World Academy of Science, Engineering and Technology
International Journal of Health and Medical Engineering
Vol:18, No:08, 2024

Data-Driven Performance Evaluation of Surgical Doctors Based on Fuzzy Analytic Hierarchy Processes

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Abstract : To enhance the safety, quality and efficiency of healthcare services provided by surgical doctors, we propose a comprehensive approach to the performance evaluation of individual doctors by incorporating insights from performance data as well as views of different stakeholders in the hospital. Exploratory factor analysis was first performed on collective multidimensional performance data of surgical doctors, where key factors were extracted that encompass assessment of professional experience and service performance. A two-level indicator system was then constructed, for which we developed a weighted interval-valued spherical fuzzy analytic hierarchy process to analyze the relative importance of the indicators while handling subjectivity and disparity in the decision-making of multiple parties involved. Our analytical results reveal that, for the key factors identified as instrumental for evaluating surgical doctors' performance, the overall importance of clinical workload and complexity of service are valued more than capacity of service and professional experience, while the efficiency of resource consumption ranks comparatively the lowest in importance. We also provide a retrospective case study to illustrate the effectiveness and robustness of our quantitative evaluation model by assigning meaningful performance ratings to individual doctors based on the weights developed through our approach.

Keywords : analytic hierarchy processes, factor analysis, fuzzy logic, performance evaluation
Conference Title : ICHMHS 2024 : International Conference on Hospital Management and Health Services
Conference Location : New York, United States
Conference Dates : August 08-09, 2024