
Prioritized Routing and Scheduling for Home Healthcare Services

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Abstract

In home healthcare services it is customary to visit the patients on a schedule. A Turkish company that sells medical nutrition products provides follow up services to its patients that are fed by tube or orally. Each nurse either visits a set of patients for whom she is responsible at home or calls them by phone on a specific day. In the current system, each nurse decides by herself how to follow the patients up in a given month. Thus, the managers cannot control whether the nurses visit the right patients in the right order. Patients can be prioritized depending on factors such as the last visit time, next prescription date and the severity of his/her condition. An important aspect of the priority parameter is that it is updated by time. As time progresses, the priority of an unvisited patient increases. We define an optimization problem that determines which patients to visit on each day of a multi-period planning horizon and in which order to visit them to maximize the total priority of visited patients and to minimize the total routing time. This leads to a multi-period orienteering problem with time-dependent prizes and time windows, which has not been studied before in the literature to the best of our knowledge. We develop a mixed integer programming model and solve it by Lagrangean relaxation to obtain upper bounds. We also develop a Simulated Annealing heuristic to generate near-optimal feasible solutions in short running times. We test these methods on real-life data.

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