

ST.GALLEN SYMPOSIUM

Global Essay Competition 2024

Title: De significatio sanguine: Why blood matters.

Essay:

The human heart beats on average 80 times a minute, pumping approximately 5 litres of blood or 25×10^{12} red blood cells through our systems. With roughly 8.1 billion people living on earth, this amounts to forty billion five hundred million litres of blood, a number difficult to grasp (Worldometer, 2024). Yet, despite this alleged abundance, blood is a scarce resource. Every two seconds someone in the U.S. needs blood; approximately 29,000 units of red blood cells daily (American Red Cross, 2024). Australia needs over 1.7 million donations every year to meet demand: that's three donations needed every minute (Australian Red Cross, 2024). In Nigeria, a country of over 200 million citizens, the National Blood Transfusion Commission provides 70,000 - 500,000 pints of blood a year, falling significantly short of the national target of two million (Aluge, 2023). Blood as a limited resource is essential for the treatment of cancer and blood diseases, surgeries and road incidents (Australian Red Cross 2024). If we fail to increase blood availability, it will be impossible to meet the UN's Sustainable Development Goal No. 3 of "good health & wellbeing" because reduction of maternal mortality (target 3.1), reduction of neonatal mortality (target 3.2) and reduction of road deaths (target 3.6) all depend on increased availability of blood as a resource, yet countries around the globe are experiencing scarcity in blood supply.

While blood supplies are under pressure around the globe, the scarcity issue is significantly more pressing in low-income countries, with 40% of globally collected blood donations taking place in high-income countries, home to only 16% of the world's population (WHO, 2024). Consequently, there is an imperative to critically assess how to strive for more and find opportunities to increase blood availability not only to ensure lifesaving healthcare can be provided but also to support efforts to reduce social inequality in healthcare. In the following, this essay will firstly discuss reasons for current low blood availability before embarking on a journey to present low-cost and ethical solutions to address the scarcity issue in a realistic way. Overall, this essay has the aim to emphasise the significance of blood as a resource and why we need to strive for more; highlighting concrete opportunities to address the global scarcity issue by rethinking blood on global rather than national level while utilizing the power of social influence.

Blood availability

About 118.54 million blood donations are collected worldwide to save lives and improve health (WHO 2024). In the UK, the National Blood Transfusion Committee's (NBTC) monitors and manages the country's blood stock levels that can be supplied to hospitals. The NBTC currently evaluates the available stock as "pre-amber" situation; a situation where "there is reduced availability of blood for a short or a prolonged period", which could impact on clinical activity (NHS Blood and Transplant, 2024). Figure 1 provides an insight on the red blood cell stock levels (as of January 5th).



Figure 1: UK blood stock levels (as of January 5th)

It becomes evident that the system operates on small margins with only few days of supply being covered at any given moment; with less than 72 hours covered by stock level for certain types such as O- or B- . Not only in the UK but globally, we observe low levels of stored blood unit availability. Blood donation rates serve as an indicator for the general availability of blood in a country, which constitutes the first and foremost reason for the scarcity issue. To illustrate an example, in 2022 Singapore had 74,154 donors, an equivalent to only 1.82% of the residential population (Government of Singapore, 2024). Likewise, in Switzerland, where 700 blood donations are needed every day, only 2,5% of the residential population donate blood regularly (Swica, 2023). Based on samples of 1000 people, the blood donation rate is 31.5 donations in high-income countries, 16.4 donations in upper-middle-income countries, 6.6 donations in lower-middle-income countries and 5.0 donations in low-income countries (WHO, 2024). To raise donations, payment incentives have been trialled, however, paid donors often come from the lowest socioeconomic groups, highly dependent on the money while on the verge to illness from poverty or substance abuse themselves (Nwogoh et al., 2012); a case where donation jeopardizes both the life of the donor and potential recipient, ruling out payment as a sustainable and ethical solution to address the low supply.

Low donation rates are not the only factor influencing the blood availability. Low-income countries are experiencing additional difficulties such as higher levels of anaemia and blood-borne transmittable diseases such as HIV, HBV and HCV, which diminishes the donor pool. Furthermore, problems pertain to poor infrastructure, limited technical knowledge and reckless and inconsiderate usage of blood products by physicians (Aluge, 2023; Saillant et al., 2022) which reduces credibility of the system and trust and need to be addressed to solve the scarcity issue.

