Journal of Diabetes Science and Technology
Volume 4, Issue 1, January 2010

An Intensive Insulinotherapy Mobile Phone Application Built on Artificial Intelligence Techniques

Kevin Curran, Ph.D.,[1] Eric Nichols, M.Sc.,[1] Ermai Xie, B.Sc.,[1] and Roy Harper, M.D.[2]

Abstract

Background:

Software to help control diabetes is currently an embryonic market with the main activity to date focused mainly on the development of noncomputerized solutions, such as cardboard calculators or computerized solutions that use "flat" computer models, which are applied to each person without taking into account their individual lifestyles. The development of true, mobile device-driven health applications has been hindered by the lack of tools available in the past and the sheer lack of mobile devices on the market. This has now changed, however, with the availability of pocket personal computer handsets.

Method:

This article describes a solution in the form of an intelligent neural network running on mobile devices, allowing people with diabetes access to it regardless of their location. Utilizing an easy to learn and use multipanel user interface, people with diabetes can run the software in real time via an easy to use graphical user interface. The neural network consists of four neurons. The first is glucose. If the user's current glucose level is within the target range, the glucose weight is then multiplied by zero. If the glucose level is high, then there will be a positive value multiplied to the weight, resulting in a positive amount of insulin to be injected. If the user's glucose level is low, then the weights will be multiplied by a negative value, resulting in a decrease in the overall insulin dose.

Results:

A minifeasibility trial was carried out at a local hospital under a consultant endocrinologist in Belfast. The short study ran for 2 weeks with six patients. The main objectives were to investigate the user interface, test the remote sending of data over a 3G network to a centralized server at the university, and record patient data for further proofing of the neural network. We also received useful feedback regarding the user interface and the feasibility of handing real-world patients a new mobile phone. Results of this short trial confirmed to a large degree that our approach (which also can be known as intensive insulinotherapy) has value and perhaps that our neural network approach has implications for future intelligent insulin pumps.

continued →

Author Affiliations: [1]Faculty of Computing and Engineering, University of Ulster, Northern Ireland; and [2]Ulster Community Hospital, Dundonald, Belfast, Northern Ireland, United Kingdom

Abbreviations: (DKA) diabetic ketoacidosis, (INNSULIN) An Intelligent Neural Network for Suggesting Unambiguous Levels of Insulin via Needle, (UI) user interface

Keywords: artificial intelligence, insulinotherapy, mobile computing, neural networks, telehealth

Corresponding Author: Kevin Curran, Ph.D., Faculty of Computing and Engineering, School of Computing and Intelligent Systems, University of Ulster, Northern Ireland, UK; email address kj.curran@ulster.ac.uk

Abstract cont.

Conclusions:

Currently, there is no software available to tell people with diabetes how much insulin to inject in accordance with their lifestyle and individual inputs, which leads to adjustments in software predictions on the amount of insulin to inject. We have taken initial steps to supplement the knowledge and skills of health care professionals in controlling insulin levels on a daily basis using a mobile device for people who are less able to manage their disease, especially children and young adults.

J Diabetes Sci Technol 2010;4(1):209-220