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# Blood Inventory Management in Hospitals: Considering Supply and Demand Uncertainty and Blood Transshipment Possibility

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## BLOOD INVENTORY MANAGEMENT IN HOSPITALS: CONSIDERING SUPPLY AND DEMAND UNCERTAINTY AND BLOOD TRANSSHIPMENT POSSIBILITY

### ABSTRACT

Despite significant advancements in medicine, human blood is still a scarce resource. Only humans produce it, and there is currently no other product or alternative chemical process that can be used to generate blood. For this reason, blood is a vital commodity in healthcare systems. Since blood is also a perishable product, its inventory management is difficult. The challenge is in holding enough stock to ensure a high level of supply while keeping losses from expiration at a minimum. This research will investigate blood inventory management in a hospital, and develop a mathematical model to manage blood ordering and issuing. This study will account for the fact that blood demand and supply are uncertain, and blood transshipment is possible. The proposed model considers the substitution relations among various blood types in the blood transfusion process to minimize blood shortage and wastage. Since the proposed model contains uncertain parameters, the use of chance constraint programming creates a deterministic counterpart. The deterministic model is then adapted to include approximations to remove non-linearity. Finally, a numerical experiment is designed to exhibit the model's results and analyze the influence of different parameters on blood inventory management.

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