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Supplemental findings of the 2023 National Blood Collection and Utilization Survey

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Abstract

Background: The National Blood Collection and Utilization Survey (NBCUS) is conducted biennially to estimate U.S. blood collection and utilization. Supplemental data from the 2023 NBCUS not presented elsewhere are described here.

Methods: Data on blood donor characteristics, donation deferrals, component costs, transfusion-associated adverse reactions, and use of pathogen-reduced platelets during 2023 were collected from U.S. blood collecting and transfusing facilities. National estimates were produced using weighting and imputation methods.

Results: Compared with 2021, successful blood donations from donors aged 45–64 decreased (11%) in 2023 but still accounted for most donations overall (39%). Donations from donors aged 16–18 years, Black or African American, and Hispanic donors increased by 66%, 38%, and 9% respectively, since 2021. Donation deferrals for travel increased since 2021 (+162%). From 2021 to 2023, the median price hospitals paid per unit of leukoreduced red blood cells, fresh frozen plasma, and leukoreduced and pathogen-reduced apheresis platelets increased. Apheresis platelets experienced the largest price increase per unit (+$65). Compared with 2021, the proportion of transfusing facilities using pathogen-reduced platelets increased in 2023 (60% vs. 64%). The overall rate of transfusion-associated adverse reactions per 100,000 components transfused was

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*The estimated number of autologous and directed blood components units transfused in the United States presented for 2021 is from Free et al.[31] These numbers differ from those presented in Kracalik et al. which have been corrected.[7] The numbers presented here are corrected estimates for 2021 for autologous and directed blood components transfused.

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higher in 2023 than in 2021 (312.3 vs. 273.8), although the rate of transfusion-transmitted infections (bacterial, viral and parasitic) declined in 2023 (0.25 vs 0.43).

Conclusion: From 2021 to 2023, blood donations among older donors decreased, while donations from younger and Black or African American donors increased. Adoption of pathogen-reduced platelets and cost of all blood products increased.

1. Introduction

Intermittent national surveys of blood collection and transfusion in the United States have been conducted since the 1970s.[1,2] Since 2013, the U.S. Centers for Disease Control and Prevention (CDC) and the Office of the Assistant Secretary for Health (OASH) conducted the National Blood Collection and Utilization Survey (NBCUS), a biennial survey of blood collection organizations and transfusing hospitals.[3–5]

The goal of NBCUS is to quantify blood collection and transfusion, monitor trends in donor characteristics, donor deferrals, whole blood and red blood cell (RBC) transfusions, plasma distributions and transfusions, granulocyte distributions and transfusions, cost of blood units, hospital policies and practices related to blood collection, processing, pediatric transfusions, and transfusion-associated adverse reactions. Data from NBCUS have been utilized to monitor the safety and adequacy of the blood supply in the United States.[6,7]

Overall findings of blood collection and utilization for the 2023 NBCUS have been published.[8] This report describes supplemental findings of the 2023 NBCUS.

2. Methods

The 2023 survey was administered using the Research Electronic Data Capture (REDCap) survey platform used by CDC for public health surveys. The survey design, sampling frame and analysis for the 2023 NBCUS have been previously described.[8] Most survey questions presented are identical to previous survey cycles, which allows longitudinal comparison. Estimates were compared to 2021 NBCUS data.[7] Analyses were performed with SAS statistical software version 9.4.[9]

2.1 Sampling method

Eligible U.S. blood collection facilities were identified from the U.S. Food and Drug Administration's Blood Establishment Registration (FDA-BER) database. The sampling frame for the 2023 NBCUS has been previously described.[10] Briefly, transfusing hospitals were identified using the 2021 American Hospital Association annual survey database.[11] Hospitals performing 100–999 inpatient surgeries annually were sampled at 40%; hospitals performing 1000 or more inpatient surgeries per year were sampled at 100%.[5,7] All blood collection centers were surveyed.

2.2 Stratification, imputation, and weighting

Community-based blood collection centers were stratified into four categories based on number of annual RBC collections in units: <50,000; 50,000–199,999; 200,000–399,999; and ≥400,000.[7] Transfusing hospitals were stratified by number of annual inpatient

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surgeries: 100–999, 1000–1399, 1400–2399, 2400–4999, 5000–7999, and ≥8000. Hospital-based blood collection centers were stratified by number of inpatient surgeries per year: <1000, 1000–7999, and ≥8000.

Survey weighting was used to account for non-response, sampling design and imputation used to account for missing entries for the 2023 NBCUS have been previously described.[10] Estimates and CIs from the 2023 NBCUS were compared to the 2021 NBCUS point estimates. Instances in which the 2021 point estimate fell outside the 2023 CIs were considered statistically significant differences.

