

Essential Elements of the Native Glucoregulatory System, Which, If Appreciated, May Help Improve the Function of Glucose Controllers in the Intensive Care Unit Setting

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Abstract

In 2001, Van den Berghe and colleagues were able to show that tight glucose control decreases morbidity and mortality rates in the intensive care unit (ICU) setting. Several large, prospective, randomized controlled trials have failed to confirm these results. All of these studies attempted tight glucose control using expert-designed algorithms to adjust the rate of intravenous insulin. Unfortunately, these studies each had high rates of hypoglycemia, a high percentage of glucose values outside of the target range, and increased glucose variability. These three measurements have been shown to increase mortality rates in ICU patients. In order to achieve a high rate of success with regards to tight glucose control, a closed-loop system will need to be created. The two main elements of such a system are a continuous glucose sensor and a recursive glucose control algorithm. This review highlights the important elements of the native glucoregulatory system, which, if utilized, may help create a successful glucose control algorithm for a closed-loop system.

J Diabetes Sci Technol 2010;4(1):190-198

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Abbreviations: (ICU) intensive care unit, (MPC) model predictive control, (NICE-SUGAR) Normoglycemia in Intensive Care Evaluation—Survival Using Glucose Algorithm Regulation

Keywords: algorithm, closed loop, control, fuzzy logic, glucose, hyperglycemia, intensive care unit

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