

The supply chain of migrant blood donors: an organisational interview study

Elisabeth F. Klinkenberg,^{1,2}  Praiseldy K. B. Langi Sasongko,¹ Wim L. A. M. de Kort,^{1,2} Julia C. M. van Weert,³ Mirjam P. Franssen² & Elisabeth M. J. Huis in 't Veld^{1,4}

¹Department of Donor Medicine Research, Sanquin Research, Amsterdam, the Netherlands

²Department of Public Health, Amsterdam UMC, Amsterdam Public Health Research Institute, University of Amsterdam, Amsterdam, the Netherlands

³Amsterdam School of Communication Research/ASCoR, University of Amsterdam, Amsterdam, the Netherlands

⁴Department of Cognitive Science and Artificial Intelligence, Tilburg University, Tilburg, the Netherlands

Vox Sanguinis

Background and Objectives Migrant blood donors are underrepresented worldwide resulting in shortages of compatible blood products. Prior studies focused on individual barriers and motivators of potential blood donors, but no studies addressed organisational factors of the blood supply chain. This study explored the perceptions and experiences in recruitment and retention of migrant – and potentially rare-blood donors among staff members within the blood supply chain and identified obstacles and solutions in this chain.

Materials and Methods The study was conducted at Sanquin, the national blood supply organisation of the Netherlands. Qualitative in-depth interviews were done among key staff members (N = 17). Expert validity was assessed in three feedback meetings.

Results Seven staff members believed there is a shortage of migrant blood donors, while five believed there is not. However, there was a consensus that it may become a problem in the future due to demographic changes. The perceived obstacles to recruit and retain migrant donors were difficulties in determining how many migrant donors are needed and recruiting them, excluding potentially rare donors prior to donation, limited use of extended phenotyping and high blood typing and frozen storage costs. The possible solutions to increase blood pool diversity lay in registering donor ethnicity, specialised information provision for donors, reconsidering eligibility criteria and optimising blood typing strategies.

Conclusion Whilst recruitment of migrant blood donors is perceived by staff as difficult, various organisational policies and guidelines seem to hinder retention. Improvements in the blood supply chain may be achieved by addressing logistics, current procedures and registration of ethnicity.

Key words: blood collection, blood processing, donor recruitment, donors.

Received: 6 July 2018,
revised 21 November 2018,
accepted 14 December 2018,
published online 9 January 2019

Introduction

People from different ethnic or racial backgrounds often have distinct blood type compositions [1]. This is the case not only for the distribution of the ABO blood types but

also for other blood group antigens. For instance, the prevalence of the Duffy negative phenotype is more than 90% in some Sub-Saharan African countries (e.g. Ghana and Tanzania), while this is rare among populations of European or Asian descent [2]. However, migrant groups – who have migrated from a non-Western country or from who at least one of the parents migrated from a non-Western country – are underrepresented as blood donors in many Western countries, restricting the

Correspondence: Elisabeth F. Klinkenberg, Donor Studies, Sanquin Research, Plesmanlaan 125, 1066 CX Amsterdam, The Netherlands
E-mail: l.klinkenberg@sanquin.nl

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

diversity of the blood pool and possibly leading to shortages of compatible blood products among patients of the same ethnic background [3–6].

The problem of the underrepresentation of migrant groups may exacerbate in the future due to two societal trends. First, the non-Western migrant population is growing due to increasing migration into Western countries [7]. Although migrants are underrepresented as blood donors, they are often not underrepresented as transfusion patients and may even be more prone for need of blood transfusions due to specific genetic haemoglobinopathies [8, 9]. Second, in most Western countries, the active blood donor pool is decreasing, further limiting the blood supply [10]. Therefore, it is imperative to engage migrants in blood donation to prevent possible future shortages and decrease the risk of alloimmunization [5]. The Netherlands is one such country where the above situation is occurring, which is of concern.

Literature suggests that the recruitment and retention of migrant blood donors is a complex issue due to the interrelation of various barriers and motivators, such as cultural perceptions of blood, high deferral rates due to low haemoglobin levels and medical conditions such as cardiovascular- and infectious diseases, lack of knowledge and awareness of blood donation and fears [4, 11–14]. Prior interventions in France, Australia, Canada and the United States have been attempted with varying levels of success [15–18]. These interventions consisted of community-oriented education and information programmes, awareness-raising activities, organising mobile blood drives, staff-training, involvement of religious and political leaders and producing and supplying campaign materials. Obstacles for recruiting minorities include temporary- or even permanent bans on candidate donors from Sub-Saharan descent, language-proficiency requirements of the donors, high deferral percentages and difficulties in reaching the target audience [5].