2.3 Variables analyzed in this report

Response rates were calculated using American Association for Public Opinion Research (AAPOR) guidelines and calculated separately for transfusing and blood collecting facilities. Numerators included all facilities providing completed or partial survey responses. Denominators for each survey include all facilities responding “yes” to the screener question (collected blood or transfused blood) plus an estimated proportion of non-responding facilities. Estimated proportions were calculated using APPOR methods. Response rates were compared to previous years (2017–2021) and summarized by facility type, volume of RBC collections, annual inpatient surgeries, and Health and Human Services (HHS) regions.[12]

National estimates for donor deferrals were stratified by sex and deferral reason. Successful donations were stratified by donor age and race/ethnicity. Estimates are presented for the number of apheresis and whole-blood derived plasma units distributed, plasma units transfused, and number of granulocyte units distributed and transfused.

Median and mean dollar amounts paid per blood component unit by hospitals and stratified by HHS region and annual inpatient surgeries are reported for the following blood components: leukoreduced RBCs, apheresis platelets, pathogen-reduced apheresis platelets, fresh frozen plasma, plasma frozen within 8 and 24 hours of donation, and cryoprecipitated antihemophilic factor.

The age of RBC units, apheresis platelet units, and whole blood-derived platelet units at time of transfusion, group O RBC units distributed, transfused, and outdates (expired units) are presented.

Policies and practices related to blood collection, processing, and transfusion are presented, including the following: estimated number of apheresis platelet units distributed to hospitals stratified by bacterial risk control strategies; bacterial risk mitigation strategies for platelets performed stratified by annual surgical volume; number of pathogen-reduced platelets distributed and transfused; use of platelet additive solution (PAS) to prepare apheresis platelets; leukoreduction and irradiation of blood components; number of donors and recipients genotyped; cross-match procedures and method; routine dosing criteria for plasma, prophylactic platelets, and therapeutic platelets; policies and practices to enhance transfusion safety.

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Data related to neonatal (defined as aged <4 months for this analysis due to use of lower volume aliquots for young infants) and pediatric (aged ≥5 months) transfusions and recipients are presented by whole blood/RBC, apheresis platelet, plasma transfusions, and hospital policies for neonatal aliquot production. Lastly, data related to the number of transfusion-associated adverse reactions are presented by reaction type.

The 2023 NBCUS included variables not previously collected, such as the number of RBC units transfused to individuals with sickle cell disease or thalassemia.

3. Results

3.1 Survey participation

Table 1 shows response rates for U.S. blood collection and transfusion facilities in 2023 compared to 2017–2021. In 2023, response rates for community-based collection centers, hospital-based collection centers and transfusion hospitals were: 96.2%, 90.3%, and 85.7%, respectively.

Responses rate for community- and hospital-based blood collectors, during 2017–2023, stratified by annual RBC collections are shown in Table S1. Compared with 2021, response rates in 2023 increased for community-based blood collectors with <50,000 annual RBC collections (84.6% vs. 96.3%) and decreased for facilities with 50,000–199,999 annual RBC collections (100% vs. 93.8%).

Response rates for transfusing facilities from 2017 to 2023, stratified by annual surgical volume, are shown in Table S2. Compared with 2021, response rates for transfusing facilities in 2023 increased in all regions and inpatient surgical volume strata (Table S2 and S3).

3.2 Donor characteristics

The number of donors presenting to donate blood and deferred donors stratified by sex and deferral criteria are presented in Table 2. Total number of donors presenting to donate increased by 5.3% from 2021 to 2023 (12,302,000 vs. 12,954,000 [95% CI 12,468,000–13,439,000]). The proportion of female (49.9%) and male (50.1%) donors was comparable.

The donor deferral rate (i.e., total deferrals divided by total donors presenting to donate) was lower in 2023 than in 2021 (14.2% vs. 16.3%) (Table 2). Most deferrals were due to low hemoglobin or hematocrit values (886,000; 48.2%), followed by other non-medical reasons (323,000; 17.6%), irregular pulse or rate outside specified limits(144,000; 7.8%), blood pressure outside specified limits (124,000; 6.7%), and medication use (117,000; 6.4%). Females accounted for 65.9% (1,210,000/1,836,000) of all deferrals in 2023, and 77.7% of deferrals due to low hemoglobin or hematocrit. During 2023, deferrals for men who have sex with men (MSM) declined by 26.1% compared with 2021 (2,000 vs. 3,000). Substantial increases in deferrals were observed from 2021 to 2023 for tattoo/piercing/scarring (a 276.1% increase) and travel or residence (a 161.8% increase).

Successful donations stratified by donor age and race/ethnicity are shown in Table 3. Compared with 2021, successful donations in 2023 decreased by 4.2% (11,507,000 vs.

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11,023,000 [95% CI 10,393,000–11,654,000]). Donors aged 45–64 years accounted for most successful donations (39%; 4,298,0000/11,023,000). Compared with 2021, successful donations in 2023 increased among Black or African Americans (37.6%) and donors aged 16–18 years (66%) and decreased among donors aged 25–64 years (11.6%).

Total number of repeat allogeneic and first-time allogeneic successful donors during 2023 were comparable to 2021 (Table 4).

3.3 Whole blood and RBC transfusions

Table S4 shows the number of allogeneic RBC units transfused, number of recipients, and units per recipient. From 2021 to 2023, total allogeneic RBC units transfused and number of recipient declined by 3.8% (10,668,000 vs 10,263,000 [95% CI 9,859,000–10,666,000]), and by 5.7% (4,065,000 vs 3,834,00 [95% CI 3,651,000–4,017,000]) respectively.

