

Sustained Blood Supply Chain through Strategic Donors Channelling

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Abstract

Problem definition: Plasma is a strategic blood product sourced from blood donors used to produce vital medicines. Blood services in recent years developed a program to boost plasma collections. However, establishing an optimal strategic balance for plasma donations and other types of blood collection is a current challenge. We investigate the problem of strategically challenging donors for different blood type collections. **Academic/Practical relevance:** We develop a novel mathematical modelling with chance constraint to ensure maximum plasma collection while maintaining the required level of other blood products. Our model also considers the variability of other blood product supplies to avoid shortages and wastage. **Methodology/results:** We propose a linear integer programming model to allocate donors to different types of donations and find an optimal number of donors to meet demand. Computational results show that donors are assigned to different donation types based on their probability of donation. Donors with a lower probability of donating are allocated to whole blood donations, while those with a higher probability are directed to apheresis donations. This allocation framework optimizes the collection of blood products. The strategic channelling of donors across various donation types plays a critical role in determining this allocation and directly impacts the availability of key blood products, particularly plasma. Our findings identify an optimal strategy for assigning donors to donation types, ensuring the fulfillment of blood product demand. These results underscore the pivotal role of donor flexibility in sustaining an efficient and resilient blood supply system. **Managerial implications:** Our finding helps decision makers in blood services to manage blood donors by strategically channelling donors to obtain a stable system.

KEYWORDS: Blood Supply Chain, Donor Channelling/ Management, Operations Interface Marketing, Blood Donation