Allocation Policies in Blood Transfusion

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چکیده

Red Blood Cells (RBCs) transfusion is an essential part of many treatments and surgeries. While advances in storage technologies in the late 1970s led to an increase of RBCs shelf-life from 21 to 42 days, an extensive body of recent studies suggests moderate to strong correlation between receiving older blood and increased risk of adverse clinical outcomes. This raises the important question of whether the age of transfused blood can be reduced without significantly affecting its availability.

We develop a stylized model of the blood bank of a hospital and consider a family of allocation policies characterized by a threshold. Under the threshold policy, the oldest available RBCs unit which is younger than the threshold is allocated unless no such unit is available, in which case, the freshest available unit is allocated. The model captures important underlying characteristics of the system namely uncertainty in demand and supply, and fixed shelf-life of RBCs units. For the system operating under the threshold policy, we obtain the long-run proportion of outdated units as well as the distribution of the age of transfused units. Through a numerical study we observe the age-availability trade-off and provide further insights on the potential of allocation policies in reducing the age of transfused blood in hospitals.

خلاصه بیوگرافی

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