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The health implications of low hemoglobin deferral in infrequent blood donors

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Abstract

BACKGROUND—The causes of anemia in infrequent blood donors deferred for low hemoglobin (Hb) are not well known. We sought to assess this via surveys of infrequent, nonmenstruating deferred blood donors at two institutions, BloodCenter of Wisconsin and Puget Sound Blood Center.

STUDY DESIGN AND METHODS—Men at least 18 years of age and women at least 50 years of age who were deferred for low Hb (≤ 12.5 g/dL), had not more than one donation in the year prior to deferral, and did not successfully donate in the 3 months after their deferral were surveyed.

RESULTS—The total response rate was 380 donors or 34% of those contacted. Of the respondents, 141 had sought medical advice about their low Hb. Of these, 90 were confirmed to have anemia and 13 reported serious disease requiring medical intervention, including mantle cell lymphoma, multiple myeloma, and gastrointestinal bleeding.

CONCLUSIONS—A small but concerning number of infrequent blood donors deferred for low Hb have an underlying illness that is severe and would benefit from medical attention. Donors deferred for low Hb who have a high risk for serious underlying illness should be provided targeted educational information advising them to seek additional medical care.

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CONFLICT OF INTEREST

The authors have disclosed no conflicts of interest.

Each day approximately 50,000 potential blood donors present at blood centers in the United States. Approximately 10% of these donors will be deferred for hemoglobin (Hb) below 12.5 g/dL. Because of variation in day-to-day Hb finger stick testing values,¹ many blood collection agencies do not wish to discourage donors and lose potential donations with an extended deferral period. Therefore, it is common practice to provide donors deferred for low Hb with a list of iron-rich foods and defer them for only 1 day.² Newly recognized anemia may signal an unrecognized underlying illness, particularly in males and nonmenstruating females.^{3,4} However, deferred donors are often not provided with adequate information regarding their low Hb deferral or alerted to the possibility that it may be caused by a serious or treatable medical condition.⁵ Although blood collection agencies do not provide medical care to donors, they play an important public health role. If accurate and understandable educational health information is provided, it may prompt donors to seek diagnosis and treatment for their anemia. This, in turn, could also benefit the blood center by decreasing the number of low-Hb deferrals, the associated costs of failed donations, and the loss of willing blood donors.^{6,7}

Previous studies have found medically important underlying illness in seemingly healthy blood donors deferred for low Hb. These include gastrointestinal (GI) bleeding, B12 deficiency, thyrotoxicosis, hyperthyroidism, and uncontrolled diabetes in a study by Bryant and colleagues,⁸ as well as acute lymphocytic leukemia and Stage IV lung cancer in two donors from a previous study by our group.² Here we report results from a survey of a large group of blood donors from two blood collection centers in the United States to further define and quantify the types of underlying medical disease present in infrequent blood donors deferred for low Hb.

MATERIALS AND METHODS

Study participants

Qualifying whole blood or double-red-blood-cell donors who were deferred for low Hb (<12.5 g/dL) during a 9-month period (January through September, 2011), inclusive of mobile and fixed donation sites, were surveyed. There were two exclusion criteria: 1) those with at least two successful whole blood donations in the 12 months before their deferral to avoid evaluation of anemia caused by frequent donation and 2) females younger than 50 to exclude women with iron deficiency anemia secondary to menstruation and pregnancy. Institutional review board approval was obtained from both BloodCenter of Wisconsin in Milwaukee, Wisconsin, and the University of Washington in Seattle, Washington.

Survey distribution

A 27-question survey to assess the donors' response to their deferral was mailed in January 2012 to allow the donors to have had at least 3 months to take action in response to their deferral. The survey included questions on attitudes and beliefs regarding their deferral experience, communications received from the blood center about their deferral, actions taken in response to their deferral, outcomes of those actions, and demographic information. BloodCenter of Wisconsin (Center 1) used a paper survey mailed to the study subjects, while Puget Sound Blood Center (Center 2) utilized an electronic survey delivered via e-

mail (SelectSurvey.Net, Overland Park, KS). The methods for survey distribution were the common practice at each site at that time. Responses to surveys from both centers were collated and analyzed using descriptive statistics and independent t tests to compare mean values of continuous variables (Excel, Microsoft Corp., Redmond, WA).

