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Abstract:

As a consequence of aging population and an increasing prevalence of obesity and diabetes there are more and more patients with heart failure. This leads to a lack of professionals who can treat them and to escalating costs. An interesting solution appears to be home telemonitoring with an intelligent clinical decision support system. In this paper, the use of cumulative information estimations for risk assessment of heart failure patients with such a system is analyzed. These cumulative information estimations are utilized for creation of an algorithmic model using fuzzy decision trees that combine decision trees and notions of fuzzy logic. The algorithmic model employs mutual cumulative information and relative mutual cumulative information for association of an important piece of data about the patients with a decision node. The risk assessment with the presented solution is analyzed from the point of view of minimization of life-threatening situations and minimization of costs. Comparisons with a Bayesian network method, a nearest neighbor method, and a logistic regression method show it is a promising solution.

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Given the rapidly growing aging population, the increased prevalence of obesity and diabetes, the increased burden of heart failure, and the increasing healthcare costs, there is an urgent need for the development, implementation, and deployment of new models of healthcare services. The burden of heart failure affects 2%–3% of the adult population with disabling symptoms, the most common of which are fatigue and dyspnea, while in terms of disability, the end stage of the disease is comparable to the end stage of terminal cancer [13]. 2%–3% of the adult population means over 26 million people with heart failure worldwide and this number is growing rapidly with newly diagnosed people every year. In the UK, heart failure affects about 900,000 people with 60,000 new cases annually [5]. Heart failure is characterized by a poor prognosis: up to 70% of all patients with heart failure die within 5 years after their first hospital admission [18]. In addition to a poor prognosis, a common feature of advanced heart failure is multiple hospital (re-)admissions [5]. A promising strategy that can cope with these challenges seems to be a greater use of home telemonitoring in which physiological data is transferred from the patients' home to the center to monitor them, interpret the data, and make clinical decisions [14]. Home telemonitoring should be integrated with a clinical decision support system that identifies both the nature and optimal response to a problem rather than just its mere existence [4].

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