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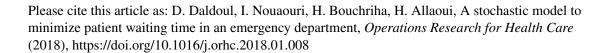
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A stochastic model to minimize patient waiting time in an emergency department

Dorsaf Daldoul 1,2*, Issam Nouaouri 2, Hanen Bouchriha 1, and Hamid Allaoui 2

Abstract The hospital emergency department (ED), which constitutes a complex system with random demands, is the primary facility for urgent health issues. Overcrowding and the limited resources affect the waiting time of patients in the ED. In this research, we model the healthcare services in the ED of a university hospital in Tunisia. We consider simultaneously six patient queues. The goal is to optimize the human and material resources required to reduce the average total patient waiting time. We focus particularly on the medical staff (physicians and nurses) and beds in the ED. We propose a stochastic mixed-integer programming model, which can be solved by a sample average approximation approach. Here, we use the solver ILOG CPLEX Optimization Studio. We compare the performance obtained from the optimization model with what exists currently in the ED under consideration. The results of the experimental study demonstrate that the proposed approach improves the average total patient waiting time by up to 23.24%.

Keywords: emergency department, waiting time, stochastic programming, sample average approximation, resource allocation

E-mail address: daldouldorsaf@yahoo.fr

^{*} Corresponding author

¹ National Engineering School of Tunis, LR11ES20 LACS Laboratory, University of Tunis Elmanar 1002 Tunis, Tunisia

² University of Artois, LGI2A Laboratory 62400 Bethune, France

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