Use of Case-Based Reasoning to Enhance Intensive Management of Patients on Insulin Pump Therapy

Frank L. Schwartz, M.D., FACE,[1] Jay H. Shubrook, D.O., FACOFP,[1] and Cynthia R. Marling, Ph.D.[2]

Abstract

Background:

This study was conducted to develop case-based decision support software to improve glucose control in patients with type 1 diabetes mellitus (T1DM) on insulin pump therapy. While the benefits of good glucose control are well known, achieving and maintaining good glucose control remains a difficult task. Case-based decision support software may assist by recalling past problems in glucose control and their associated therapeutic adjustments.

Methods:

Twenty patients with T1DM on insulin pumps were enrolled in a 6-week study. Subjects performed self-glucose monitoring and provided daily logs via the Internet, tracking insulin dosages, work, sleep, exercise, meals, stress, illness, menstrual cycles, infusion set changes, pump problems, hypoglycemic episodes, and other events. Subjects wore a continuous glucose monitoring system at weeks 1, 3, and 6. Clinical data were interpreted by physicians, who explained the relationship between life events and observed glucose patterns as well as treatment rationales to knowledge engineers. Knowledge engineers built a prototypical system that contained cases of problems in glucose control together with their associated solutions.

Results:

Twelve patients completed the study. Fifty cases of clinical problems and solutions were developed and stored in a case base. The prototypical system detected 12 distinct types of clinical problems. It displayed the stored problems that are most similar to the problems detected, and offered learned solutions as decision support to the physician.

Conclusions:

This software can screen large volumes of clinical data and glucose levels from patients with T1DM, identify clinical problems, and offer solutions. It has potential application in managing all forms of diabetes.

J Diabetes Sci Technol 2008;2(4):603-611

Author Affiliations: [1]Appalachian Rural Health Institute Diabetes and Endocrine Center, Ohio University College of Osteopathic Medicine, Ohio University, Athens, Ohio; and [2]School of Electrical Engineering and Computer Science, Russ College of Engineering and Technology, Ohio University, Athens, Ohio

Corresponding Author: Cynthia R. Marling, Ph.D., School of Electrical Engineering and Computer Science, Russ College of Engineering and Technology, Ohio University, Athens, OH 45701; email address *marling@ohio.edu*