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POSTER ABSTRACT

An Expert System to Assist the Diagnosis of Ischemic Heart Disease.

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Motivations: Ischemic Heart Disease (IHD) is one of the most common causes of the death in many countries [1]. The disease is unpredictable in onset and hence, requires rigorous diagnosis in regards to multiple signs and symptoms such as cardiac pain, breathlessness, sweating, palpitation, nausea vomiting and hypertension [2]. However, these signs and symptoms cannot be measured with full confidence because of the presence of various uncertainties such as vagueness, imprecision, ambiguity, ignorance and incompleteness [3]. Therefore, traditional diagnosis by the physician lacks the reliability in two ways: a) uncertainty issues in reading the signs and symptoms, and b) difficulty to handle multiple signs and symptoms simultaneously as a human agent. Fuzzy expert systems can be considered for IHD diagnosis; however they are not able to address all types of uncertainty, especially ignorance, incompleteness and ignorance in fuzziness [4]. Such uncertainties were addressed by using a Belief Rule Base (BRB) in the literature in assessing clinical asthma suspicion [3]. In this paper, we propose a Belief Rule Based Expert System (BRBES) to assist the physician to handle all kinds of uncertainty that exist with the signs and symptoms of IHD.

Method: The proposed expert system uses BRB to develop the knowledge base and Evidential Reasoning (ER) as inference methodology in an integrated system, named as RIMER [5]. RIMER is a relatively new knowledge representation and inferencing scheme that can handle various types of uncertainties such as vagueness, ambiguity, imprecision, ignorance and incompleteness. Therefore, RIMER allows the handling of various types of uncertainty exist with the signs and symptoms of IHD. The architecture of the proposed BRBES is module based while its layer based user friendly interface allows capturing of input data from the signs and symptoms of IHD as well as allows the assessment of the IHD level of a patient. The whole system has been implemented as a desktop application. The backend data management layer has been constructed using Microsoft SQL server to handle the knowledge base. The interface engine has been developed by using C#.NET.

Results and Discussion: A data set of 200 patients has been used to generate results from the BRBES. These have been compared with the results generated from Fuzzy based expert system (FBES) as well as with a manual system where a physician gives the assessment of the IHD level. The Area under Curve (AUC) parameter (the larger the better) of Recover Operating

Characteristics (ROC) curves have been used to compare the reliability of the BRBES with FBES and the manual system. The AUC of BRBES is found as 0.949 (95% confidence intervals 0.729 - 0.970) while the AUC of Manual System is 0.811 (95% confidence intervals 0.675 - 0.947) and the AUC of FBES is 0.884 (95% confidence intervals 0.693 - 0.956). The reliability of manual approach is less because the physicians is unable to deliver desired accuracy in assessing IHD due to in most of the cases their mindset of diagnosis is Boolean as observed during our research. It can also be observed from the presented data that the AUC of BRBES is greater than that of FBES because the later considers uncertainties due to vagueness, imprecision and ambiguity while earlier in addition to these uncertainties considers uncertainty due to randomness and ignorance. The proposed system is intended for assisting the physicians in health checkup as an assisting monitoring technology [6].

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