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Inventory Sharing Protocol to Minimize Blood Platelet Wastage in Hospital Network

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Abstract: This research proposes an inventory sharing protocol to minimize blood platelet wastage in a hospital network (HN). It has been shown that a significant amount of platelets is wasted at the hospitals due to its short expiration time after processing. Since the platelet has high shortage cost and demand uncertainty, the safety stock of platelets is extremely high to mitigate risk of stock-outs. Therefore, the objective of this research is to minimize the platelet wastage by designing an efficient inventory sharing collaboration among a set of hospitals. Over the years, different inventory models for platelets have been proposed with the objective of reducing shortage and outdated of platelets, at the same time also minimizing the operational costs. However, limited research has been conducted on multi-hospital collaboration to reduce platelets wastage. In a collaborative HN, it is assumed that hospitals, which can only partially fulfill its patient demand by its local inventory, can receive an additional amount of platelet units from other collaborating hospitals, which have excess platelet availabilities. As a result, the extent of platelet demand fulfillment is increased due to excess platelet units shared by collaborating hospitals. This can lead to platelet wastage minimization. In this research, an inventory sharing protocol is proposed to enhance the collaboration among a set of hospitals, which have their own patient demands and limited platelet capacities. The numerical results indicate that on applying the protocol in a multi-hospital network, there is significant reduction in number of platelet units outdated and also the total cost is reduced. Moreover, the demand fulfillment rate is also increased in a collaborative network compared to a no-collaboration network.

Keywords: Inventory sharing protocol, hospital network, shortage, safety stock, collaboration