

Integrating Lean Six Sigma and Discrete-Event Simulation for Shortening the Appointment Lead-Time in Gynecobstetrics Departments: A Case Study

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Abstract

Long waiting time to appointment may be a worry for pregnant women, particularly those who need perinatology consultation since it could increase anxiety and, in a worst case scenario, lead to an increase in fetal, infant, and maternal mortality. Treatment costs may also increase since pregnant women with diverse pathologies can develop more severe complications. As a step towards improving this process, we propose a methodological approach to reduce the appointment lead-time in outpatient gynecobstetrics departments. This framework involves combining the Six Sigma method to identify defects in the appointment scheduling process with a discrete-event simulation (DES) to evaluate the potential success of removing such defects in simulation before we resort to changing the real-world healthcare system. To do these, we initially characterize the gynecobstetrics department using a SIPOC diagram. Then, six sigma performance metrics are calculated to evaluate how well the department meets the government target in relation to the appointment lead-time. Afterwards, a cause-and-effect analysis is undertaken to identify potential causes of appointment lead-time variation. These causes are later validated through ANOVA, regression analysis, and DES. Improvement scenarios are next designed and pretested through computer simulation models. Finally, control plans are deployed to maintain the results achieved through the implementation of the DES-Six sigma approach. The aforementioned framework was validated in a public gynecobstetrics outpatient department. The results revealed that mean waiting time decreased from 6.9 days to 4.1 days while variance passed from 2.46 days² to 1.53 days².

Keywords

Six sigma; Discrete-event simulation (DES); Appointment lead time; Gynecology Healthcare