During 2023, the number of transfused units of autologous and directed whole blood, whole blood-derived RBCs, and apheresis RBCs declined compared to 2021 (Table S5).

3.4 Plasma distributions and transfusions

The number of plasma units distributed during 2023 and 2021 by component type is displayed in Table S6. Total plasma units distributed decreased from 2021 to 2023 (3,114,000 vs. 3,032,000 [95% CI, 2,764,000–3,300,000]), but the change was not statistically significant.

From 2021 to 2023, the number of transfused plasma units declined (2,215,000 vs. 1,882,000 [95% CI 1,765,000–1,998,000]) (Table S7).

3.5 Granulocyte distributions and transfusions

The number of granulocyte units distributed and transfused in 2023 are shown in Table S8. Compared with 2021, total granulocyte units distributed in 2023 decreased (1,308 vs. 1,260 [95% CI 790–1,729]) while total units transfused in 2023 increased (990 vs. 1,221 [95% CI 620–1,822]).

3.6 Cost

Price of blood components paid per unit by hospitals in 2023 is shown in Table 5. Compared with 2021, the mean price of blood components increased for all component types. Pathogen-reduced apheresis platelets had the highest cost, with a mean of $701 per unit (IQR: $665–737). The largest mean price increase was for conventional apheresis platelets (+$65); mean increases in cost from 2021 to 2023 were statistically significant.

Price of blood components paid per unit by hospitals in 2023, stratified by annual inpatient surgical volume is presented in Table 6. From 2021 to 2023, the mean price paid per unit of blood components varied by facility inpatient surgical volume. In general, smaller facilities (100–999 annual inpatient surgeries) paid more for blood components than larger facilities.

During 2023, price of blood components paid per unit by hospitals varied geographically (Table S9). The mean price paid per apheresis platelet unit ranged from a low of $608 in

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HHS Region 9 to a high of $716 in HHS Region 10. Hospitals in all 10 HHS regions reported an increase in price paid per unit of all components from 2021 to 2023 for leukoreduced RBCs, except for fresh frozen plasma in Region 1 and Region 2.

3.7 Inventory and supply

3.7.1 Age of transfused units: Table S10 presents the proportion of RBC, apheresis platelet, and whole-blood derived platelet units transfused by unit age at time of transfusion. During 2023, the proportion of apheresis platelets aged 1–3 days increased from 2021 (41.4%) to 2023 (43.6%).

3.7.2 Group O-positive and group O-negative units distributed, transfused, and outdated: Allogeneic group O^+ and group O^- RBC distributed, transfused, and outdated are shown in Table S11. During 2023, the proportion of distributed O^+ and group O^- RBC units was higher in 2021 (O^+: 41.9% vs. 38.5% and O^-: 12.1% vs. 9.8%). RBC blood center outdates for O^+ units increased in 2023 compared with 2021 (14.8% vs. 10.0%). Outdates in acute care hospitals during 2023 for O^+ and O^- units were higher than in 2021 (O^+:18.7% vs. 17.1% and O^-:15.3% vs. 14.1%).

3.8 Policies and practices related to blood collection, processing, and transfusion

3.8.1 Bacterial testing of platelets: Bacterial risk control strategies used for apheresis platelet units are shown in Table S12. Overall, 990,000 (95% CI 861,000–1,118,000 units) apheresis platelet units underwent single step culture, 40,000 (95% 24,000–57,000 units) two-step, and 1,418,000 (95% 1,358,000–1,478,000 units) were subjected to pathogen reduction technology (PRT).

Table S13 presents the number of hospitals, stratified by annual surgical volume, performing secondary pre-transfusion bacterial testing of platelets. Use of pre-transfusion bacterial testing in 2023 (1.4%, 26/1,823) was lower than 2021 (3.5%, 63/1,821).

During 2023, a single transfusing hospital reported performing 9,605 secondary bacterial culture tests prior to transfusion no sooner than day 3, and none were positive (Table S14).

3.8.2 Pathogen reduction technology treatment of platelets: Table S15 shows the proportion of blood collection centers reporting use of platelets subjected to PRT. From 2021 to 2023, the proportion of all community blood collection centers reporting use of these products was unchanged.

Table S16 shows use of platelets subjected to PRT by transfusing hospitals. From 2021 to 2023, the proportion of all hospitals using PRT platelets increased (60% vs. 64%).

3.8.3 Use of platelet additive solution: Use of PAS to prepare apheresis platelets by blood collection centers during 2021 was unchanged during 2023 (Table S17).

3.8.4 Leukoreduction and irradiation of whole blood and RBCs: Compared with 2021, the proportion of whole blood and RBC units leukoreduced at blood collection centers before storage increased in 2023 (95.4% vs. 96.9%) (Table S18). The number of irradiated

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whole blood and RBC units transfused at hospitals increased from 2021 (17.5%, 1,880,000) to 2023 (20.7%, 2,135,000) (Table S19).

