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# IMPROVED SYSTEM DESIGN OF AN EMERGENCY DEPARTMENT THROUGH SIMULATION-BASED MULTI-OBJECTIVE OPTIMIZATION

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## ABSTRACT

Healthcare facilities, and especially emergency departments (ED), are usually characterized by its complexity due to the variability and stochastic nature of the processes involved in the system. The combination of different flows of patients, staff and resources also increments the complexity of this kind of facilities. In order to increase its efficiency, many researchers have proposed discrete-event simulation (DES) as a powerful improvement tool. However, DES can be a limited approach in the case a simulation model has too many combinations of input parameters, complex correlations between the input and output parameters and different objective functions. Hence, to find the best configuration of a complex system, an approach combining DES and meta-heuristic optimization becomes an even more powerful improvement technique. Simulation-based multiobjective-optimization (SMO) is a promising approach to generate multiple trade-off solutions particularly when multiple conflicting objectives exist within a complex system. The generated solutions provide decision makers with feasible and optimal alternatives to improve, modify or design healthcare systems. The aim of this paper is to present the work done at the ED of the regional Hospital of Skövde in Sweden, where SMO implemented in modeFrontier has been successfully applied. The result and methodology present a successful approach for decision makers in healthcare systems to reduce the waiting time of patients saving considerable time, money and resources.