Processes to handle a highly delicate resource

Another key reason for the scarcity of blood relates to the nature of the resource under consideration. Blood is delicate. Red blood cells only last 35-42 days from when they're donated. Likewise, blood components are highly sensitive to external influences such as heat, which creates pressure on processing, storage and distribution infrastructure due to the need to control for a constant ambient temperature. Furthermore, infrastructure is not only required for storage and distribution, but also protocols, training for recipient transfusion, implementation and hemovigilance monitoring (=monitoring for adverse effects of transfusion on patients). In particular in underdeveloped or conflict regions, processes and delivery infrastructure are under pressure: Blood banks in Tel Aviv, Israel, are not just suffering from increasingly high demand for blood products due to warfare with Hamas but have also been forced to move their blood banks deeply underground to be able to keep supplying hospitals and military to treat wounded soldiers while the city is under attack. In low-income countries infrastructure is often so poor that scarce blood products are frequently withheld from adults which creates generational imbalances as up to 54 % of blood transfusions are given to children under 5 years of age (WHO, 2024), which creates an additional pressure on the limited supply as it creates intergenerational tensions.

To address above outlined problems pertaining to low levels of blood availability and the difficulties relating to processes and infrastructure to handle blood as a delicate resource, three key areas will be discussed next with the overall aim of developing an international infrastructure in which the supply of blood is sufficient, efficient, and fair, not only between countries but also within countries.

Increase donation rates through the power of social influence

The first and most obvious area to address is the low levels of blood supply resulting from low donation numbers. There is a strong need to strengthen the donation system in an approach that takes into consideration a country's economic development, local needs and cultural differences. In developing countries such as Nigeria, voluntary non-remunerated blood donations only account for 10% of total blood donations (WHO, 2023), while the majority is made by replacement donors (for example family members of a recipient) and paid donors. While the latter has been ruled out as a way to increase donation levels safely and sustainably, there is potential to invest into educating people on the importance of blood donations to increase the stock of blood banks. With mobile adoption rates at 84% (Asia Pacific), 83% (Europe), 85% (North America) and 75% (Sub-Saharan Africa) by 2025 (Statista, 2024), there is an opportunity for low-cost campaigns on digital channels that can be scaled across countries regardless of their economic development. However, there is a need to adapt to local and cultural differences and social media campaigns targeted at younger generations and to take advantage of local influencers as a strategic tool. Influencer marketing is highly effective generating \$6.50 in revenue for each \$1 spent (Tomoson, 2016). The example of the German DKMS stem cell bank illustrates the potential of this strategy to affect behaviour: TV icons Joko & Klaas invited their audience to a treasure hunt if they registered themselves as potential stem cell donors with the DKMS; a move that resulted in 10.000 new registrations within 24h (DKMS, 2023). This example illustrates the power of utilizing digital channels and social influence. Due to its low-cost nature and adaptability to local or cultural differences, it is a suitable approach to increase donation rates in both high- and low-income countries.

International coordination through the World Health Organization

Short supply of blood is not a national problem but a global one, with low-income economies and conflict regions disproportionately negatively affected due to tensions negatively affecting infrastructure, coordination, and processes. With 125 out of 171 countries having a national blood policy and 113 out of 171 having specific legislation for ensuring safety and quality of blood transfusions (WHO, 2023), there is an untapped opportunity for developing mechanisms for international coordination of collection, testing, processing, storage and distribution. Since it has been founded in 1948, the WHO has become a key player for improving systems and access to healthcare globally, driving UN Sustainable Development Goal No. 3 "Good health & wellbeing" which makes it a suitable institution to coordinate global blood infrastructure and delivery. An international coordination through the WHO would allow for streamlining and optimizing of resources both tangible and intangible of individual nations, eradicating inefficiencies at the same time. While it is an ambitious proposal to unify and streamline

national efforts through an international institution, it is not an unrealistic one. The WHO has a track record of implementing actions on international scale to improve health. For instance, the eradication of smallpox, one of the most significant milestones in global health, must be accredited to efforts by the WHO and its member states, demonstrating the success of tackling global problems through international efforts. With policies and legislation already in place to ensure safety and quality, barriers to rethinking blood availability as a global scarcity issue rather than a national one are low, enabling the WHO to take leadership quickly and efficiently to enable countries to thrive better.

Technologically enhanced processes

Likewise, while coordination takes place on international level, there is a need to enhance processes and infrastructure on local levels, too. Local networks for distribution of blood and central laboratories for testing and storing blood products need to be improved. One way to improve network width is by using novel technologies such as drones to enhance existing processes. For instance, “Zipline” drones have been in use in Rwanda since 2018, catering to hospitals and clinics nationally from two central points (Levy, 2022). The drones fly to their destination, drop the blood parcel with parakeet over the clinic and return to their central hub. This strategy has proven to dramatically reduce delivery time and loss of products. While drone technology requires an initial investment, its actual use and coordination can be scaled through automation, meaning that it forms an overall cost-effective approach to enhancing infrastructure. In times and locations where blood supply is especially scarce, methods for reducing blood loss and wastage are critical. With drones such as “Zipline”, access to lifesaving blood could be democratized through automated central coordination while simultaneously reducing delivery time in countries of vast geographical spreading.

