Peer-Review Report

Peer Review of “In-Silico Works Using an Improved Hovorka Equations Model and Clinical Works on the Control of Blood Glucose Levels in People With Type 1 Diabetes: Comparison Study”

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KEYWORDS

blood glucose level; closed-loop system; Hovorka model; in-silico work; meal disturbance; type 1 diabetes mellitus

This is a peer-review report submitted for the paper “In-Silico Works Using an Improved Hovorka Equations Model and Clinical Works on the Control of Blood Glucose Levels in People With Type 1 Diabetes: Comparison Study.”

Round 1 Review

General Comments

The paper [1] simulates the ability of a new version of the Hovorka model to simulate the blood glucose level (BGL) of type 1 diabetes (T1D) for 3 patients with meal disturbances for 24 hours. The simulation was done using MATLAB software, and the BGL profile from both simulation and clinical works were compared and analyzed. While the *P* values for the simulation and clinical data were <.05, indicating that the simulation work using the improved Hovorka equations was acceptable for predicting the BGL, results showed that the BGLs for all 3 people with T1D were lower in the simulation work compared to the clinical work.

Specific Comments

Major Comments

1. The paper is well written, the experiments seem correctly designed, and the results seem reasonable. However, the most interesting result is that the simulated BGL results were consistently lower than the clinical results. While the authors discuss some clinical reasons for this systematic difference the hypotheses are not terribly compelling. I think it is also necessary to discuss that the simulation/model may have some systematic bias due to the assumptions of its construction. The model may be an effective low BSL baseline estimate for a patient as opposed to an effective expected value estimate.

In some sense, this is an unexpected result from the model, but it does not make the model invalid. Explicitly stating this, characterizing it in an established taxonomy of unexpected behaviors for simulations, and discussing how the model can still be valid would improve the paper and increase its maturity, in terms of its application of modeling and simulation.

Papers/books to support this effort:

- Mittal S, Diallo S, Tolk A.*Emergent Behavior in Complex Systems Engineering: A Modeling and Simulation Approach*. John Wiley & Sons; 2018.
- Gore R, Reynolds PF. An exploration-based taxonomy for emergent behavior analysis in simulations. Presented at: 2007 Winter Simulation Conference; December 9-12, 2007; Washington, DC.

2. The paper refers to many tables (1-6) that are not present in the text. The data in these tables are needed for the presentation of the material (ie, they need to be present in the paper) and certainly should be present if referenced by the authors.

3. The importance of the issue (T1D) and regulating BGLs has the potential to impact millions of people. In addition, being able to estimate this (even a low-end estimate) with modeling reduces material costs, time, and patient risk. However, this context establishing the impact and importance of the paper is missing. Adding this will help readers appreciate the impact (and cite) the paper.

Minor Comments

4. In the replication crisis era, the MATLAB software the scripts used to create the graphics should be provided to the reader and reviewers.

5. The abstract reads as if it was written continuously (ie, subsections infer context from previous subsections). This is not how JMIR abstracts are written. The subsections within the abstract should be able to be read independently.

Conflicts of Interest

None declared.

Reference

1. Som AM, Sohadi NAM, Nor NSM, Ali SA, Ahmad MA. In-silico works using an improved Hovorka equations model and clinical works on the control of blood glucose levels in people with type 1 diabetes: comparison study. JMIRx Bio. 2024;2(1):e43662. [FREE Full text] [doi: 10.2196/43662]

Abbreviations

BGL: blood glucose level
T1D: type 1 diabetes

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