While most studies focused on individual and community level determinants and interventions from the viewpoint of the potential donors, little is known about the possible determinants of migrant blood donation on the organisational level from the viewpoint of staff that work in the blood supply chain. A few of these studies mention organisational factors such as (in)convenient locations and opening times of blood collection centres, staff-skills or minority/migrant-focused recruitment campaigns [14], but do not address the potentially significant implications it has on the topic of the recruitment and retention of migrant blood donors. Yet, a substantial part of the recruited migrant blood donors drop out prior to donating or donate less overall [15, 16]. More insight into the organisational perspective may provide essential

information on what adjustments need to be made within the organisation to prevent future shortages, as certain blood bank aspects or policies could further complicate this matter.

In this study, we primarily look at the blood supply chain from the recruitment of the donor to the transportation and transfusion of the final blood product [19]. The main aim of the study is to explore the factors within the blood supply chain that could play a role in the underrepresentation of migrant blood donors and the shortage of compatible blood products. Our specific research questions are:

- (1) What are the perceptions of key staff in the whole blood supply chain on the underrepresentation of migrant blood donors?
- (2) What is the effect of the current blood supply chain within the blood bank organisation on the representation of migrant blood donors versus non-migrant blood donors?
- (3) Which obstacles and possible solutions to these obstacles in the whole blood supply chain do key staff observe regarding migrant blood donors?

Materials and Methods

Design and Sample

To explore the factors involved in the migrant underrepresentation within the blood supply, qualitative in-depth individual interviews were performed. Interview respondents were recruited from the Dutch national blood supply organisation, Sanquin. Key staff members with high level knowledge, experience or involvement in migrant recruitment and retention and key steps in the blood supply chain (e.g. blood collection, diagnostic screening, matching and distribution) were invited to participate. Snowball sampling was used to further identify key staff within the organisation, in which each interview respondent was asked to refer a colleague involved in this topic. No exclusion criteria were formulated for participation in the interviews.

In total, 17 qualitative interviews were completed between March and June 2017 with staff from the headquarters in Amsterdam. These headquarters also contain a large blood collection centre and most of the screening, processing, storage and research is done there as well. The interviews lasted from 20 to 60 min, with an average of 41 min. One interview was done written via e-mail because a face-to-face appointment was not possible but the key person was deemed to have an important position within the organisation relating to this topic. An overview of the interview respondents is presented in Table 1.

An illustration of where the respondents were involved in the general blood supply chain is presented in Fig. 1. Thirteen respondents were involved in multiple steps or did work overseeing the entire chain.

Data collection

One of the authors (*PLS*) performed the interviews. The interviews were semi-structured meaning that a

Table 1 General characteristics of interviewed blood bank key staff members (N = 17)

Variable	Interview respondents (N = 17)	
	n/M(SD)	%/range
Work division		
Blood bank	10	58.8%
Research	5	29.4%
Corporate staff	2	11.8%
Working position		
Head	5	29.4%
Researcher	3	17.6%
Donor physician	2	11.8%
Transfusion physician	2	11.8%
Donor recruitment and services employee	2	11.8%
Other	3	17.6%
Women	9	52.9%
Non-European ethnic background	4	23.5%
Duration of employment	12.3 (9.5)	1–36
<5 years' experience	5	29.4%
5–10 years' experience	3	17.6%
>10 years' experience	9	52.9%

preconceived interview guide was used, while allowing new ideas to surface and follow-up questions were not predetermined in the guide. Interview participation was voluntary and respondents gave both oral and written consent to the recording of the interviews and use of the data for scientific purposes. To prevent the traceability of individual persons, we did not report the exact department or position of our respondents. Interviews were continued till saturation was achieved, which had resulted in 17 staff-interviews as mentioned above.

Analysis and verification

Interviews were recorded and transcribed. Transcripts were analysed using qualitative analysis software: MAXQDA (version 12, VERBI, GmbH, Germany). Two authors (*PLS* and *EK*) performed the preliminary coding using a predetermined coding scheme, which was based on the research questions. They independently read and coded three transcripts and subsequently compared the transcripts on coding differences. These differences were resolved in discussion. Since no new codes emerged and consensus was reached [20], the remaining transcripts were coded by one author (*PLS*). Secondary coding was done to allow for emergent subcategories and interrelationships between codes. These were restructured to be placed under 'Individual' or 'External/structural' factors. The final code-scheme with the main themes and sub-themes derived from the interviews is presented in Table 2.

