Integrated blood supply chain planning for disaster relief

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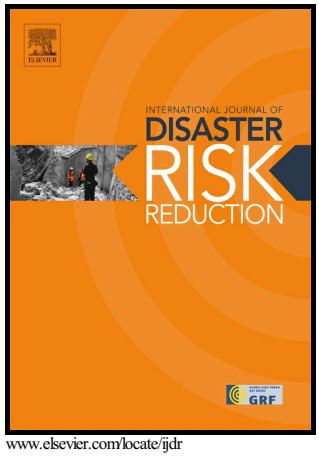

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Abstract

This paper proposes a multi-objective mixed integer linear programming model for the design of an integrated blood supply chain network for disaster relief. The developed model accounts for all the special properties of blood supply chains involving uncertain demand of blood products and their irregular supply, perishability of blood products and shortage avoidance. It also provides a trade-off analysis between the cost efficiency (via minimizing the total costs) and the responsiveness level of the designed network (through minimizing the maximum unsatisfied demand and the total delivery time of blood products to demand zones as the second and third objectives). A hybrid framework based on the two-stage stochastic programming and possibilistic programming approaches is devised to deal with a mixture of random and epistemic uncertainties. Some numerical experiments are conducted to validate the proposed model and its solution approach. Also, a real case study is presented to demonstrate the practicality of the proposed model. Helpful managerial insights are also provided through conducting a number of sensitivity analyses.

Keywords: Blood supply chain; Disaster relief; Multi-objective programming; Two-stage stochastic programming; Possibilistic programming.