3.8.5 Molecular genotyping of blood donors and recipients: The proportion of blood collection centers and hospitals reporting the use of molecular genotyping to identify non-ABO RBC antigen expression among blood donors and recipients was unchanged from 2021 (Table S20). The mean proportion of units genotyped by blood collection centers in 2023 was greater than reported in 2021 (5.9% vs. 3.1%).

3.8.6 Crossmatch procedures on whole blood and RBCs: During 2023, total crossmatch procedures performed (electronic, manual serologic, and automated serologic) on whole blood and RBC units was 14,658,000 (95% CI 13,880,000–15,436,000) (Table S21). Of these, 66.9% were performed using electronic methods, which represented a 4.9% increase from 2021.

3.8.7 Dosing criteria for transfusions: Table S22 displays criteria used by transfusing hospitals for routine dosing of plasma, prophylactic platelet, and therapeutic platelet transfusions for non-pediatric patients. During 2023, most transfusing hospitals determined dosing of plasma (58.9%), prophylactic (62.3%), and therapeutic platelet transfusions (67.7%) based on the patient's coagulation factor deficiency, thrombocytopenia, or bleeding.

3.8.8 Hospital policies and practices to enhance recipient safety: Compared to 2021, the proportion of hospitals with a policy to transfuse only leukoreduced components and those having a specific program to treat patients who refused blood components due to religious, cultural, or personal reasons declined in 2023 (Table S23).

3.9 Pediatric transfusions

Compared with 2021, adult-equivalent units used in whole or part for pediatric and neonatal recipients of whole blood or RBC units (360,000 adult equivalent units) and apheresis platelets (174,000 adult equivalent units) increased in 2023 and decreased for plasma (68,000 adult equivalent units) (Table S24). The number of pediatric recipients increased across all component types.

Table S25 presents data from hospitals regarding policies on neonatal aliquot production during 2023. Overall, 478/788 (60.7%) hospitals reported neonatal aliquots were made using syringes from full-size units and 369/788 (46.8%) hospitals reported neonatal aliquots were made using Pedipacks. Overall, 640 (86.8%) hospitals obtained aliquots using syringes from similar full-size unit for neonatal transfusions.

3.10 Transfusion-associated adverse reactions

Transfusion-associated reactions and reactions per 100,000 components transfused are shown in Table 7. Compared with 2021, the rate of adverse reactions increased in 2023 (45,142; 273.8 vs. 50,031 [95% CI 43,941–56,122]; 312.3 [95% CI 281.0–343.7]). During 2023, the most common types of transfusion-associated adverse reactions were

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febrile nonhemolytic transfusion reactions (21,193;131.3 [95% CI 111.9–150.7]]) followed by: mild to moderate allergic reactions (13,377;82.2 [95% CI 75.0–89.5]), delayed serologic transfusion reactions (3,405; 21.1 [95% CI 17.8–24.4]) and transfusion-associated circulatory overload (3,151; 19.3 [95% CI 13.6–25.0]]). Compared with 2021, rates of adverse reactions in 2023 increased for febrile nonhemolytic transfusion reactions, allergic reactions (mild, moderate, and severe), transfusion-associated circulatory overload, and acute hemolytic reactions (ABO and non-ABO); and decreased for transfusion-transmitted infections. However, these observed changes in rates of adverse reactions were not statistically significant.

3.11 Collection Errors

Overall, 70,877 sample collection errors (e.g., wrong blood in tube) were reported in 2023 from 1,064 facilities (Table S26).

3.12 Sickle cell disease and thalassemia

Figure 1 shows the number of RBCs transfused to patients with sickle cell and thalassemia during 2023. The number of units provided as transfusion therapy ranged from 1 to 6,871 per hospital during 2023. In general, more RBC units were transfused in the southeastern and northeastern regions of the United States for patients with sickle cell and/or thalassemia.

4. Discussion

This report provides an analysis of nationally representative data of blood collection, processing, and utilization reported to the 2023 NBCUS.

4.1 Donor Characteristics

A greater proportion of donors aged >45 years and declining donations among the population aged <20 years have been observed.[7,13,14] In an effort to replace the aging donor population, blood collection establishments have prioritized recruiting younger, first-time blood donors (aged under 20 years). Consistent with these efforts, the present findings suggest an increase in the number of younger blood donors in 2023 aged 16–18. While donations from individuals aged 45–64 declined (−13.4%), this category continued to account for the greatest proportion of overall donors.[13] The growing proportion of younger donors may reflect transitions from blood collection practices during COVID-19 pandemic, which may have limited blood drives at schools as observed in 2021.[15]

In contrast to previous reports, successful donations from Black or African American, Hispanic, and Asian donors increased.[7] Despite this increase, the proportion of Black or African Americans among all donors (3.8%) is small relative to the estimated proportion of the 2023 total U.S. population (13.7%).[16] Ensuring a robust blood supply is crucial since transfusion-related complications, including alloimmunization, may be more likely to arise from mismatched major and minor blood antigens. This phenomenon may be minimized by transfusing recipients with blood from donors who have more phenotypically matched major and minor blood antigens. This is likely to disproportionately affect patients with sickle cell disease.[17]