Conclusion

In summary, this essay has critically discussed global scarcity pertaining to blood supply with higher demand required for lifesaving surgeries, treatment of chronic illnesses and diseases than supply of blood as an available and accessible resource. Following an evaluation of reasons resulting in low blood availability, three areas have been highlighted where there is potential to strive for more while at the same time supporting the removal of barriers to healthcare, reduction of social inequality in healthcare and attainment of the UN Sustainable Development Goal No. 3 of “good health & wellbeing”. By building on the power of social influence, donation rates can be increased. Likewise, there is the need to rethink blood on

international rather than national level, seizing the opportunity of already existing legislations governing the safety and quality of blood handling across countries to coordinate efforts through the WHO and enhancing processes through innovation and technology. In this way, we can strive for more in a way that is low-cost, ethical and attainable, promising to result in significant success, because blood matters.

Reference List / Bibliography / Sources:

Allain J-P, Owusu-Ofori AK, Assennato SM, Marschner S, Goodrich RP, Owusu-Ofori S (2016). Effect of plasmodium inactivation in whole blood transfusion-transmitted malaria in endemic regions: the African investigation of the mariosol system AIMS randomized controlled trial. *Lancet*. 387(10029):1753-61.

Aluge E (2023). Nigeria needs more blood to meet the demand from its health sector, Retrieved from: <https://blogs.lse.ac.uk/africaatlse/2023/07/18/nigeria-needs-more-blood-to-meet-the-demand-from-its-health-sector/> (08.01.2023 09:59) .

American Red Cross (2024). Importance of the Blood Supply. Retrieved from: <https://www.redcrossblood.org/donate-blood/how-to-donate/how-blood-donations-help/blood-needs-blood-supply.html> (08.01.2024 09:37).

Australian Red Cross. (2024). Why donate blood? Retrieved from: <https://www.lifeblood.com.au/blood/learn-about-blood/why-donate-blood> (08.01.2024 09:21).

Balarajan Y, Ramakrishnan U, Ozaltin E, Shankar AH, Subramanian SV (2011). Anaemia in low-income and middle-income countries. *Lancet*. 378(9809):2123-35.

Butler E K, McCullough J (2022). Pathogen reduction combined with rapid diagnostic tests to reduce the risk of transfusion-transmitted infections in Uganda. *Transfusion* 58(4):854-861.

DKMS (2023). DKMS Rekord dank „Joko & Klaas LIVE: die Schatzsuche“. Retrieved from: <https://www.dkms.de/aktiv-werden/news-stories/dkms-rekord-schatzsuche> (29.1.2024 9:52).

Douglas J (2022). Zipline testing medical supply drones with US military. CNBC. Retrieved from: <https://www.cnbc.com/2019/10/22/zipline-testing-medical-supply-drones-with-us-military.html#:~:text=Zipline%20announced%20its%20partnership%20with,cargo%20in%20under%20three%20hours.> (29.1.2024 9:55).

Estcourt L (2023). Blood shortages. The Royal College of Pathologists. Retrieved from: <https://www.rcpath.org/profession/publications/college-bulletin/january-2023/blood-shortages.html> (29.1.2024 10:01).

Gammon R, Becker J, Cameron T, Eichbaum Q, Jindal A, Singh Lamba D, Nalezinski S, Rios J, Shaikh S, Shepher J, Tanhehco YC (2023). How do I manage a blood product shortage?. Transfusion. Volume 63, Issue 12. P.2205-2213.

Government of Singapore (2024). Blood facts and figures. Retrieved from: <https://www.hsa.gov.sg/blood-donation/blood-facts-and-figures> (08.01.2023 12:08) .

Holcomb JB, Spinella PC, Apolseth TO, Butler FK, Cannon JW, Cap AP, Corley JB, Doughty H, Fitzpatrick M, Goldkind SF, Gurney JM, Homer MJ, Ilstrup SJ, Jansen JO, Jenkins DH, Marques MB, Moore EE, Ness PM, O'Connor KC, Schreiber MA, Shinar E, Sloan S, Strandenes G, Stubbs JR, Taylor AL, Ward KR, Waltman E, Yazer M (2021). Civilian walking blood bank emergency preparedness plan. Transfusion. Volume 61, Issue S1. P.S313-S325.