RESULTS

Demographics

Surveys were sent to 901 donors at Center 1 and 219 donors at Center 2, consisting of approximately 80% female donors and 20% males. There was a 33% (n = 297) and 38% (83) response rate, respectively, for a total response rate of 34% (380). The difference in center response was not significant (p = 0.29). The distribution of respondents was similar between both centers (Table 1) and predominantly females (86%) aged 51 to 60 (57%). Women were more likely to respond (37%) than men (22%). Greater than 90% of respondents identified themselves as Caucasian with less than 1% each African-American, Asian, or Hispanic. Although female participants were at least 50 years old, 10% of women reported that they were still actively menstruating, 13% were perimenopausal, and the remainder were post-menopausal. Center 2 donors reported higher presurvey iron supplementation than Center 1 donors (63% vs. 51%), but this was not significant (p = 0.42). The majority 53% (201) of these donors at both centers reported taking iron more than four times per week, but at a minimum of weekly. Center 1 provides an informational pamphlet for donors with low Hb deferral, which indicates that iron supplementation may be helpful, among other suggestions. Center 2 does not provide specific information recommending iron use. The majority of respondents reported a prior history of anemia diagnosis 58% (221). Educational level was consistent at both sites with 46% college graduates and 31% having some college. Nineteen percent were high school graduates and 1% reported some high school as the highest educational level achieved.

Overall, 37% (141) of the survey respondents sought medical care after their deferral. Of these care-seekers, 64% (90) reported that their doctor confirmed that they had anemia, while 36% (51) stated that they were told they did not have anemia. Follow-up testing was performed in 73% (103). The most common follow-up testing performed were blood tests in 55% (77), followed by colonoscopies or sigmoidoscopies in 17% (24), stool hemoccult testing in 10% (15), referral to another physician in 10% (14), and X-rays or CT scans in 4% (five). Marrow biopsy was reported by two donors and upper GI endoscopy by one. One respondent reported referral to an oncologist. Eleven indicated that they had recent testing before the deferral or were being monitored for anemia and their physician felt that additional testing was unnecessary. None of the respondents who went to their physician and were found to be anemic indicated that they felt the additional testing was too expensive or unnecessary.

A wide variety of diagnoses were identified by the workups among the 74 deferred donors (Center 1) who were determined to be anemic by their physicians (Table 2). In 34% (25) it was attributed to diet or nutrition. However, other treatable illnesses were also identified: two had colon polyps, two had gastric ulcers, five had diabetes, three had arthritis, and three were diagnosed with “other cancer,” which included prostate cancer, multiple myeloma, and

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mantle cell lymphoma. Two donors listed “other bleeding” as a diagnosis with no additional information provided, and five indicated that they had heavy menses or fibroids. One was diagnosed with lupus and another had myelodysplastic syndrome. Center 2 had a survey format which excluded a question about diagnosis, but did ask about prescribed treatments, allowing indirect determination of the diagnosis. One Center 2 respondent noted that she was diagnosed with monoclonal gammopathy of undetermined significance and another had a splenectomy due to a hemangioma. Overall, 13 deferred donors reported diagnosis of serious illness, including several cancers and autoimmune diseases, totaling 3.4% of all survey respondents (Table 2). All of the donors who were determined to have significant medical illness had anemia confirmed by their physician.

Sixty-three percent (240) of respondents did not seek medical treatment. Many donors felt that follow-up with their physician was unnecessary (43%, 103); some stated that they returned to donate and were successful (21%, 50) or that they self-treated (17%, 40) their low blood count. Five percent (11) felt that it was too expensive to seek treatment. Comments included this statement from a Center 1 donor: “When I asked the blood center collection staff if I should be concerned, the only suggestion was to take an iron supplement 1 week prior to the scheduled donation. At my annual check-up, I was diagnosed with iron deficiency and needed iron infusions.” Thirty-four respondents commented that they felt that diet would be sufficient to produce an adequate change or that they knew they had a Hb level that tended to run below the donation cutoff.

For the 36% (51) of deferred donors who went to their physician but were found not to have anemia, 33% (17) felt “fine” about the results, many indicating they were at the physician for another reason, while 27% (14) were “relieved.” Four respondents felt “anxious for no reason” and three respondents indicated that it was a “waste of time and money.”

Donors were asked if they sought additional information or self-education about low Hb. Of the overall 42% (159) of respondents, 14% (23) indicated that they had asked friends or family, 28% (45) used the Internet, and 58% (92) answered “other.” Most, 95% (87) of write-in responses to “other,” stated that they spoke to a physician or other health care professional, including dietitians, nurses, or friends in the medical field.

When asked which educational methods might best encourage them to seek medical attention, the majority indicated that written information provided by blood collection staff was the preferred method (47%, 177) followed by verbal information by the blood collection staff (26%, 98) or verbal information by the blood center physician (13%, 49). Encouragement from friends or family, online information provided by the blood collection staff, or from a medical Web site were the least popular choices (each <1%). Write-in comments were varied, with common examples including “I would seek attention if I was feeling poorly” and “Only if I were told it was dangerously low.”

