

A Benchmark Data Set for Model-Based Glycemic Control in Critical Care

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Abstract

Background:

Hyperglycemia is prevalent in critical care. That tight control saves lives is becoming more clear, but the “how” and “for whom” in repeating the initial results remain elusive. Model-based methods can provide tight, patient-specific control, as well as providing significant insight into the etiology and evolution of this condition. However, it is still often difficult to compare results due to lack of a common benchmark. This article puts forward a benchmark data set for critical care glycemic control in a medical intensive care unit (ICU). Based on clinical patient data from SPecialized Relative Insulin and Nutrition Tables (SPRINT) studies, it provides a benchmark for comparing and analyzing performance in model-based glycemic control.

Methods:

Data from 20 of the first 150 postpilot patients treated under SPRINT are presented. All patients had longer than a 5-day length of stay (LoS) in the Christchurch ICU. The benchmark data set matches overall patient data and glycemic control results for the entire cohort and this particular LoS >5-day group. The mortality outcome ($n = 3$, 15%) also matches SPRINT results for this patient group.

Results:

Data cover 20 patients and 6372 total patient hours with an average of 339.4 hours per patient. It includes insulin and nutrition inputs along with 4182 blood glucose measurements at an average of 224.3 measurements per patient, averaging a measurement approximately every 1.5 hours (16 per day). Data are available via download in a Microsoft Excel format. A series of cumulative distribution functions and tables are used to summarize data in this article.

Conclusion:

Model-based methods can provide tighter, more adaptable “one method fits all” solutions using methods that enable patient-specific modeling and control. A benchmark data set will enable easier model and protocol development for groups lacking clinical data, as well as providing a benchmark to compare results of different protocols on a single (virtual) cohort based on real clinical data.

J Diabetes Sci Technol 2008;2(4):584-594

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Abbreviations: (APACHE II) Acute Physiology and Chronic Health Evaluation II, (ICU) intensive care unit, (LoS) length of stay, (SI) international system of units, (SPRINT) Secondary Prevention Reinfarction Israeli Nifedipine Trial

Keywords: clinical results, control, critical care, glucose variability, hyperglycemia, model based, mortality

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