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4.2 Donor deferrals

Consistent with previous reports, more women than men were deferred from donation, primarily due to low hemoglobin or hematocrit, which can be attributed to the impact of menstruation and pregnancy on hemoglobin and iron stores.[18] In addition to this finding, during 2023, donors deferred due to travel increased substantially (161.8%) compared with 2021, despite changes to FDA travel deferral recommendations. In 2022, FDA guidance was updated to remove travel-based blood donor deferral for time spent in the United Kingdom (1980–1996), France and Ireland (1980–2001) or who received a blood transfusion in those countries (1980-present) due to risk of Creutzfeldt-Jakob disease transmission via blood transfusion.[19] In 2022, FDA guidance continued to recommend the shortened deferral period for blood donors who travel to malaria-endemic areas and are residents of a non-endemic country from 1 year to 3 months.[20] The increase in travel-based deferrals may reflect increased international travel by blood donors following the end of the COVID-19 pandemic.[21]

Similarly, increase in deferrals for tattoo/piercings may reflect a reversal in COVID-19 era precautions, which limited seeking these services. Increases in medication deferral may be related to a growing number of therapeutics that can impact blood safety such antiplatelet, anticoagulants and long-acting injectable HIV pre-exposure prophylaxis.[22] While the proportion of deferrals for high-risk behavior among MSM declined in 2023 compared with 2021, future surveys are necessary to track this trend adequately. Guidance on individual donor risk-based assessments was provided in 2023, with likely varying implementation dates across blood establishments.[23]

4.3 Cost and uptake of additional bacterial risk control interventions

Mean cost of all blood components, unadjusted for inflation, increased across all HHS regions from 2021 to 2023. Increased costs may be related to adoption of enhanced safety interventions including PRT or other manufacturing costs (e.g., staffing, overhead, etc.). In 2023, pathogen-reduced apheresis platelets cost $60 more per unit than conventional apheresis platelet products. Despite the increased cost, use of platelets subjected to PRT expanded in 2023 to 64% of transfusing facilities versus 60% in 2021, likely due to the additional patient safety benefits. While rare bacterial contamination events have been reported among platelets subjected to PRT, this method provides added risk mitigation for transfusion-transmitted bacterial, viral, and parasitic infections.[24,25]

4.4 Adverse Reactions and Transfusion-Transmitted Infections

The overall rate of adverse reactions observed here is higher than what has been reported by the National Healthcare Safety Network Hemovigilance Module (NHSN-HM) (312.3 adverse reactions/100,000 vs. 220/100,000 components transfused). This difference could be due to the additional validation requirements in the NHSN-HM, such as verification of imputability and case definitions, leading to a more conservative estimate.[26] During 2013–2018, approximately 20% of all adverse reactions reported to the NHSN-HM did not meet case definition or imputability criteria.[26]

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The observed increase in the rate of TACO reactions during 2023 compared with 2021 (19.3/100,000 vs. 14.7/100,000), although not statistically significant, may reflect increased clinical awareness, efforts to harmonize and revise international case definitions, or incomplete reporting from facilities.[27] Declines in the rate of transfusion-transmitted infections (bacterial, viral, and parasitic) compared to 2021, although not statistically significant, may reflect greater adoption of pathogen reduction of platelets, improved donor screening, and enhanced testing of the blood supply such as geographic-based screening for *Babesia spp.* in the United States.[23,24,28,29]

Delayed serologic reactions remained unchanged in the United States in 2023. While molecular genotyping can reduce the occurrence of hemolytic reactions, adoption of molecular genotyping also remained unchanged (27.3% in 2023 vs. 27.6% in 2021).[30] As molecular genotyping becomes more widely adopted in the United States, the occurrence of delayed serologic reactions may decrease.

4.6 Limitations

The findings of this study are subject to the following limitations. First, to account for non-responses and missing data, national estimates were produced using imputation and weighting. Any uncertainty related to these methods is expressed within confidence intervals. Second, the sampling frame was created using annual inpatient surgical operations collected from the 2021 AHA annual survey database, which may not reflect changes that occurred after the survey, resulting in inaccurate stratification. Any impact on these findings cannot be quantified but is likely to be minimal. Lastly, we did not adjust for inflation in our cost estimates. It is possible observed increases were due to inflation.