DISCUSSION

The objectives of this study were to determine the frequency, types, and causes of medical disease present in infrequent blood donors who are deferred for low Hb and to understand

how these donors seek medical advice in response to their deferral. Overall, only 37% went to their physician, but of those who did seek medical care, 64% were confirmed to be anemic, and 73% reported additional testing. Evaluating the data from both sites, a small but significant 3.4% of infrequent donors who were deferred for low Hb reported a previously unrecognized serious illness requiring treatment, including lymphoma, prostate cancer, autoimmune disease, and upper GI bleeding (excluding those anemic attributed to heavy menstruation, fibroids, diabetes, or arthritis). These results identify a subset of individuals presenting to donate blood who have a high likelihood for unrecognized and serious medical illness first presenting as anemia.

A weakness of the study design was that the Center 2 survey did not directly ask donors to enter their diagnosis as free text; however, several subjects entered diagnoses in a general comment section at the end of the survey. It is possible that significant diagnoses were missed; thus, the study may be providing a low estimate of the prevalence of medical illness. However, the potential for response bias by individuals who received medical attention with a significant disease may result in overreporting the prevalence of disease in this group. It is not possible to delineate the direction of bias, should it exist. To further examine response bias, it would have been ideal to resurvey some of the nonresponders. However, because of the institutional review board requirements, survey responses did not include identifiers. Thus an accurate resampling is not possible.

Consistent with the survey findings presented here, Edgren and colleagues⁹ have reported that the risk of stomach cancer, multiple myeloma, and lymphatic leukemia was increased in blood donors with declining Hb over the 3 years before their diagnosis. Additionally, cancer of the small intestine, colon, and Hodgkin's lymphoma showed an increased risk detectable by declining Hb 2 years before diagnosis. Although the sensitivity of anemia as a screening test for cancer is poor, the data presented here demonstrate that there is notable serious medical illness (13) in this subset of blood donors who infrequently attempt donation. Many current blood donors are unaware that anemia may herald a treatable or more significant illness and are unclear as to when to seek medical attention.¹⁰ Center 1 provides initial training for staff on what basic recommendations to make regarding low Hb levels, particularly if they are just below the cutoff, but does not encourage staff to provide an in-depth discussion. Center 2 instructs staff to provide a one-page information sheet to all donors who do not meet Hb criteria.

This idea was reinforced by survey respondents, whose comments included "The nurses kind of brush it off and don't make my [low Hb] level an important health reason to visit my doctor. Is it?" and "No one at the blood center gave me this information, which turned out to have grave health consequences for me when I plummeted to a 9 serum ferritin level. The blood donation staff needs better training on this to help maintain the health of their donors." In contrast, the value of providing accurate information to these donors is poignantly expressed by a respondent diagnosed with mantle cell lymphoma, who stated "Trying to donate blood saved my life."

Very few respondents felt that pursuing medical care in response to their low Hb was a waste of their money or time, inclusive of those who went to their doctor and found that

their Hb was normal. Although this may be related to the fact that essentially all of the respondents had medical insurance, it is significant as a concern of blood centers is that blood donors may ask to be reimbursed for medical expenses, particularly if they have normal results after seeking recommended follow-up. In the future, more comprehensive medical coverage in the United States may mitigate this potential risk.

Infrequent donors who are deferred for low Hb should be given appropriate guidance as to the meaning of their Hb level. An algorithm could be devised that focuses upon the sex and Hb level; the donor could be then given a different message by the phlebotomy staff or a specific brochure or pamphlet. For example, a male donor whose Hb is less than 12.0 g/dL could be told that it is recommended that he see his physician, whereas a woman over age 50 with a Hb level of 12.0 g/dL may be advised that she is in the normal range. Donors with a severely low Hb level, such as less than 10 g/dL could be called by the blood center medical director. Providing an algorithm and guidance for what is appropriate commentary from the phlebotomists would also help to provide a consistent and correct message for our donors. We have developed a pamphlet using focus groups composed of deferred donors that provides educational information about potential causes for their low Hb deferral, including the possibility of underlying illness that is available on-line.¹⁰

The current educational methods used to help these donors improve their low Hb may not be adequate, as education material is often focused on frequent blood donors, who often develop iron deficiency secondary to repeated blood donation.^{11,12} These donors often are very interested in obtaining information on how to improve their Hb, so that they will be eligible to donate again.¹⁰ Many blood centers provide brochures or other information that emphasizes lists of iron-rich foods.² Consistent with this, some donors responded that they would just “eat a big red steak” the night before donating or skip their morning coffee. However, several studies have indicated that an iron-rich diet alone does not adequately replace the iron stores in frequent donors.^{13–15} Although shown to be safe and effective,⁸ iron supplementation is not yet common practice.² Despite clear differences in the potential causes underlying anemia in infrequent and frequent donors, blood centers tend to provide all donors with the same information about low Hb deferral. There are many different causes of anemia in blood donors and it is difficult to communicate accurate information to all. Informational pamphlets can be used;¹⁰ the American Red Cross has recently updated their Web site with more comprehensive information about low Hb deferral, its causes, and appropriate actions for donors to take, based on the recommendations made by the AABB panel of experts in 2012 (<http://www.aabb.org/advocacy/regulatorygovernment/donoreligibility/Pages/hemoglobstdswrkshp110911.aspx>).