To assess the expert validity of the main findings, the preliminary results were presented to a group of interviewed key staff and non-interviewed staff members in

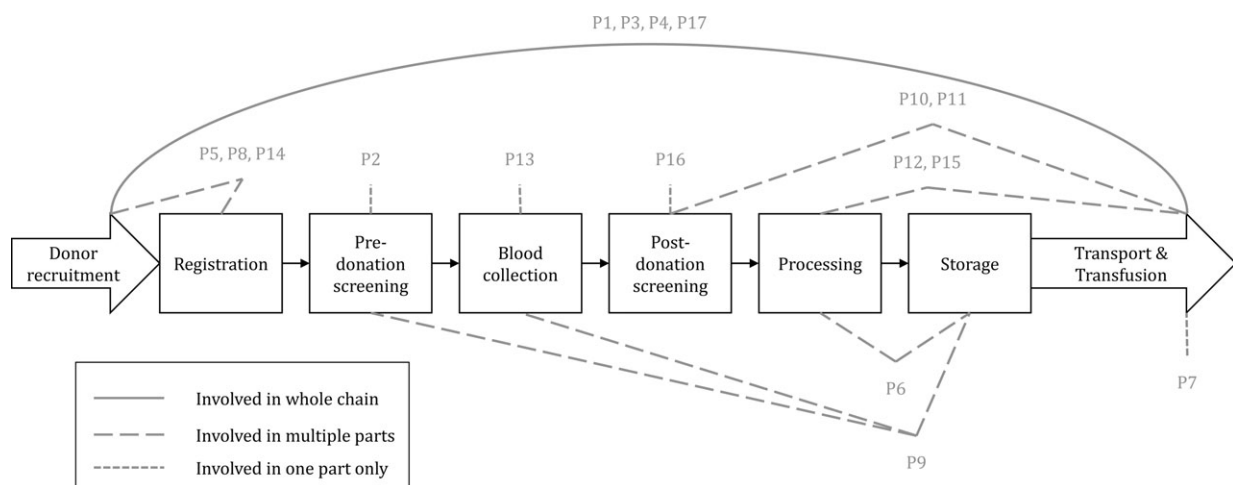


Fig. 1 Overview of interview respondents and their workforce within the general blood supply chain (N = 17). Most interview respondents were found to be involved in more than one part of the blood chain. The four respondents working in the whole chain are represented in the figure with a curved, solid line. The nine respondents involved in multiple parts of the chain are represented with dashed lines. The remaining four respondents mainly involved in one part of the chain are represented with a dotted line.

Table 2 Code-scheme with main themes and sub-themes in the interview transcripts

Factors	Main themes	Sub-themes		
Individual factors	Knowledge and skills			
	Attitudes towards change			
External and structural factors	Engagement with migrants and non-migrants	Recruitment Retention		
	Policy/regulations/guidelines	Exceptions Background information		
	Perceptions of underrepresentation	Resources	Blood safety Difficulty Biomedical need/availability Compatibility Eligibility criteria Diversity	
			Training Finances/costs Goals/strategies Organisational structure Communication materials	
			Circumstances	Blood supply chain Demand of blood
			Changes	Blood supply chain Policies

similar working positions in the form of feedback sessions. A total of three feedback meetings were held with a total of 23 employees to confirm the interview findings. The expert feedback meetings confirmed the findings from the main interviews.

Results

The perceptions of key staff in the whole blood supply chain on the underrepresentation of migrant blood donors

Out of the 17 interview respondents, seven believed a shortage of migrant blood donors exists, as argued by the lack of specific blood types rarely present in the Dutch or other European population. This was considered to be particularly worrisome because patients with chronic blood diseases are often in need of them: 'For the sickle cell and B-thalassemia patient groups, it can sometimes be a problem to find compatible blood, especially if they have multiple antibodies.' (Transfusion physician, >10 years' experience). Besides this biomedical need of blood matching, some respondents also argued that more

migrant blood donors are needed from a representational perspective. It was noticed that the blood donor population mainly consists of native Dutch persons: 'Today we had 93 men who were invited by us because they had donated many times; Donor Day. One of those [men] said: "Why is everybody white here?" People notice it. I don't think it is normal anymore to have such white donor history and donor population.' (Donor services employee, <5 years' experience).

In contrast, five interview respondents indicated that they did not believe there is a shortage and reported for instance that more migrants are seen at the blood banks or that more rare blood types are found: 'I found a lot of Duffy A-B- in the last years amongst the new blood donors, so there are a lot of new blood donors from the Sub-Sahara African regions at this moment.' (Head, >10 years' experience). 'From my experience of working here the past 3-5 years, I could probably say that I am seeing more migrant donors.' (Donor assistant, <5 years' experience). Also, it was reported that, in practice, the right product can always be found with some effort: 'I've been working in many hospitals for many years [...] during those years with limited matching protocols, there was never a problem in finding compatible donors.' (Researcher, >10 years' experience). 'We don't have a shortage of blood. We still have the luxury to be in the position that we provide optimal products with respect to safety.' (Head, >10 years' experience).