5. Conclusion

Data from the 2023 NBCUS suggest increases in the number of donations from younger (aged <20 years) and Black or African-American donors, cost of blood products nationwide, usage of PRT as a blood safety measure, and an increase in adverse reactions requiring diagnostic or therapeutic interventions related to transfusions.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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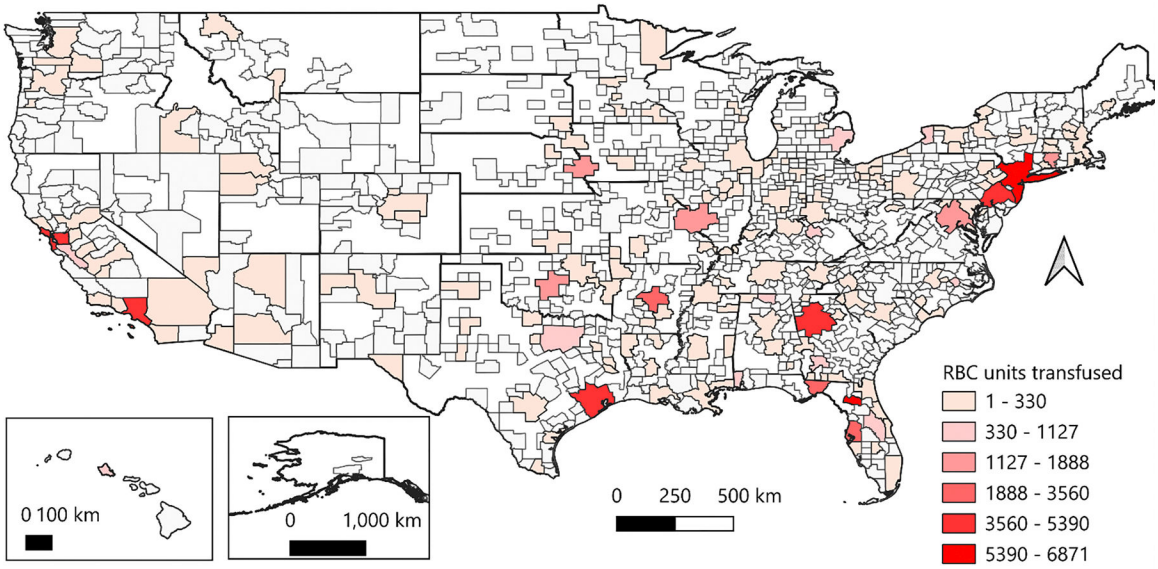

Figure 1. The number of red blood cells provided as transfusion therapy to sickle cell disease and thalassemia patients by metropolitan statistical area in the United States in 2023.

Overall, 358/2,196 transfusing facilities reported transfusing one or more red blood cell units to patients with sickle cell disease or thalassemia.

Note: Data were neither weighted nor imputed.

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Table 1.

National Blood Collection and Utilization Survey response rates among blood collection centers and hospitals, 2017–2023.

Facility Type	2023 (n)	2021 (n)	2019 (n)	2017 (n)
Collection Section				
Community-based Collection Centers	96.2% (51)	92.5% (49)	94.3% (50)	93.8% (61)
Hospital-based Collection Centers	90.3% (65)	79.7% (62)	84.4% (76)	88.9% (92)
Transfusion Section				
Hospitals	85.7% (2195)	77.0% (2102)	83.2% (2140)	86.5% (2435)

* n denotes the number of survey responders.

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Table 2.

Estimated number of donors and deferrals in the United States, 2023 and 2021 (expressed in thousands), as reported to the National Blood Collection and Utilization Survey.

	Donors in 2023		Donors in 2021		
	Number in thousands (95% CI)	Percent of total	Number in thousands	Percent of total	% change 2023–2021
Total presenting to donate†	12,954 (12,468–13,439)		12,302		5.3
Male	6,489 (6,205–6,773)	50.1	5,642	45.9	15.0
Female	6,459 (6,163–6,755)	49.9	6,659	54.1	−3.0
Total deferrals	1,836 (1,731–1,941)		2,010		−8.7
Male	625 (575–676)	34.1	655	32.6	−4.6
Female	1,210 (1,152–1,268)	65.9	1,355	67.4	−10.7
Donors deferred by criteria					
Low hemoglobin or low hematocrit	886 (833–939)	48.2	1,028	51.1	−13.8
Male	195 (179–211)	10.6	207	10.3	−5.8
Female	690 (648–733)	37.6	820	40.8	−15.8
Medication use	117 (76–157)	6.4	91	4.5	28.1
Pulse††	144 (128–160)	7.8	140	6.9	2.9
Blood pressure¶	124 (114–133)	6.7	130	6.4	−5.0
High-risk behavior, restricted to MSM	2 (2–3)	0.1	3	0.2	−26.1
High-risk behavior, all other behaviors	10 (9–12)	0.6	9	0.5	13.4
Travel or residence	71 (66–75)	3.9	27	1.3	161.8
Tattoo/piercing/scarring	49 (0–110)	2.7	13	0.6	276.1
Other non-medical reasons	323 (298–347)	17.6	494	24.6	−34.6

Abbreviations: CI, confidence interval; MSM, men who have sex with men.

Note: Weighted; no imputation.

†Repeat donors who donated more than one time are counted once.

††A donor with an irregular pulse (under 50 or over 100 beats per minute).

¶A donor with blood pressure outside specified limits (90–180 mm Hg systolic or 50–100 mm Hg diastolic).

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Table 3.

Estimated number of successful donations* stratified by donor age and race/ethnicity in the United States, 2023 and 2021 (expressed in thousands), as reported to the National Blood Collection and Utilization Survey.

