Journal of Diabetes Science and Technology
Volume 3, Issue 2, March 2009

MEETING PROCEEDINGS

Mathematical Modeling Research to Support the Development of Automated Insulin-Delivery Systems

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Abstract

The world leaders in glycemia modeling convened during the Eighth Annual Diabetes Technology Meeting in Bethesda, Maryland, on 14 November 2008, to discuss the current practices in mathematical modeling and make recommendations for its use in developing automated insulin-delivery systems. This report summarizes the collective views of the 25 participating experts in addressing the following four topics: current practices in modeling efforts for closed-loop control; framework for exchange of information and collaboration among research centers; major barriers for the development of accurate models; and key tasks for developing algorithms to build closed-loop control systems. Among the participants, the following main conclusions and recommendations were widely supported:

1. Physiologic variance represents the single largest technical challenge to creating accurate simulation models.
2. A Web site describing different models and the data supporting them should be made publically available, with funding agencies and journals requiring investigators to provide open access to both models and data.
3. Existing simulation models should be compared and contrasted, using the same evaluation and validation criteria, to better assess the state of the art, understand any inherent limitations in the models, and identify gaps in data and/or model capability.

J Diabetes Sci Technol 2009;3(2):388-395

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Abbreviations: (AR) autoregressive, (DirecNet) Diabetes Research in Children Network, (GMWG) Glycemia Modeling Working Group, (ICU) intensive care unit, (JDRF) Juvenile Diabetes Research Foundation, (ODE) ordinary differential equation, (PK/PD) pharmacokinetic/pharmacodynamic, (T1DM) type 1 diabetes mellitus, (T2DM) type 2 diabetes mellitus

Keywords: algorithms, artificial pancreas, closed-loop control, diabetes, models

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