The five remaining interviewed key persons did not report whether they believed a shortage of migrant blood donors exists. For instance, some of these respondents wondered how large the problem actually is. 'First of all, why has it been decided that this is a topic that needs attention? Because the absolute number of Sub-Saharan Africans is low in Holland. So this should only be an issue if the blood group mismatch is so large that we need them!' (Head, >10 years' experience). 'I'm convinced that we're better off if we have more ethnic minorities as blood donors, but I'm wondering how much off a problem it really would be if we didn't [recruit them].' (Staff officer, 5-10 years' experience).

Although five respondents did not believe there is a shortage and five did not know whether there is a shortage of migrant blood donors, most of the respondents felt that a shortage could emerge in future due to demographic changes: 'About 50 babies annually will have a severe form of thalassemia major or sickle cell anaemia [...]; and then there are of course immigrants [with these diseases]. So that's not that many people, but of course, each year, their number will grow. Peoples' longevity increases, so in the end, you do need more blood.' (Head, 5-10 years' experience). 'In the future, there will be more patients who need a different blood type than the

Caucasians have. Then you have to make an effort to get them in your normal blood pool.’ (Donor physician, >10 years’ experience).

The effect of the current blood supply chain within the blood bank organisation on the representation of migrant blood donors versus non-migrant blood donors

An overview of the key findings from the interviews with regards to the effects of the current donation chain on migrant - and potentially rare - blood donors’ representation compared with non-migrant blood donors, as well as the perceived obstacles of and possible solutions for the blood supply chain can be found in Fig. 2.

Donor recruitment and registration

Regarding the recruitment of the migrant blood donors, respondents indicated that they thought tailored approaches related to the blood bank policies and education are necessary to recruit and retain migrants: ‘Donors have to speak Dutch or English. So if we recruit donors from a minority population, we have to inform and train them about our policy: “OK, this [only Dutch or English language proficiency] is what you can expect from us”.’ (Head, <5 years’ experience). ‘With people of different background, we might need a different approach. Instead of trying to persuade them to become a donor, we need to be providing more information on how everything works, and why this is so important.’ (Donor services employee, >10 years’ experience). It was often mentioned in the interviews that more knowledge on how to find and recruit people from specific ethnic groups is needed, as different cultural factors might play an important role: ‘There is a huge cultural difference. People have different ideas about the body, about medicine and about healing. So they don’t easily think about blood donation.’ (Researcher, 5–10 years’ experience).

Pre-donation screening and blood collection

When the recruited blood donor visits the donation centre in the Netherlands, after filling out a Donor Health Questionnaire, a donor physician assesses the eligibility and measures the hemoglobin level and blood pressure. Migrant blood donors have a higher chance of being excluded on certain eligibility criteria such as travel history, language or having a sexual relationship with someone from Sub-Saharan Africa. Here, there seems to be a friction between the policy factors of the blood bank organisation and the cultural factors of the potential blood donors: ‘Maybe the problem is that we cannot have donors that are not speaking Dutch or English, because our questionnaire is not available in other languages.

Doctors also don’t speak the other languages.’ (Head, 5–10 years’ experience). ‘Sometimes we see a donor who has a partner from Africa for example. Because this partner stems from a high-risk area for HIV they have to do a HIV test with the partner. That is sometimes difficult to explain to the donor.’ (Donor physician, <5 years’ experience). Also, educating the blood donor about these deferral reasons is a factor that is regularly reported in the interviews to be complicated.

Post-donation screening and processing

When the blood donor has successfully donated a unit of blood, it goes to the post-donation screening and processing phase. In the Netherlands, only ABO-blood group A and O donors are routinely extensively typed in the Netherlands, while blood group B seems to be more common among people of African descent [21, 22] decreasing the chances of finding rare donors with the current typing policy. Furthermore, it was again noted that typing could be targeted if ethnicity would be registered ‘If it [registering ethnicity] was allowed, I know which donors to type for Duffy A & Duffy B blood groups, because I know they [Sub-Saharan Africans] are quite likely to be Duffy A-B-.’ (Researcher, <5 years’ experience). However, identifying matching recipients to blood donors would possibly not be resolved by focusing on donor ethnicity alone: ‘In the United States they do a lot of matching of migrant recipients with migrant donors and it does not always work out well because the Rhesus gene is very heterogeneous in migrants, especially in people of African descent.’ (Researcher, 5–10 years’ experience).