	Donations in 2023		Donations in 2021		
	Number in thousands (95% CI)	Percent of total	Number in thousands	Percent of total	% change 2023–2021
Total successful donations	11,023 (10,393–11,654)		11,507		−4.2
Donations by donor age (years)					
15	0 (0–0)	0.0	1	0.0	−95.9
16–18	800 (712–889)	7.3	482	4.2	66.0
16	164 (144–184)	1.5	108	0.9	52.2
17	344 (299–389)	3.1	206	1.8	67.0
18	285 (253–316)	2.6	167	1.5	70.4
19–24	633 (583–683)	5.7	646	5.6	−2.0
25–64	6,997 (6,601–7,394)	63.5	7,920	68.8	−11.6
25–44	2,791 (2,536–3,046)	25.3	3,221	28.0	−13.4
45–64	4,298 (4,058–4,538)	39.0	4,829	42.0	−11.0
65 or older	2,502 (2,314–2,691)	22.7	2,493	21.7	0.4
65–74	1,954 (1,816–2,092)	17.7	1,936	16.8	0.9
75 or older	540 (496–585)	4.9	569	4.9	−5.1
Successful donations by race/ethnicity					
Hispanic or Latino	724 (633–814)	6.6	667	5.8	8.5
Black or African American	420 (353–487)	3.8	305	2.7	37.6
Asian	377 (240–514)	3.4	350	3.0	7.8
Native Hawaiian or Pacific Islander	27 (0–60)	0.2	27	0.2	−0.1
American Indian or Alaska Native	52 (18–86)	0.5	53	0.5	−1.9
White†	8,839 (8,236–9,443)	80.2			

Abbreviation: CI, confidence interval.

Note: Weighted; no imputation.

*Facilities reported the number of donors with successful collection of allogeneic whole blood and apheresis red blood cell donations by age-group. Facilities reported the number of donors with successful collection of allogeneic whole blood and red blood cell donations by race/ethnicity.

†The 2021 NBCUS survey did not collect data on successful donations from White donors.

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Table 4.

Estimated number of allogeneic blood donors in the United States, 2023 and 2021 (expressed in thousands), as reported to the National Blood Collection and Utilization Survey.

	Donors in 2023		Donors 2021		
	Number in thousands (95% CI)	Percent of total	Number in thousands	Percent of total	% change 2023–2021
Number of donors					
First time, allogeneic	1,721 (1,595–1,847)	26.3	1,719	26.3	0.1
Repeat, allogeneic *	4,826 (4,494–5,158)	73.8	4,840	74.0	−0.3
Total individual donors †	6,540 (6,156–6,923)		6,545		−0.1

Abbreviation: CI, confidence interval.

Note: Weighted; no imputation.

* Repeat donors who donated more than one time are counted once.

† Excludes directed and autologous donors. Only includes donors from whom blood products were successfully collected.

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Table 5.

Median and mean dollar amount paid per blood product unit (in US dollars), 2023 and 2021, as reported to the National Blood Collection and Utilization Survey.

	Amount paid, 2023 ($)			Amount paid, 2021 ($)			Difference, 2023–2021 ($)		
Component	**Median**	**IQR**	**Mean**	**Median**	**IQR**	**Mean**	**Median**	**Mean**	**Matched Mean**
RBCs, leukoreduced	226	214–247	234	214	202–230	221	12	13*	11.7
Apheresis PLTs	635	593–690	638	567	520–618	573	68	65*	67.3
Pathogen-reduced apheresis PLTs	695	665–737	701	660	624–689	659	35	42*	34.8
FFP	56	47–67	60	52	45–60	56	4	4*	5.3
PF24	56	47–67	59	51	43–60	56	5	3*	4.5
Cryoprecipitated AHF, each unit	57	48–71	61	52	43–64	55	5	6*	6.7

Abbreviations: AHF, antihemophilic factor; FFP, fresh frozen plasma; IQR, interquartile range; PF24, plasma frozen within 24 hours after phlebotomy; PLT, platelet; RBC, red blood cell.

Note: Data were neither weighted nor imputed.

*Significant difference between 2021 and 2023 with $p < 0.05$.

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Table 6.

Median and mean dollar amount paid per blood product unit (in US dollars), as reported by US hospitals to the National Blood Collection and Utilization Survey and stratified by annual inpatient surgical procedures, 2023 and 2021. *

