Overnight Control of Blood Glucose in People with Type 1 Diabetes

In this paper, we develop and test a Model Predictive Controller (MPC) for overnight stabilization of blood glucose in people with type 1 diabetes. The controller uses glucose measurements from a continuous glucose monitor (CGM) and its decisions are implemented by a continuous subcutaneous insulin infusion (CSII) pump. Based on a priori patient information, we propose a systematic method for computation of the model parameters in the MPC. Safety layers improve the controller robustness and reduce the risk of hypoglycemia. The controller is evaluated in silico on a cohort of 100 randomly generated patients with a representative intersubject variability. This cohort is simulated overnight with realistic variations in the insulin sensitivities and needs. Finally, we provide results for the first tests of this controller in a real clinic.

General information
Publication status: Published
Organisations: Department of Informatics and Mathematical Modeling, Scientific Computing, Mathematical Statistics, Department of Systems Biology, Center for Systems Microbiology, Center for Energy Resources Engineering, Horus ApS, Copenhagen University Hospital
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Pages: 73-78
Publication date: 2012

Host publication information
Title of host publication: Biological and Medical Systems
Volume: 8
ISBN (Print): 978-3-902823-10-6
(IFAC Proceedings Volumes (IFAC-PapersOnline) ).
Electronic versions:
Boiroux_BMS2012_0106_FI.pdf
DOIs:
10.3182/20120829-3-HU-2029.00106
Source: dtu
Source-ID: u::4980
Research output: Chapter in Book/Report/Conference proceeding › Article in proceedings – Annual report year: 2012 › Research › peer-review