

报告 23

短周期血液产品的最优补货和分配策略

Optimal Replenishing and Rationing Management of Short-Life Blood Products

陈旭教授 | 电子科技大学经济与管理学院副院长



报告摘要 Abstract

我们研究了周期检查的单个易逝品库存模型，用来管理两类随机异质需求（紧急需求和普通需求）和两个生命周期的短周期血液产品。根据血库管理的实际，血液产品采集补货是不确定的。如果血液产品库存是充分的，紧急需求将被立即满足；如果血液产品库存不充分，通过高成本的紧急采集来满足紧急需求。如果剩余的一个周期的血液产品库存是充分的，普通需求将被满足；否则，普通需求将被剩余的两个周期的血液产品库存满足或到下个周期延迟供应，剩余一个周期的血液产品将在周期末报废，剩余两个周期的血液产品可以被保存到下个周期以降低高成本紧急采集的风险。我们通过动态规划方法得到血库的多周期最优补货和分配策略，并以血液中心的血库管理为例进行案例研究。

We study a periodic-review single-item perishable inventory model of managing short-life blood products in a medical service facility with two classes of demand and two-period lifetime stocks. The inventory replenishment, to reflect a commonly collecting blood practice, is uncertain. If available stock, inclusive of the inventories with two different lifespans, is sufficient, the prior demand representing emergent demand patients with critical conditions in the medical service must be completely satisfied immediately; otherwise, the unmet prior demand will be satisfied with costly expedite purchase. If the stock of one-period lifespan is sufficient, the regular demand from less critical patients are satisfied with the remaining stock of one-period lifespan blood product completely; otherwise, the spillovers of the regular demand are satisfied with the stock of two-period lifespan as effectively as possible, and backlogged if needed. The leftover stock of one-period lifespan will be discarded at the end of any period and that of two-period lifespan will be held if any to reduce a risk of high cost of expedite purchase. We obtain optimal dynamic policy and perform it to improve on the efficiency of the utilization and supply of the short-lifetime blood products for a large city blood distribution center.