		Amount paid, 2023 ($)			Amount paid, 2021 ($)			Difference, 2023–2021 ($)	
Component	**Number of inpatient surgical procedures per year**	**N†**	**Median**	**Mean**	**N†**	**Median**	**Mean**	**Median**	**Mean**
Apheresis PLTs	100–999	250	$663	$662	296	$593	$599	$70	$64
	1000–1399	157	$638	$637	194	$572	$582	$67	$55
	1400–2399	239	$639	$644	322	$553	$563	$86	$81
	2400–4999	279	$630	$631	391	$564	$568	$66	$62
	5000–7999	127	$623	$619	174	$560	$570	$63	$49
	≥8000	111	$622	$611	160	$551	$556	$71	$55
Cryoprecipitate, each unit	100–999	85	$60	$66	71	$53	$56	$7	$10
	1000–1399	68	$58	$62	96	$56	$59	$2	$3
	1400–2399	107	$56	$61	141	$52	$55	$5	$6
	2400–4999	143	$58	$62	205	$52	$54	$6	$8
	5000–7999	79	$61	$61	104	$52	$55	$9	$7
	≥8000	66	$50	$55	114	$47	$52	$3	$3
FFP	100–999	128	$60	$67	133	$57	$69	$3	$-2
	1000–1399	95	$56	$62	111	$55	$58	$1	$4
	1400–2399	160	$56	$59	186	$51	$55	$5	$4
	2400–4999	200	$55	$59	261	$52	$55	$3	$4
	5000–7999	88	$54	$56	127	$52	$52	$2	$4
	≥8000	89	$50	$53	123	$47	$52	$3	$1
Pathogen-reduced apheresis PLTs	100–999	150	$720	$729	38	$663	$665	$57	$64
	1000–1399	110	$700	$710	34	$665	$658	$35	$52
	1400–2399	210	$700	$705	64	$664	$657	$36	$49
	2400–4999	256	$688	$691	85	$660	$661	$28	$29
	5000–7999	107	$686	$688	42	$662	$662	$24	$26
	≥8000	96	$680	$683	51	$650	$647	$30	$36
Plasma frozen between 8 and 24 h of donation (PF24)	100–999	242	$64	$68	226	$57	$67	$7	$1
	1000–1399	148	$57	$60	153	$53	$59	$4	$1

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Component	Number of inpatient surgical procedures per year	Amount paid, 2023 ($)			Amount paid, 2021 ($)			Difference, 2023–2021 ($)	
		N[†]	Median	Mean	N[†]	Median	Mean	Median	Mean
	1400–2399	254	$55	$58	264	$50	$55	$5	$3
	2400–4999	302	$55	$57	327	$51	$53	$5	$4
	5000–7999	131	$54	$56	158	$48	$50	$6	$5
	≥8000	116	$50	$52	148	$47	$49	$4	$3
RBCs, leukoreduced	100–999	352	$240	$248	350	$223	$233	$17	$15
	1000–1399	180	$226	$234	196	$217	$225	$10	$9
	1400–2399	293	$225	$234	327	$211	$218	$14	$16
	2400–4999	341	$223	$228	395	$214	$219	$9	$9
	5000–7999	139	$224	$225	178	$213	$216	$12	$9
	≥8000	123	$220	$222	161	$208	$213	$12	$9

Abbreviations: FFP, fresh frozen plasma; PLT, platelet; RBC, red blood cell.

Note: Data were neither weighted nor imputed.

[*] Costs were not adjusted for inflation.

[†] Number of facilities

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Table 7.

Transfusion-associated adverse reactions in the United States, 2023 and 2021, as reported to the National Blood Collection and Utilization Survey.

Adverse transfusion reactions	Number of reactions (95% CI)		Reactions per 100,000 components transfused (95% CI)	
	2023	2021	2023	2021
Total number of reactions that required any diagnostic or therapeutic intervention	50,031 (43,941–56,122)	45,142	312.3 (281.0–343.7)	273.8
Reactions that were life threatening, requiring major medical intervention *	293 (88–498)	162	1.8 (0.6–3.1)	1.0
Febrile, nonhemolytic transfusion reaction	21,193 (17,728–24,658)	18,918	131.3 (111.9–150.7)	113.3
Mild to moderate allergic reactions	13,377 (11,921–14,833)	12,010	82.2 (75.0–89.5)	71.4
Delayed serologic transfusion reaction	3,405 (2,836–3,973)	3732	21.1 (17.8–24.4)	22.2
Transfusion-associated circulatory overload	3,151 (2,177–4,126)	2491	19.3 (13.6–25.0)	14.7
Hypotensive transfusion reaction	1,533 (1,328–1,737)	1315	9.5 (8.3–10.8)	7.8
Transfusion-associated dyspnea	1,196 (949–1,443)	918	7.4 (6.0–8.9)	5.5
Delayed hemolytic transfusion reaction	695 (534–857)	770	4.3 (3.3–5.2)	4.6
Severe allergic reactions	572 (415–728)	427	3.5 (2.6–4.4)	2.5
Acute hemolytic transfusion reaction (other antibodies)	201 (148–254)	227	1.2 (0.9–1.6)	1.4
Transfusion-related acute lung injury	165 (123–207)	192	1.0 (0.8–1.3)	1.1
Posttransfusion purpura	89 (33–144)	96	0.55 (0.20–0.90)	0.57
Acute hemolytic transfusion reaction (ABO)	75 (36–115)	62	0.46 (0.22–0.70)	0.37
Transfusion-transmitted bacterial infection (previously asked as posttransfusion sepsis)	41 (20–61)	57	0.25 (0.13–0.38)	0.34
Transfusion-associated graft-versus-host disease	6 (0–15)	0≠	0.037 (0.000–0.091)	
Transfusion-transmitted viral infection	0≠	11		0.064
Transfusion-transmitted parasitic infection	0≠	4		0.023

Note: Data were weighted but not imputed.

* Examples include vasopressors, blood pressure support, intubation, or transfer to the intensive care unit.

≠ Zero events reported in the sample, so no national estimate of the number of occurrences could be made.