Accurate Glycemic Control in Critically Ill Patients: The STAR Framework

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Objective:
Stochastic **TAR**geted (STAR) is a model-based, adaptive and patient-specific accurate glycemic control (AGC) framework, customizable to clinically specified glycemic targets, control approaches and clinical resources. This work compares two STAR pilot trials with different control approaches (insulin-only vs. insulin+nutrition) to results of the model-derived SPRINT.

Method:
Pilot trials were performed at the Centre Hospitalier Universitaires (Liege, Belgium) targeting 100-140mg/dL using insulin-only (SB), and Christchurch Hospital (New Zealand) targeting 80-120mg/dL using insulin+nutrition control (SNZ). SB trials were 24 hours long and SNZ trials were for entire patient stay. Measurements and interventions were 1-3 hourly. Insulin rates were limited to 8U/hour. Results are compared to those from SPRINT, which targeted 72-110mg/dL and measured 1-2 hourly.

Result:
There were 660 hours of control for SNZ with 402 measurements and 194 hours with 91 measurements for SB. Median [IQR] SNZ BG is 108[94-122]mg/dL with 76% and 90% of BG in the 72-125mg/dL and 72-145mg/dL bands and no severe hypoglycemia. Median [IQR] SB BG is 134[117-151]mg/dL with 35% and 65% of BG in the 72-125mg/dL and 72-145mg/dL bands and no severe hypoglycemia. SB results are skewed slightly higher by the 24-hour trial length. Moderate hypoglycemia (BG<72mg/dL) was 4.5% for SNZ and 1.1% for SB.

In comparison, over 40,000 hours (371 patients) SPRINT BG was 104[90-119]mg/dL with 79% and 88% of BG in the 72-125mg/dL and 72-145mg/dL bands and ~2% of patients experiencing severe hypoglycemia (BG<40mg/dL).

Conclusion:
Pilot clinical trials demonstrate that STAR provides flexible and customizable accurate glycemic control to desired target levels, and compares well to a proven model-derived AGC protocol.