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Hybrid Approach to the Generation of Medical Guidelines for Insulin Therapy for Children

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Abstract

To support doctors in planning insulin therapy for juvenile diabetic patients, we propose in this paper a new approach to the generation of formal medical guidelines. In the first stage of our approach, we cluster static patients' data to obtain patient cohorts with similar medical characteristics. In the second stage, for every patient of the cohort, we model the course of the disease. Using discretization and a symbolic time scale, we convert numerical data to the sequence of events. Then, we define the notion of a compound event reflecting the basic unit of the pre-meal insulin therapy. The course of the disease is modeled as a sequence of compound events. To discover the patterns of such events, we propose a new algorithm based on the concept of frequent episodes. The patterns that were obtained are presented to physicians in form of a graph that illustrates the possible pathway of the therapy. Using the proposed approach, it is possible to model both mutual similarity and repetitiveness of the prescribed treatments. The proposed method was evaluated using the actual medical data of juvenile diabetic patients. We obtained encouraging results that have been evaluated positively by doctors.

Keywords: data mining, frequent episodes, medical guidelines, diabetes mellitus

1. Introduction

The medical guideline is a document that guides treatment decisions in healthcare [27, 12]. The construction of medical guidelines for diabetes mellitus is an important problem that has attracted the interest of many researchers. Mainly because of the numerous factors that influence the blood glucose level, it is difficult to define a strict medical procedure for the therapy of diabetic patients [1]. Thus, to a large degree, diabetic therapy is based on the experience of physicians [3]. It has been noted that none of the available guidelines

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