
Interdependent Home Health Care and Social Care Problems

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Abstract

In home health care (HHC) services, professional caregivers are dispatched to patients' homes to provide medical care services, such that each patient can stay at home to be treated periodically. In an increasingly aging world, many of these patients usually need additional cares, such as Social Care (SC). Very often public medical institutions and public social services attend these patients, and both services present a certain degree of interdependency, e.g., a patient should be helped to get up, groom, and eat, before being seen by a doctor; or a patient needs help to organize the pills and doses after a doctor's visit.

Since the coordination of both services is relevant in a large number of patients, the aim of this work is to propose a realistic mathematical model and solving method considering the synchronization of both services and the particularities of each of them. The HHC problem consists of the medical staff rostering problem (NRP) and the vehicle routing problem with time windows (VRPTW), both of which are NP-hard problems. Additionally, the SC problem presents similar composition. Thus, the joint solution of both problems considering synchronization is a complex challenge but that can bring a huge social and economic benefit.

We propose a Mixed Integer Program (MIP) model and a metaheuristic method to solve this synchronized rostering and routing problem. Through experiments, we show the effectiveness of our approach and the benefits of this integration proposal.

Keywords: Home Health Care, Social Care, Scheduling and Routing, Combinatorial Optimization

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