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Optimization approaches for inventory management in Blood Supply Chains: A systematic review of literature

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Blood Supply Chain Management is highly critical, as ensuring the availability of the right blood type, at the right place, in the right quantity, at the right time is a matter of life and death. Unlike other products, there is no substitute to human blood. Therefore, there is an increasing need of wisely managing this invaluable resource. Studies show that blood availability in countries need to be increased in order to meet the demands of ageing populations. Meanwhile, the discard rate of blood collections has an impact on the people's attitude towards the blood system of the country and the first-time donor return rate. The overall objective of this study is to investigate the optimization approaches towards inventory management aspect in blood supply chains. A systematic review of literature has been carried out to investigate different optimization approaches and management concepts towards blood inventory optimization while maximizing the service levels and minimizing discard rates. Firstly, articles were selected through a web search based on the keywords of the study domain in order to ensure the relevance to the study. Further, articles published between 2000 and 2019 were considered ensuring novelty of findings. Keywords such as "inventory management", "supply chain", "optimization", "simulation" and "blood" were used. In the process of reviewing literature, initially 43 studies were analysed through the keywords search and 15 papers were selected which are directly related with the area of the study. Studies revealed that perishable and substitution inventory management systems with stochastic demands are highly complex and scarcely represented in the literature. The studies further indicated that simulation could be used as a tool to determine optimal inventory policies accounting for perishability and substitution. A framework was developed summarizing management concepts and optimization techniques used in blood inventory management. This framework can be used to identify potential research areas that are available in this arena and as a guidance for future researchers who are willing to study in this field. As a further research, it is suggested to explore the behaviour of inventory management practices of multi-product, multi-echelon and perishable supply chains with highly uncertain demand and supply.

Keywords: Optimization, Blood Supply Chains, Inventory Management