Blood storage and distribution

After processing, the blood units will be stored before it is ordered and has to be transported to a hospital. When multiple ‘rare units’ are ordered for a planned transfusion, for instance for a chronic transfusion patient with antibodies, the units are not often found in the regular stock. Therefore, multiple approaches are possible depending on how many units are needed and what the urgency is: ‘For successful management, it is necessary to make a transfusion strategy. Possible sources for finding compatible units are for instance the national donor database, the patients’ family, autologous donation, international search for donors, or frozen units.’ (Transfusion physician, >10 years’ experience). ‘It happens once or twice a year, so it is very rare, but sometimes we are asking other countries – and other countries are asking us. So it is an international exchange.’ (Transfusion physician, >10 years’ experience). It seems that the current policy regarding distribution has multiple alternatives in place when the regular stock does not comply with the demand.

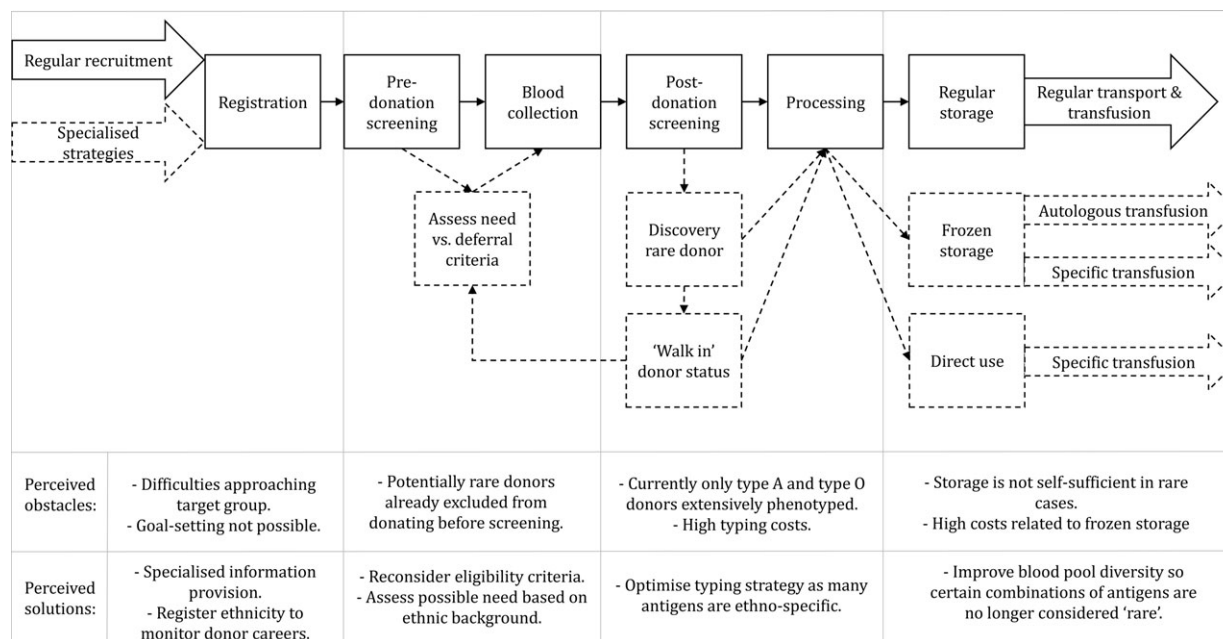


Fig. 2 Extended blood supply chain for rare donors and perceived obstacles and solutions derived from the interviews (N = 17).

Although a compatible blood unit can be found eventually, key staff from all over the blood supply chain do argue that the logistic difficulties and costs in finding the right product should be decreased: 'It would be nice if you can take immediately from the inventory of the hospital and you do not have to get it from another inventory of another hospital or distribution centre.' (Researcher, <5 years' experience). Rare blood is often stored in the Sanquin Bank of Frozen Blood (SBFB). The SBFB is responsible for the stocks and management of rare red cells in the Netherlands. A unit from the SBFB costs €2000 more than a regular unit of blood: 'We have a normal stock, a fresh stock of rare donors who can be called for donation when needed, and we have a frozen stock with rare, more uncommon blood groups [...] They are more than ten times more expensive than normal blood. That's what no one likes.' (Transfusion physician, >10 years' experience). These increased costs can be explained by the higher processing and production costs of the frozen stock compared with the normal stock.

Obstacles and possible solutions to these obstacles in the whole blood supply chain regarding migrant blood donors

It was found that a major obstacle to donor recruitment and retention and to increasing the diversity in available blood types is the prohibition of the registration of ethnicity or country of birth. Key respondents argued that registering this information would be valuable firstly to

assess if recruitment and retention targets have been met. 'This year we want 500 people from other countries. It is not that many! But the problem is: we don't know if we got them or not! Because we can't register ethnicity in the system so that is the difficult part.' (Donor services employee, <5 years' experience). Secondly, registering ethnicity could also greatly benefit the (cost-) efficiency of the selective blood typing process: 'If we knew beforehand what the ethnic background is of certain donors, maybe it is not necessary to type them, which saves us a lot of money.' (Head, <5 years' experience).

