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Riddersholm, Signe Juul; Preiser, Jean-Charles; Rousing, Mark Lillelund; Pielmeier, Ulrike; Andreassen, Steen

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Lowering of blood glucose and its variability by computerized decision support

Signe Juul Riddersholm, MD; Jean-Charles Preiser, MD;
Mark Lillelund Rousing, M.Sc.; Ulrike Pielmeier, PhD, M.B.A.; Steen Andreassen,
PhD, Dr. Tech.

Aalborg University, Center for Model-based Medical Decision Support,
Aalborg, Denmark
sjr@hst.aau.dk

Objective:

The safety and effectiveness of a medical decision support system controlling stress hyperglycemia (Glucosafe), was tested prospectively in a medico-surgical intensive care unit (ICU) with a heterogeneous patient population. Using penalty functions for insulin and blood glucose, Glucosafe balances insulin treatment against glycemic outcome.

Method:

Insulin treatment was provided according to the local usual insulin algorithm (days 1 and 3) or according to Glucosafe (day 2) to reach the target range of 90-150 mg/dl. Nutrition was provided according to departmental guidelines. After the first 6 patients penalty functions were adapted by increasing target blood glucose from $99 \pm 10\%$ to $104 \pm 10\%$ mg/dl and increasing the penalty for high insulin doses.

Results :

Glucosafe was tested on 13 patients (age: 69.8 ± 11.1 ; SAPS II: 44 ± 16). The use of Glucosafe reduced both the inpatient mean and SD of blood glucose significantly on day 2 (mean: 104 ± 7 mg/dl; $N=98$) relative to both day 1 (mean: 140 ± 11 mg/dl; $N = 90$, $p < 0.0005$) and day 3 (mean: 116 ± 10 mg/dl; $N = 60$, $p < 0.005$). Hypoglycemia (< 60 mg/dl) was not observed on any day.

On day 2 (Glucosafe) 78% of measurements were in the target range compared to 67% on day 1 and 74% on day 3.

On average insulin doses for days 1 and 3 combined were 2,08 units/h. Glucosafe used higher average insulin doses (3.62 and 2.4 units/h) before and after the adaptation of the penalty function. There was no significant difference in glycemia before and after the adaptation.

Conclusion:

Using Glucosafe with penalty functions adapted to the local environment safely improved the performance of glycemic control.