There is a need to protect donor health; donors deferred for low Hb or hematocrit receive highly varied information on the medical significance of their deferral, when they should seek additional medical care and what they should do to decrease the likelihood of deferral. In this population of infrequent male and postmenopausal female donors the findings presented here demonstrate that anemia can indicate significant underlying illness and should not be ignored. Further investigation is warranted to determine the best methods to encourage the highest-risk infrequent donors to seek appropriate medical attention and to prevent iron deficiency in all donors.

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TABLE 1

Demographics*

Demographic	BCW (n = 297)	PSBC (n = 83)	Total (n = 380)
Sex			
Male	37 (12.4)	14 (16.9)	51 (13.4)
Female	257 (86.5)	69 (83.1)	326 (85.8)
No response	3 (1.0)	0 (0.0)	3 (0.8)
Age (years)			
21–30	3 (1.0)	0 (0.0)	3 (0.8)
31–40	2 (0.7)	2 (2.4)	4 (1.1)
41–50	20 (6.7)	5 (6.0)	25 (6.6)
51–60	172 (57.9)	45 (54.2)	217 (57.0)
61–70	68 (22.9)	26 (31.3)	94 (24.7)
71–80	20 (6.7)	3 (3.6)	23 (6.0)
>81	8 (2.7)	1 (1.2)	9 (2.4)
No response	4 (1.3)	1 (1.2)	5 (1.3)
Race			
Caucasian	281 (94.6)	75 (90.3)	356 (93.6)
African American	7 (2.3)	1 (1.2)	8 (2.1)
Asian/Pacific Islander	0 (0.0)	2 (2.4)	2 (0.5)
Hispanic	6 (2.0)	2 (2.4)	8 (2.1)
No response	3 (1.0)	3 (3.6)	6 (1.6)
Menses status [†]			
Active	32 (10.8)	6 (7.2)	38 (10.0)
Perimenopausal	41 (13.8)	8 (9.6)	49 (12.9)
Menopausal	183 (61.6)	53 (63.8)	236 (62.1)
No response	1 (0.3)	2 (2.4)	3 (0.8)
Iron use			
Do not take	132 (44.4)	30 (36.1)	162 (42.6)
Take <4× per week	35 (11.8)	12 (14.5)	47 (12.4)
Take >4× per week	116 (39.1)	40 (48.2)	156 (41.1)
No response	14 (4.7)	1 (1.2)	15 (3.9)
Anemia diagnosis			
Yes	176 (59.2)	45 (54.2)	221 (58.1)
No	107 (36.0)	35 (42.1)	142 (37.4)
No response	14 (4.7)	3 (3.6)	17 (4.5)
Education			
Some high school	3 (1.0)	0 (0.0)	3 (0.8)
High school graduate	66 (22.2)	7 (8.4)	73 (19.2)
Some college	88 (29.6)	30 (36.1)	118 (31.1)
College graduate	129 (43.4)	46 (55.4)	175 (46.0)
No response	11 (3.7)	0 (0.0)	11 (2.9)

* Data are reported as number (%).

[†] Totals 100% of female respondents.

BCW = BloodCenter of Wisconsin; PSBC = Puget Sound Blood Center.

TABLE 2Treatable medical illnesses discovered by medical follow-up after deferral^{*}

Diagnosis	Sex	Age (years)
GI bleeding (4)		
GI bleed	Male	21–30
Bleeding ulcer	Male	51–60
Bleeding ulcer	Male	51–60
Ulcer	Female	51–60
Hematopoietic disorders (5)		
Mantle cell lymphoma	Male	41–50
Myelodysplastic syndrome	Female	71–80
Multiple myeloma	Male	61–70
Monoclonal gammopathy of undetermined significance	Female	61–70
Cold agglutinin disease	Male	71–80
Autoimmune disorders (2)		
Lupus	Female	51–60
Autoimmune dermatomyositis and primary biliary cirrhosis	Female	41–50
Other (2)		
Splenic hemangioma	Female	51–60
Prostate cancer	Male	>81

* Respondents who indicated low Hb due to heavy menses or fibroids (5), or indicated chronic illnesses such as arthritis (3) and diabetes (5), are not listed.