

## TIME-VARIANT INSULIN SENSITIVITY IN CRITICALLY ILL SUBJECTS

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**Abstract:** Critically ill subjects display high temporal variations in insulin sensitivity, which complicate efficient glucose control by glucose controllers. In the present study, we combined a simple, discrete-time model of glucoregulation with the regularisation method to obtain a time-variant marker of insulin sensitivity from hourly plasma glucose measurements and information about intravenous insulin infusion and parenteral intake in six critically ill subjects studied over 24 to 48h. The focus of the study was to determine “basal insulin requirements” representing insulin appearance, which maintains normoglycaemia. We observed up to five-fold variations in the basal insulin requirements over a period of 8-10h in a half of the studied subjects. The remaining subjects had virtually unchanged basal insulin requirements. We conclude that considerable heterogeneity exist in the temporal variation of insulin resistance in critically ill subjects.

**Keywords:** Insulin sensitivity, physiological models, regularisation, parameter estimation, discrete time system.