Furthermore, the pre-donation eligibility criteria are harder to meet for migrant blood donors. A few respondents mentioned that the current eligibility criteria should be reconsidered: 'A lot of people I know go back to their home country regularly. You can't ask them to not visit their families. [...] In order to get a certain type of people, you have to change the policy. You have to ask yourself as an organization: do I want that? What is the risk?' (Coordinator, >10 years' experience). The language deferral was another noted obstacle. Participants suggested that an undesired result of excluding potential donors because of potentially solvable issues such as language, could be that it remains unknown whether this person has a rare antigen combination by not taking their blood samples to be tested: 'If the donor physician has the first conversation, he might decide that it is not possible for the potential donor to become a blood donor and will not take the first samples. Then we do not find out that this person has a very interesting blood type and so

we do not reach the point that he or she might be a person who is fit for the SFBF!' (Donor physician, >10 years' experience).

A possible solution for these obstacles is already in place, as illustrated by some experts. On certain occasions, a person with a rare combination of blood phenotypes is found through other channels than standard recruitment, e.g. when he/she is treated in a hospital. Once they are identified, there are possibilities for them to enter the donor pool without having to perfectly adhere to all the standard practices applied to donors who sign up through standard means. 'We are very strict. However all animals are equal, but some are more equal than others [quote from George Orwell's novel titled *Animal Farm*] and that is the case for people who have got a very special blood type. You might go away from the rules because it is of more importance.' (Donor physician, >10 years' experience). Some respondents reported that once these rare donors are identified, some leniency is applied, for example when his or her hemoglobin levels are slightly beneath the cut-off (8.4 mmol/ml for men and 7.8 mmol/ml for women). Of course, this leniency does not apply to the guidelines that could harmfully threaten either the donor or the patient when violated, such as being HIV-positive or anemia. This is the only identified case where the blood bank policy is expanded to address the possible cultural factors of migrant blood donors. When there is no patient in urgent need of a specific blood product, these donors can be recruited as walk-in donors or donate to the SFBF for future needs or even autologous donation.

Discussion

In this study, we interviewed key staff in the blood supply chain of the Dutch blood bank organisation to explore perceptions and practical experiences with the underrepresentation of migrant blood donors. Although there were discrepant views on the underrepresentation of migrant blood donors, respondents felt that a shortage of specific migrant blood donors and thus specific antigen-negative products may emerge in the future. The impact of these differing perspectives perhaps delays more concerted efforts from addressing this issue at the present. Interview participants mentioned that certain cultural perspectives towards blood donation can make recruitment among migrant groups difficult, but cultural factors (e.g. frequent travel to country of birth) can also friction with the current policy regarding the eligibility criteria. The current policy regarding registration and typing also echoes through reported difficulties with distribution, due to the failure of identifying potential rare blood donors that are already available in the blood donor pool, but

remain undiscovered. Regarding educational factors, it is reported that the potential donors could benefit from more information on why donating blood is important and why certain policies are currently in place. But the blood bank staff also expressed a need for more information regarding the current underrepresentation of migrant blood donors.

One major reported obstacle is the pre-donation screening guidelines resulting in a temporal or permanent deferral for a substantive number of potentially rare donors; This result is in line with those of other international studies which report that lower donor eligibility and higher deferral rates are problematic [4, 23]. Although the incidence of transmittable diseases is higher among certain migrant groups, especially among people from Sub-Saharan African descent [24, 25] excluding potentially rare donors during the preliminary screening steps, the Donor Health Questionnaire and the consultation with the donor physicians, before giving blood samples precludes the identification of persons with rare antigen combinations [26]. In the Netherlands, those with a Sub-Saharan African partner cannot donate immediately, but a survey among various national blood bank organisations had revealed that almost 30% even permanently ban people from Sub-Saharan countries [5]. We advise that new migrant blood donors are typed, even when they do not strictly adhere to all current eligibility criteria when they present for a first donation, based on the need and rarity. Additionally, this may benefit retention, as even temporary deferrals due to, for example, low Hb (which is more prevalent in various migrant groups) [23], significantly increase the chances that these donors do not return [27]. Ideally, the eligibility criteria should be re-evaluated as there are large international differences and the reasons underlying these differences are often unclear [28]. This approach may decrease the friction between the current policy and cultural factors.

