A FAHP-VIKOR Approach for Supporting the Selection of Tomography Equipment in LMIC Hospitals: A Case Study

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Abstract

Computerized Tomography Scanners (CT-SCAN) provide detailed cross-sectional images of the human body which are employed for the easier detection and further analysis of abnormalities concerning the functionality and structure of the skeleton, tissues, and organs. However, the appropriate CT-SCAN selection is an arduous task considering the complexity and high cost of these medical devices. This decision is even more sharpener in hospitals from Low-and-Middle-Income-Countries (LMIC) where the available budget is usually restricted and correct resource allocation should be therefore ensured while granting the greatest impact on the timeliness and efficacy of healthcare services. In this framework, multiple criteria from diverse fields need to be taken into account to satisfy the intricate requirements of users. In this regard, it is necessary to fully elicit the expectations of stakeholders as well as identify their importance in an overall decision-making context. To address these gaps, this study proposes a novel integration between the Fuzzy Analytic Hierarchy Process (FAHP) and VIKOR methods for the CT-SCAN selection problem. Initially, a Multi-Criteria Decision-Making (MCDM) model will be designed for selecting the most suitable CT-SCAN option for a particular LMIC hospital. Then IF-AHP will be applied to calculate the relative priorities of criteria and sub-criteria under uncertainty. Ultimately, VIKOR will be implemented for obtaining an overall decision-making context. To address these gaps, this study proposes a novel integration between the Fuzzy Analytic Hierarchy Process (FAHP) and VIKOR methods for the CT-SCAN selection problem. Initially, a Multi-Criteria Decision-Making (MCDM) model will be designed for selecting the most suitable CT-SCAN option for a particular LMIC hospital. Then IF-AHP will be applied to calculate the

relative priorities of criteria and sub-criteria under uncertainty. Ultimately, VIKOR will be implemented for obtaining an overall appropriateness index per CT-SCAN candidate and thereby identifying the most pertinent one (s) for a specific LMIC medical institution. © 2021, Springer Nature Switzerland AG.

Keywords