A Risk-Based Maintenance Strategy Using Fuzzy HFMEA for Prioritization of Critical Medical Equipment

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Abstract: Medical equipment such as anaesthesia machines require essential maintenance to ensure high levels of reliability in healthcare services. A risk-based maintenance (RBP) strategy is a useful tool to design a cost-effective maintenance schedule; its objective is to reduce overall risk. In risk assessment of a failure scenario in healthcare organizations, consequences often have three key features: patient safety effect, maintenance resources effect and economic loss. In this paper, to quantify the severity of patient injury and maintenance resources, a fuzzy healthcare failure modes and effects analysis (HFMEA) method is developed using data derived from five experts. Based on conditional probability of failures and consequence analysis, the risk is calculated and prioritized. To facilitate the comparison of failures, a new risk index is introduced. A numerical example illustrates the feasibility of proposed approach in critical medical equipment. The results indicate that this method would be fit for identifying critical failures in complex medical equipment maintenance process by considering different ideas of five experts and the proposed method can increase the reliability of high risk machines in healthcare industries.

Keywords: Risk-based maintenance(RBM), Healthcare Failure modes and effects analysis(HFMEA), Fuzzy Logic, Patient safety, Anaesthesia machines