However, it is important to note that research on racial blood matching for sickle-cell disease found little or no decrease in alloimmunization levels when both the patient and the donor are from African heritage [29, 30]. Genetic variance in people of Sub-Saharan descent is relatively large, which makes it extra pressing to extensively type every blood donor and transfusion patient who originally descends from the Sub-Saharan region. Once a blood donor with a rare blood type is identified in this way, proper follow-up action can be identified, based on the need of the blood type and the risk factors associated with not meeting specific criteria. For example, the donor could be recruited as a 'walk-in' donor or could exclusively contribute to the SFBF when regular donation is made difficult by low Hb levels, a partner from Sub-Saharan Africa or regular travel to certain risk countries.

Allowing the registration of ethnicity or (parents') country of birth at registration as a blood donor, would further enable such an alternative supply chain for the sake of focused extended typing. Because of restricted blood typing, potentially rare blood donors can stay undetected in the general blood donor pool and their blood may not be optimally used. In a study on minority recruitment in various countries, it was found that many blood establishments do not register this information, while it is also valuable to monitor the status of the minority blood supply and matching strategies [5]. Additionally, it would enable focusing recruitment on second-generation migrants, which could lower the higher risks of infectious diseases and deferrals. However, in some European countries, such as the Netherlands and France, registering ethnical or racial information is forbidden by law, with certain exceptions i.e. for improving patient care [31, 32]. Of course, these laws are operative to limit discrimination based on ethnicity, race or country of birth. But because registering the ethnic background for improving donor recruitment and matching protocols may decrease inequalities in health care for chronic transfusion patients who are of non-Western background, as well as increase (cost-) efficiency, we believe it is valuable for blood bank organisations to pursue an exception.

One limitation of this study is the descriptive nature and the selective sample. Although the participants gave their insights in what they experience and perceive within their workforce, detailed numbers of migrant blood donors remain lacking. To gain a better understanding of how each step of the blood supply chain can be optimized to recruit and retain more migrant blood donors,

these migrant blood donors and their donations should first be identified and followed over time. By keeping track of how many migrant blood donors come in, what kind of eligibility criteria defers them from donating blood and what the blood-type compositions are of their donations, the bottlenecks could be further specified.

To counter the current problems in supplying adequate blood products, specialised recruitment strategies should be complemented by either an extended or possibly an alternative supply chain for potential rare donors, addressing the identified policy, educational and cultural factors. The bottlenecks in the blood supply chain assessed in the Dutch context, may also relate to other Western high-income countries with an underrepresentation of migrant or minority blood donors. On the other hand, national blood bank organisations do differ in terms of preliminary screening, deferral and typing procedures, with each having their own degree of obstacles [33]. Therefore, these organisations should carefully consider and study what is needed to retain migrant blood donors and possibly their rare extended blood types. But where the obstacles are similar, the findings of our study can help highlight what is needed to further improve the blood supply chain.

Conflict of interest

The authors declare no conflict of interests.

Funding information

This work was supported by Sanquin Research under the internal grant: PPOC-14-25.

References

- 1 Reid ME, Lomas-Francis C, Olsson ML: *The Blood Group Antigen Facts Book*, 3rd edn. San Diego (CA), Academic Press, 2002
- 2 Howes RE, Patil AP, Piel FB, *et al.*: The global distribution of the Duffy blood group. *Nat Commun* 2011; 2:266
- 3 Amponsah-Afuwape SA, Myers LB, Newman SP: Cognitive predictors of ethnic minorities' blood donation intention. *Psychol Health Med* 2002; 7:357–361
- 4 Shaz BH, Hillyer CD: Minority donation in the United States: challenges and needs. *Curr Opin Hematol* 2010; 17:544–549
- 5 van Dongen A, Mews M, de Kort W, *et al.*: Missing Minorities? A survey based description of the current state of minority blood donor recruitment across 23 countries. *Divers Equal Health Care* 2016; 13:138–145
- 6 Yazdanbakhsh K, Ware RE, Noizat-Pirrenne F: Red blood cell alloimmunization in sickle cell disease: pathophysiology, risk factors, and transfusion management. *Blood* 2012; 120:528–537
- 7 Czaika M, de Haas H: The globalization of migration: has the world become more migratory? *Int Migr Rev* 2014; 48:283–323
- 8 Miller ST, Kim H-Y, Weiner DL, *et al.*: Red blood cell alloimmunization in sickle cell disease: prevalence in 2010. *Transfusion* 2013; 53:704–709
- 9 Weatherall DJ: The inherited diseases of hemoglobin are an emerging global health burden. *Blood* 2010; 115:4331–4336
- 10 Wittcock N, Hustinx L, Bracke P, *et al.*: Who donates? Cross-country and periodical variation in blood donor demographics in Europe between 1994 and 2014. *Transfusion* 2017; 57:2619–2628
- 11 Vahidnia F, Stramer SL, Kessler D, *et al.*: Motivations for donating and attitudes toward screening policies in US blood donors with viral infection. *Transfusion* 2016; 56:2013–2020
- 12 Polonsky MJ, Brijnath B, Renzaho AM: "They don't want our blood": social inclusion and blood donation among African migrants in Australia. *Soc Sci Med* 2011; 73:336–342