Jee C (2019). The marines are testing drone medicine deliveries. MIT technology review. Retrieved from: <https://www.technologyreview.com/2019/10/22/132503/the-marines-are-testing-drone-medicine-deliveries/> (15.1.12:15).

Joseph M, Omotayo H (2023). Blood donation-a selfless life-saving act. WHO. Retrieved from: <https://www.afro.who.int/countries/nigeria/news/blood-donation-selfless-life-saving-act> (12.1.2024 20:11).

Larsen R (2016). Physiologie des Herzens und des Kreislaufs. Springer Nature. Retrieved from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7531329/> (14.1.2024 16:20).

Levy MG (2022). Drones Have Transformed Blood Delivery in Rwanda. Wired. Retrieved from: <https://www.wired.com/story/drones-have-transformed-blood-delivery-in-rwanda/> (23.1.2024 23:10).

Mednick S, Bernstein A (2023). Israel's fortified underground blood bank processes unprecedented amounts as troops move into Gaza. Apnews. Retrieved from: <https://apnews.com/article/israel-palestinians-hamas-blood-bank-c8e511a55a6da9561ca30207944afc4b> (23.1.2024 22:23).

NHS Blood and Transplant (2024). Blood stock. Retrieved from: <https://hospital.blood.co.uk/business-continuity/blood-stocks/> (08.01.2024 09:50).

Benedict N, Augustina AO, Nosakhare BG (2012). Blood donation in Nigeria: standard of the donated blood. J Lab Physicians. 4(2):94-7.

Owosu-Ofori AK, Parry C, Bates I (2010). Transfusion-transmitted malaria in countries where Malaria is endemic: a review of the literature from sub-saharan Africa. Clin Infect Dis. 51(10):1192-1198

Raykar NP, Makin J, Khajanchi M, Olayo B, Munoz Valencia A, Roy N, Ottolino P, Zinco A, MacLeod J, Yazer M, Rajgopal J, Zeng B, Lee HK, Bidanda B, Kumar P, Puyana JC, Rudd K (2021). Assessing the global burden of hemorrhage: The global blood supply, deficits, and potential solutions. SAGE Open Med. 9:20503121211054995.

Saillant NN, Kornblith LZ, Moore H, Barrett C, Schreiber MA, Cotton BA, Neal MD, Makar R, Cap AP (2022). The National Blood Shortage-An Impetus for Change. *Ann Surg.* 275(4):641-643.

Spence RK, Erhard J (2013). History of patient blood management. *Best Pract Res Clin Anaesthesiol.* (1):11-5.

Swica Healthcare Insurance (2023). Donate blood and save lives. Retrieved from: <https://www.swica.ch/en/private/health/world-of-health/health-tips/active/donating-blood> (20.1.2024 7:10)

Tagny CT, Diarra A, Yahaya R, Hakizimana M, Nguessan A, Mbensa G, Nébié Y, Dahourou H, Tapko JB, Shiboski C, Murphy E, Lefrère JJ (2009). Le centre de transfusion, le donneur de sang et le sang donné dans les pays d'Afrique francophone [The transfusion center, the blood donor and the given blood in francophone African countries]. *Transfus Clin Biol.* (5-6):431-8.

Tomoson (2016). Influencer Marketing Study. Retrieved from: <https://www.tomoson.com/blog/influencer-marketing-study/> (29.1.2024 10:26)

WHO (2016). Global health sector strategy on viral hepatitis 2016-2021: report from the World Health Organization. Geneva. Retrieved from: <https://www.who.int/publications/i/item/WHO-HIV-2016.06> (27.1.2024 15:03)

WHO (2023). Human rights. Retrieved from: <https://www.who.int/news-room/fact-sheets/detail/human-rights-and-health> (28.1.2024 14:10)

WHO (2023). Blood Safety and availability. Retrieved from: <https://www.who.int/news-room/fact-sheets/detail/blood-safety-and-availability#:~:text=WHO%20recommends%20that%20all%20blood,and%20syphilis%20should%20be%20mandatory> (25.1.2024 9:26)

WHO (2024). Blood Transfusion safety. Retrieved from: https://www.who.int/health-topics/blood-transfusion-safety#tab=tab_1 (28.1.2024 14:30)

United Nations (1948). Universal Declaration of Human Rights. Retrieved from: <https://www.un.org/en/about-us/universal-declaration-of-human-rights> (07.1.2024 22:32)

Worldometer (2024). Current world population. Retrieved from: <https://www.worldometers.info/world-population/> (28.1.2024 13:07)

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