**INTRODUCTION**

**Background:** Several accurate glycemic control (AGC) protocols for critical care patients exist but making comparisons is very hard. Hypoglycemia is a common concern when attempting AGC and improving care. Hypoglycemia occurred more in patients with high variability, and the behavior of STAR and SPRINT to respond quickly with both insulin and nutrition changes limited the risk of hypoglycaemia in these patients.

**Objective:** This study uses clinically validated virtual patient methods to compare safety and performance for several published AGC protocols and highlight characteristics that lead to improved glycemic performance.

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**METHOD**

Clinically validated virtual trials were run on 371 patients (39,481 hours, 26,646 measurements) created from the SPRINT AGC cohort. Details from published literature protocols were implemented into software and simulated trials conducted on the virtual cohort.

For protocols that do not modulate feed rates enteral nutrition was held at 100% of ACCP goal (25kcal/kg/day) when the patients were clinically fed, and parenteral nutrition rates were matched to clinical data.

Performance was defined as %BG within glycemic bands and BG measurement frequency. Safety was defined as the incidence of severe (number patients with BG<40mg/dL) and moderate (%BG>72mg/dL) hypoglycemia. Patients were grouped by variability tertiles defined as the inter-quartile range of sensitivity to insulin divided by median insulin sensitivity.

**RESULTS: VIRTUAL TRIALS**

STAR, SPRINT and UNC showed high BG performance and relatively low severe hypoglycemia. Hypoglycemia occurred more in patients with high variability, and the behavior of STAR and SPRINT to respond quickly with both insulin and nutrition changes limited the risk of hypoglycaemia in these patients.

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**CONCLUSIONS**

Virtual trials provided an effective comparison across protocols with different target bands/values and different clinical cohorts. More hypoglycemia occurs with higher variability patients, indicating more dynamics protocols can provide safer control. The model-based STAR protocol provided the best management of patient variability to yield benefits in safety.