

Multi-Objective Simulation Bed Resource for Emergency Admitted to Hospital

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Abstract

In the post-pandemic era, emergency department congestion has become a global issue. When congestion occurs in the emergency department, it directly impacts mortality and morbidity rates among emergency patients. Therefore, the timely provision of critical resources by healthcare institutions has become a primary goal. Faced with the increasing number of emergency patients each year, easing the growing frequency of emergency department congestion is a challenge. One prevalent solution involves admitting emergency patients to inpatient care, especially as hospitalization is a common strategy. In Taiwan's medical centers, there are dedicated units managing inpatient beds. Despite variations in the importance hospitals place on inpatient bed management, it remains a significant revenue source. Therefore, effective inpatient bed management can serve as an avenue for implementing strategies to improve emergency department congestion. Single emergency department indicators are insufficient to meet the diverse management policies and complex requirements of different hospitals. Analyzing emergency department congestion requires identifying appropriate key performance indicators crucial for evaluating a hospital's emergency performance. This study collects data from Taiwan's medical centers and utilizes surveys to assess the situation of emergency department congestion in Taiwan. Additionally, it develops a simulation for optimizing the allocation of inpatient bed resources for emergency patients. The optimization considers different hospitals' inpatient department resource allocation speeds, selecting the optimal bed numbers for specific time periods. This approach provides hospital bed managers with the means to optimize bed planning based on the hospital's needs, thus contributing to the improvement of emergency department congestion.

Keywords

Resource Allocation, Simulation, Emergency Department, Overcrowding, Hospital System

Biographies

Dr. Shao-Jen Weng is a Professor in the Department of Industrial Engineering & Enterprise Information at Tunghai University in Taiwan. Dr. Weng received his PhD with Graduate Certificate in Statistics and Preparing Future Faculty Certificate from Arizona State University in 2008. His industrial experience includes Union Pacific in the US and World-Wide Test Technology Inc. in Taiwan. He is an author in Journal of Medical Systems, International Journal for Quality in Health Care, Total Quality Management & Business Excellence, BMC Health Services Research, BMC Cardiovascular Disorders, Journal of Medical Imaging and Health Informatics, and others. In addition, he serves on paper reviewers for international journals and conferences. His main areas of interests are in Hospital Systems, Lean Healthcare, Patient Safety, Decision Support Systems, and Data Envelopment Analysis. He has 20 years of project experience in the healthcare and industry. (completed more than 50 projects in the healthcare sector).

Dr. Yao-Te Tsai is an associate professor in the Department of Information Management at the National Kaohsiung University of Science and Technology. He has also served as the Chief Operating Officer of the Healthcare Systems Consortium and the executive secretary of the Ergonomics Society of Taiwan. Dr. Tsai received his Ph.D in the Department of Industrial and Systems Engineering at Auburn University in 2015. Dr. Tsai started his academic career as a research fellow at the Logistics Institute-Asia Pacific, National Singapore University, in 2016. In the institute, he collaborated with several FMCG companies and aimed to optimize their supply chain networks. From 2017 to 2023, he served in the Department of International Business of Feng Chia University and mainly taught/researched in the area of logistics and supply chain. In addition, Dr. Tsai started to establish partnerships with healthcare organizations and initiated more than 30 projects. The objective of these projects was all about how to improve operational efficiency in healthcare. His current research interests include supply chain management, operations management, healthcare system improvement, and ESG-related topics. Dr. Tsai's research works can be found in the Journal of Retailing and Consumer Services, Transportation Research: Part F, Journal of Industrial Information Integration, International Journal of Engineering Business Management, etc.

Chih-Hao Chen is a Ph.D. candidate in the Department of Industrial Engineering & Enterprise Information at Tunghai University in Taiwan. His research interests include lean, six-sigma, simulation, data analysis, supply chain, and optimization. In addition, He has 6 years of project experience in the healthcare and industry.