FACULTY OF ECONOMICS

Published scientific paper - Binary Programming Model for Rostering Ambulance Crew-Relevance for the Management and Business

Marcikic Horvat, A., Dudic, B., Radovanov, B., Melovic, B., Sedlak, O., & Davidekova, M. (2021). Binary Programming Model for Rostering Ambulance Crew-Relevance for the Management and Business. Mathematics, 9, 64. https://doi.org/10.3390/math9010064

The nature of health care services is very complex and specific, thus delays and organizational imperfections can cause serious and irreversible consequences, especially when dealing with emergency medical services. Therefore, constant improvements in various aspects of managing and organizing provision of emergency medical services are vital and unavoidable. The main goal of this paper is the development and application of a binary programming model to support decision making process, especially addressing scheduling workforce in organizations with stochastic demand. The necessary staffing levels and human resources allocation in health care organizations are often defined ad hoc, without empirical analysis and synchronization with the demand for emergency medical services. Thus, irrational allocation of resources can result in various negative impacts on the financial result, quality of medical services and satisfaction of both patients and employees. We start from the desired staffing levels determined in advance and try to find the optimal scheduling plan that satisfies all significant professional and regulatory constraints. In this paper a binary programming model has been developed and implemented in order to minimize costs, presented as the sum of required number of ambulance crews. The results were implemented for staff rostering process in the Ambulance Service Station in Subotica, Serbia. Compared to earlier scheduling done ad hoc at the station, the solution of the formulated model provides a better and equable engagement of crews. The developed model can be easily modified and applied to other organizations with the same, stochastic, nature of the demand.