Accepted Manuscript

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PII: S2352-9148(17)30095-3

DOI: 10.1016/j.imu.2017.12.002

Reference: IMU 77

To appear in: *Informatics in Medicine Unlocked*

Received Date: 5 July 2017

Revised Date: 19 November 2017

Accepted Date: 2 December 2017

Please cite this article as: Strilka RJ, Trexler ST, Sjulin TJ, Armen SB, A qualitative numerical study of glucose dynamics in patients with stress hyperglycemia and diabetes receiving intermittent and continuous enteral feeds, *Informatics in Medicine Unlocked* (2018), doi: 10.1016/j.imu.2017.12.002.

A Qualitative Numerical Study of Glucose Dynamics in Patients with Stress Hyperglycemia and Diabetes Receiving Intermittent and Continuous Enteral Feeds

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Abstract

Background: Using 12 healthy adults, it was shown that a reduction in mean glucose concentration follows intermittent gastric feeds, not continuous: a desirable result for hospitalized patients. A numerical study comparing glucose dynamics after intermittent gastric and continuous post-pyloric feeds may inform the design of a similar clinical study in the critical care setting.

Methods: A mathematical model was used to construct a small virtual crossover study comparing intermittent gastric feeds and continuous post-pyloric feeds. The model, validated for eight diabetic patients, produced maximum glucose concentration, mean glucose concentration and glucose concentration standard deviation data. Simulations were repeated after renal insulin clearance was increased by 50%, a common physiologic alteration in critical illness. Five hypothetical patients with stress hyperglycemia also underwent simulation.

Results: Mean glucose concentration was significantly lower after intermittent gastric feeds in type 1 diabetics and in the stress hyperglycemia patients. Without insulin therapy, intermittent gastric feeds increased maximum glucose concentration more than continuous post-pyloric feeds, and glucose concentration standard deviation was largest after intermittent gastric feeds in all patients. Also, the continuous glucose concentration data suggests that the total amount of insulin required to treat patients with stress hyperglycemia would be least in the intermittent feed arm.

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