- 13 James AB, Schreiber GB, Hillyer CD, *et al.*: Blood donations motivators and barriers: a descriptive study of African American and white voters. *Transfus Apher Sci* 2013; 48:87–93
- 14 Klinkenberg EF, Huis In 't Veld EMJ, de Wit PD, *et al.*: Blood donation barriers and facilitators of Sub-Saharan African migrants and minorities in Western high-income countries: a systematic review of the literature. *Transfus Med* 2018. [Epub ahead of print]
- 15 Charbonneau J, Daigneault S: Engaging ethnic minority blood donors. *ISBT Sci Ser* 2016; 11:140–147
- 16 Grassineau D, Papa K, Ducourneau A, *et al.*: Improving minority blood donation: anthropologic approach in a migrant community. *Transfusion* 2007; 47:402–409
- 17 Frye V, Caltabiano M, Kessler DA, *et al.*: Evaluating a program to increase blood donation among racial and ethnic minority communities in New York City. *Transfusion* 2014; 54:3061–3067
- 18 Francis KL, Polonsky MJ, Jones SC, *et al.*: The effects of a culturally-tailored campaign to increase blood donation knowledge, attitudes and intentions among African migrants in two Australian States: Victoria and South Australia. *PLoS ONE* 2017; 12: e0188765
- 19 Ramoa A, Maia S, Lourenco A: A rational framework for production decision making in blood establishments. *J Integr Bioinform* 2012; 9:69–79
- 20 Beth H, Sturges KM, Klingner JK: Mapping the process: an exemplar of process and challenge in grounded theory analysis. *Educ Res* 2016; 34:3–13
- 21 Garratty G, Glynn SA, McEntire R: ABO and Rh(D) phenotype frequencies of different racial/ethnic groups in the United States. *Transfusion* 2004; 44:703–706
- 22 Tagny CT, Owusu-Ofori S, Mbanya D, *et al.*: The blood donor in sub-Saharan Africa: a review. *Transfus Med* 2010; 20:1–10
- 23 James AB, Hillyer CD, Shaz BH: Demographic differences in estimated blood donor eligibility prevalence in the United States. *Transfusion* 2012; 52:1050–1061
- 24 Custer B, Kessler D, Vahidnia F, *et al.*: Risk factors for retrovirus and hepatitis virus infections in accepted blood donors. *Transfusion* 2015; 55:1098–1107
- 25 Wendland A, Ehmsen BK, Lenskjold V, *et al.*: Undocumented migrant women in Denmark have inadequate access to pregnancy screening and have a higher prevalence Hepatitis B virus infection compared to documented migrants in Denmark: a prevalence study. *BMC Public Health* 2016; 16:426
- 26 Gemelli CN, Hayman J, Waller D: Frequent whole blood donors: understanding this population and predictors of lapse. *Transfusion* 2017; 57:108–114
- 27 Custer B, Chinn A, Hirschler NV, *et al.*: The consequences of temporary deferral on future whole blood donation. *Transfusion* 2007; 47:1514–1523
- 28 Karp JK, King KE: International variation in volunteer whole blood donor eligibility criteria. *Transfusion* 2010; 50:507–513
- 29 Chou ST, Jackson T, Vege S, *et al.*: High prevalence of red blood cell alloimmunization in sickle cell disease despite transfusion from Rh-matched minority donors. *Blood* 2013; 122:1062–1071
- 30 Dezan MR, Oliveira VB, Bianchi JVS, *et al.*: Effectiveness of a red cell antigen-matching transfusion protocol in sickle cell disease patients. *ISBT Sci Ser* 2016; 11:132–139
- 31 Kertzer DI, Arel D: *Census and Identity: the Politics of Race, Ethnicity, and Language in National Censuses*. Cambridge, Cambridge University Press, 2002
- 32 Guiraudon V, Phaet K, ter Wal J: Monitoring ethnic minorities in the Netherlands. *Int Soc Sci J* 2005; 57:75–87
- 33 World Health Organization: *Global Status Report on Blood Safety and Availability 2016*. Geneva, World Health Organization, 2017

Copyright of Vox Sanguinis is the property of Wiley-Blackwell and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.