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Mutation or polymorphism in colony stimulating factor-3 receptor: Diagnostic implications

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Mutations in the colony-stimulating factor 3 receptor gene (CSF3R) have been characterize as a distinctive feature in severe congenital neutropenia (SCN) and very recently in the majority of patients with chronic neutrophilic leukemia (CNL) and in few chronic myelomonocytic leukemias (CMML). Distal truncating mutations are more frequent in SCN whereas the auto-activating membrane proximal T618I missense mutation is prevalent in CNL. Other missense mutations in CSF3R have been described, however, in some cases, the consequences are unknown. We have found that some CSF3R variants that have been previously described as mutations are most likely polymorphisms since they were also present in germline DNA of patients without evidence of SCN, CNL or CMML. The distinction between polymorphisms and mutation with clinical significance is important, specially, since it has been suggested the inclusion of CSF3R mutations among World Health Organization diagnostic criteria of CLN.

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Blood platelet inventory management with protection levels

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We consider a discrete-time inventory system for a perishable product where demand exists for product of different ages; an example of such a product is blood platelets. In addition to the classical costs for inventory holding, outdating and shortage, our model includes substitution (mismatch) costs incurred when a demand for a certain-aged item is satisfied by a different-aged item. We propose a simple inventory replenishment and allocation heuristic to minimize the expected total cost over an infinite time horizon. In our heuristic, inventory of the newest items are replenished in fixed quantities and the newest items are protected for future use by limiting some substitutions when making allocation decisions according to a critical-level policy. We model our problem as a Markov Decision Process (MDP), derive the costs of our heuristic policy, and computationally compare this policy to extant "near optimal" policies in the literature. Our extensive computational study shows that our policy leads to superior performance compared to existing heuristics in the literature, particularly when supplies are limited.

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