

Simulation of Patient Flow and Healthcare Resources in a Hospital

**Afnan Hamadah, Lina Handa, Nourhan Hasan, Samar Qutom, Yasmeen Sheebbeb and
Ufuk Kula**

Industrial Engineering Department
American University of Middle East
Kuwait

Abstract

In this simulation study, we simulate patient arrivals and their flow within a hospital with the objective of improving patient waiting times and effective usage of health care resources such as nurses, physicians and other healthcare personnel. Our simulation model includes the following departments of the hospital. Registration, Triage, Emergency department, X-ray, Labs, Clinics, and the Surgery department. We, first collect the arrival data, map out the processes in each department, and collect processing time data for each operation. We also determine the type and number of nurses, physicians, their alternates needed to perform each operation. In our simulation study, we first simulate the current situation in the hospital and establish a baseline for several key performance indicators such as waiting time, number of patients served, nurse and physician utilization. As an improvement attempt, we develop several scenarios which focus on resource sharing among several departments, changing staffing levels of departments during the day based on patient traffic and provide recommendations to the hospital management.

Keywords

Healthcare, simulation, hospital simulation, scheduling

Biographies

Afnan Hamadah is a senior student in the Industrial Engineering Department at the American University of Middle East, Kuwait.

Lina Handa is a senior student in the Industrial Engineering Department at the American University of Middle East, Kuwait.

Nourhan Hasan is is a senior student in the Industrial Engineering Department at the American University of Middle East, Kuwait.

Samar Qutom is a senior student in the Industrial Engineering Department at the American University of Middle East, Kuwait.

Yasmeen Sheebbeb is a senior student in the Industrial Engineering Department at the American University of Middle East, Kuwait.

Ufuk Kula is an Assistant Professor in the Industrial Engineering Department at the American University of Middle East, Kuwait. Dr. Kula holds a Bachelor of Science degree in Industrial Engineering from Yıldız echnical University, Turkey, and MSc. and PhD. Degrees in Industrial and Operations Engineering in the University of Michigan, Ann Arbor. He has taught courses in simulation, stochastic processes, quality engineering, supply chain management, decision analysis, and probability and statistics. His research interests are stochastic modeling and optimization of production and service systems, revenue management and supply chain management.