Stochastic TARgeted (STAR) glycaemic control: improved performances and safety for all

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Background & Objectives

- Glycaemic control (GC) targeting normoglycaemic ranges in **ICU patients** has shown improved outcomes but was proven difficult to achieve safely, increasing risk of hypoglycaemia.

- STAR is a model-based GC protocol with proven safety and performance. It uses a unique risk-based dosing approach accounting for both intra- and inter- patient variability (**Figure 1**).

- This study compares safety and efficacy of intermediate clinical results of the STAR-Liège trial at the University Hospital of Liège, Belgium, with retrospective data from patients under the standard protocol (SP).
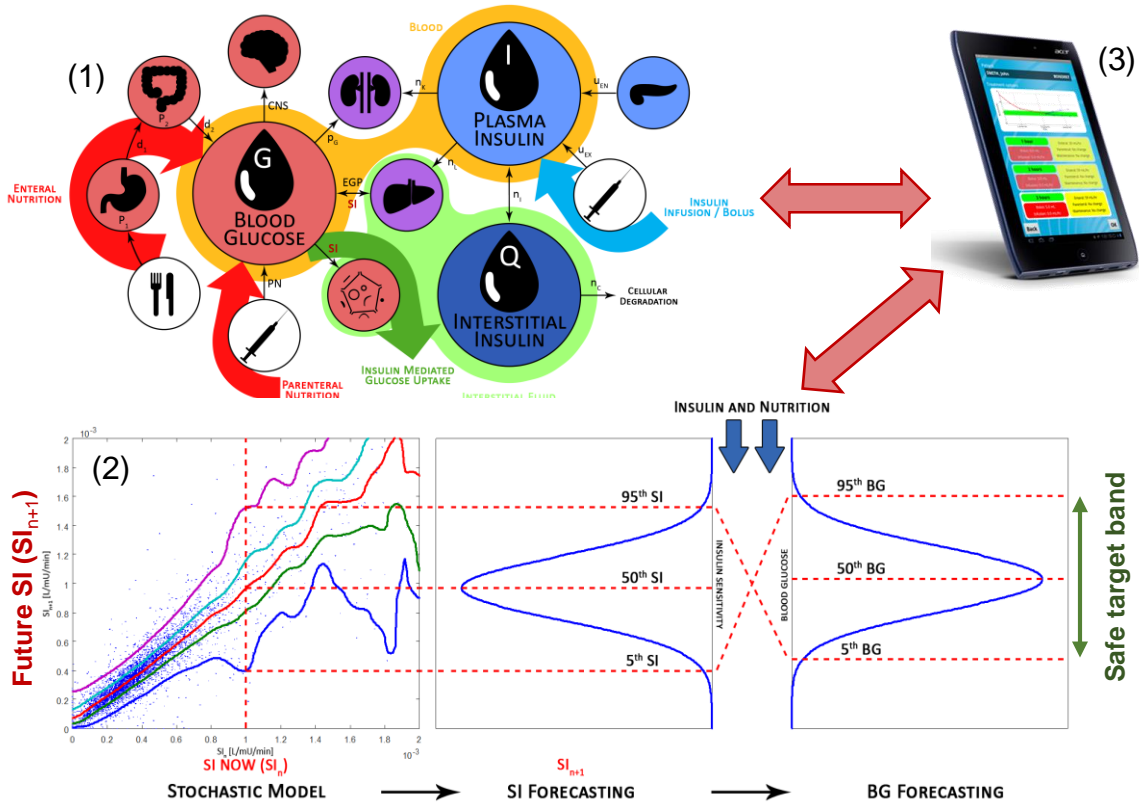
Methods

Ethics approval was granted by the University Hospital of Liège Ethics Committee for the STAR-Liège clinical trial. STAR-Liège offers 1-3 hourly blood glucose (BG) measurement options.

- **Target band:** 80 – 145 mg/dL (100 – 150 mg/dL for SP)
- **Starting criteria:** 2 BG measurements > 145 mg/dL
- **Stopping criteria:** BG stable for 6h at low insulin rates (≤ 2U/h) or 72h after inclusion
- **Insulin:** Max. 9U/h with maximum increment of 2U/h
- **Nutrition:** Decrease to a min. of 30% original goal feed

Results

- Clinical results of STAR are compared to retrospective patients (**Table 1**).

Table 1 – Clinical data from 10 STAR patients and 20 retrospective patients. BG is resampled hourly. Results are given as median [IQR].

	STAR	SP
# Patients	10	20
Total hours	455	5006
Average measurements per day	12	7
Cohort BG (mg/dL)	**118 [109 129]**	**139 [117, 160]**
Per-patient median insulin rate (U/hr)	3.0 [2.0 4.0]	2.5 [2.0, 3.0]
Per-patient median dextrose rate (g/hr)	7.0 [4.7, 8.2]	9.8 [8.6, 11.5]
Per-patient median dextrose rate (%Goal)	90 [60 100]	/
% BG in 80-145 mg/dL	**89**	**55**
% BG in 100-150 mg/dL	84	54
% BG in 145-180 mg/dL	9	31
% BG > 180 mg/dL	2	13
% BG < 80 mg/dL	0.5	1
% BG < 40 mg/dL	0	0

Conclusions

- It is possible to provide safe, and effective control for all patients despite lower intermediate glycaemic target ranges, using model-based, risk-based dosing of insulin and nutrition.

- **These results are encouraging, comparable to previous studies, and support STAR's risk-based dosing approach as a robust solution across different ICU settings and usages.**

Fig. 1. Current patient-specific insulin sensitivity (SI) is identified using a mathematical model (1). Future SI is forecast using a stochastic model (2). Using distribution of future SI, STAR (3) optimises insulin-nutrition rates to overlap predicted BG outcomes with the safe target band.