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# A multi-period location-allocation of organ transplant centers

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***Abstract* — This paper presents a mixed-integer linear programming (MILP) model for a multi-period location-allocation problem in an organ transplant supply chain. Considering the objective function as a minimization of the total costs can elevate the efficiency of the presented supply chain network. The significance of applicability of the model is demonstrated by numerical examples and a sensitivity analysis inspired by a real-case study in Iran.**

***Keywords - Healthcare management; Organ transplant supply chain; Multi-period location-allocation***

## I. INTRODUCTION

Location of healthcare facilities is very crucial in ensuring that the chosen location network serves the purpose of minimizing the social cost or equivalently maximizing the people's benefits. Similarly the allocation of demands to these facilities has a direct impact on the whole system's efficiency. In other words, more satisfaction of demand points by facilities results in more efficiency of the proposed network. Thus, location-allocation models play a critical role in health service planning, as it provides a framework for investigating accessibility problems, comparing the quality (in terms of the efficiency) of the previous location decisions, and providing alternative solutions to change and improve the existing system [1, 2].

Many previous studies have been devoted to facility location problems (See Drira et al. [3] and Farahani et al. [4] for review); however, the significant survey of implementation of operational research on healthcare facilities are done by Papageorgiou [5] and Rais and Viana [6]. In this field, many researchers have presented a model for location-allocation of healthcare facilities. Syam and Côté [7] proposed a model for location-allocation of treatment department related to traumatic brain injuries. A common resource constraint is also assumed and minimization of the total cost for the objective function is applied. The derived data obtained from Department of Veterans Affairs (DVA) have been used for testing applicability of the model. They also examined the effects of five critical factors, such as the degree of service centralization, service level mandates by acuity, lost admission cost by acuity, facility overload penalty cost by acuity and target utilization level by acuity and treatment unit. Shariff et al. [1] formulated the model as a capacitated maximal covering location problem and applied it to one of the districts of Malaysia. For determining the percentage of coverage of the existing facilities, they proposed a new genetic algorithm. The medium-sized problem with 179 nodes network and the larger with 809 nodes has also solved. Benneyan et al. [8] presented a model for location-allocation multi-period Veterans Health Administration. In their paper, single and also multi-period mathematical integer programming with consideration of tradeoffs between costs, coverage, service location, and capacity is proposed. Sha and Huang [9] focused on multi-period location allocation of healthcare systems (i.e., emergency blood supply systems) for a case study in Beijing. They proposed a heuristic algorithm based on the Lagrangian relaxation.