Total
Number of males	22	25	47
Number of females	23	34	57
Age (years), median (range)			
Male	57 (25–85)	58 (24–83)	59.1 (24–85)
Female	57 (51–81)	58 (51–74)	58.5 (51–81)
Hct (%), mean (range)			
Male	36.0 (34–37)	35.7 (31–37)	35.8 (31–37)
Female	34.3 (31–35)	34.2 (31–35)	34.3 (31–35)