

# GLYCEMIC VARIABILITY, HYPOGLYCEMIA AND ORGAN FAILURE IN THE GLUCONTROL STUDY

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## Abstract

Organ failure is the leading cause of intensive care unit (ICU) mortality. This research evaluates the influence of glycemic variability and hypoglycemia on organ failure rate. The analysis uses data from the Glucontrol study and results show that high glycemic variability and hypoglycemia are both associated with increased SOFA score, and thus increased organ failure rate.

Keyword(s): medical/clinical engineering – modeling of physiological systems

## 1 Introduction

Organ failure is a common complication associated with increased mortality in intensive care unit (ICU) patients. Increased mortality is also related to glycemic variability (GV) and hypoglycemia [1]. This research evaluates the influence of GV and severe hypoglycemia on organ failure rate.

## 2 Methods

Daily Sequential Organ Failure Assessment (SOFA) score is used to assess organ failure rate. Glycemic variability was estimated by a daily glycemic lability index. A hypoglycemic event is defined as blood glucose (BG) < 2.2 mmol/L. These metrics are evaluated for all 704 patients in the Glucontrol study (multiple centers) who were treated in matched cohorts to two different target glycemic levels [2]. The analysis thus considers these glycemic outcomes independent of glycemic target.

### 2.1 GV and SOFA score

For each day, patients are divided in two groups depending if their GV was higher or lower than the median GV of the considered day. We compare daily SOFA scores (median, IQR, mean) for each group using a Mann-Whitney test and  $p < 0.05$  is considered significant.

### 2.2 Hypoglycemia and SOFA score

Patients are divided in two groups depending whether they had a severe hypoglycemic event or not during their ICU stay. We compare daily SOFA scores (median, IQR, mean) for each group on each day using a Mann-Whitney test.

## 3 Results

Patients with high GV have higher SOFA scores (Figure 1) but this difference is significant only on Days 2-4 ( $p < 0.05$ ). Figure 2 shows that patients who had at least one hypoglycemic event are associated with significantly higher SOFA scores ( $p < 0.05$  on Days 2-14). These results match those of other studies on ICU mortality and glycemic control.

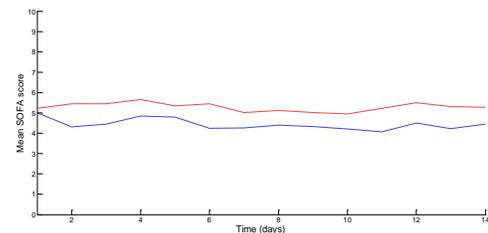


Figure 1 - Evolution of mean SOFA score for patients with high GV (red) and low GV (blue)

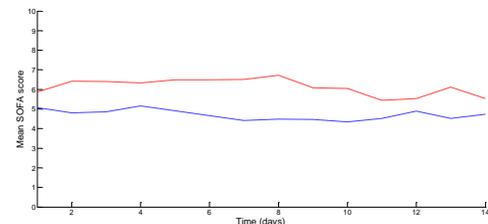


Figure 2 - Evolution of mean SOFA score for patients with (red) and without (blue) hypoglycemic event

## 4 Conclusion

High glycemic variability and hypoglycemia are both associated with increase in SOFA score, and thus increase in organ failure rate.

## References

- [1] Bagshaw, S. *et al.* The impact of early hypoglycemia and blood glucose variability on outcome in critical illness. *Critical Care*, 13(3), R91, 2009.
- [2] Preiser, J.C. *et al.* A prospective randomised multi-centre controlled trial on tight glucose control by intensive insulin therapy in adult intensive care units: the Glucontrol study. *Intensive Care Med*, 35(10), 1738-48, 2009.