

Inpatient Glycaemic Variability and Long-term Mortality: A Neglected Diabetic Parameter?

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Introduction

Diabetes mellitus is an increasingly common and important condition worldwide with an estimated growth to 366 million diagnoses by 2030. (1) The importance of optimal management of diabetes will be an increasing challenge over coming years. The deleterious effects of hyperglycaemia and hypoglycaemia are well reported. In hospital inpatients hyperglycaemia and hypoglycaemia have been extensively explored. A concept of increasing interest is that of glycaemic variability. (2) There have been few large scale studies examining inpatient glycaemic variability and long-term mortality outcomes.

Objective

To determine the association between inpatient glycaemic variability and long-term mortality in patients with type 2 diabetes mellitus.

Methods

Capillary blood glucose (CBG) of inpatients from 8 hospitals was analysed. 28,353 admissions identified were matched for age, duration of diabetes and admission, number of inpatient hypos and median and interquartile range of CBG. 6 year mortality was investigated for (i) those with CBG IQR in the top half of all IQR measurements (matched for all except IQR), vs those in the lower half and (ii) those with the lowest quartile median glucose (matched for all except median).

Results

1. Glucose variability analysis: 3165 matched pairs were identified. Higher inpatient glycaemic variability was demonstrated to be associated with decreased survival from day 90 post-discharge over follow up for a 6 year period ($p < 0.01$) (figure 1). Hazard Ratio for mortality was 1.17 in the higher variability group.

2. Median CBG analysis: 3755 matched pairs were identified. Higher inpatient median CBG was demonstrated to be associated with increased survival from day 90 post-discharge over follow up for a 6 year period ($p < 0.01$) (figure 2). Hazard Ratio for mortality was 0.87 in the higher variability group.

Discussion

Higher inpatient glycaemic variability is associated with increased mortality on long-term follow up. When matched by IQR, we have demonstrated higher median CBG is associated with lower long term mortality. CBG variability may increase cardiovascular morbidity by increasing exposure to hypoglycaemia or to variability *per se*. In hospitalized patients with diabetes, glycemic variability should be minimised and when greater CBG variability is unavoidable, a less stringent CBG target considered.

Further research is required to identify whether inpatient variability predicts adverse glucose patterns post discharge and whether an approach that reduces glucose variability can reduce morbidity or mortality. Glycaemic variability may well be a neglected diabetic parameter. By targeting this parameter we may be able to improve outcomes for our patients.

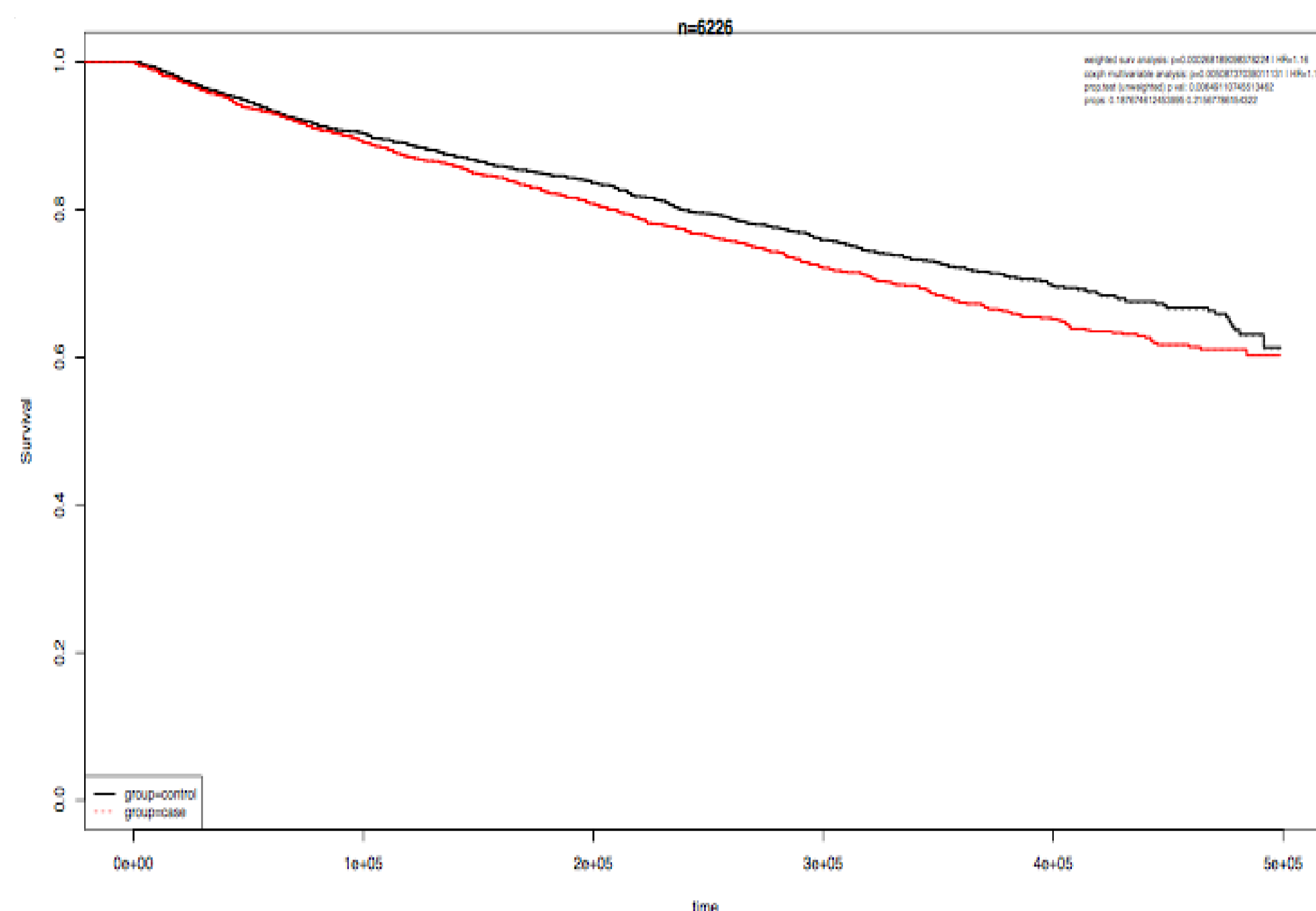


Figure 1
Legend: 6 year survival analysis of individuals with IQR in upper 50% (≥ 50.9 mg/dl) (red) vs those with IQR in lower 50% (black). 3165 matched pairs, matched for age, duration of diabetes, duration of admission, inpatient median glucose and number of episodes of hypoglycaemia. OR for mortality (upper vs lower 50%) 1.17 ($p < 0.01$).

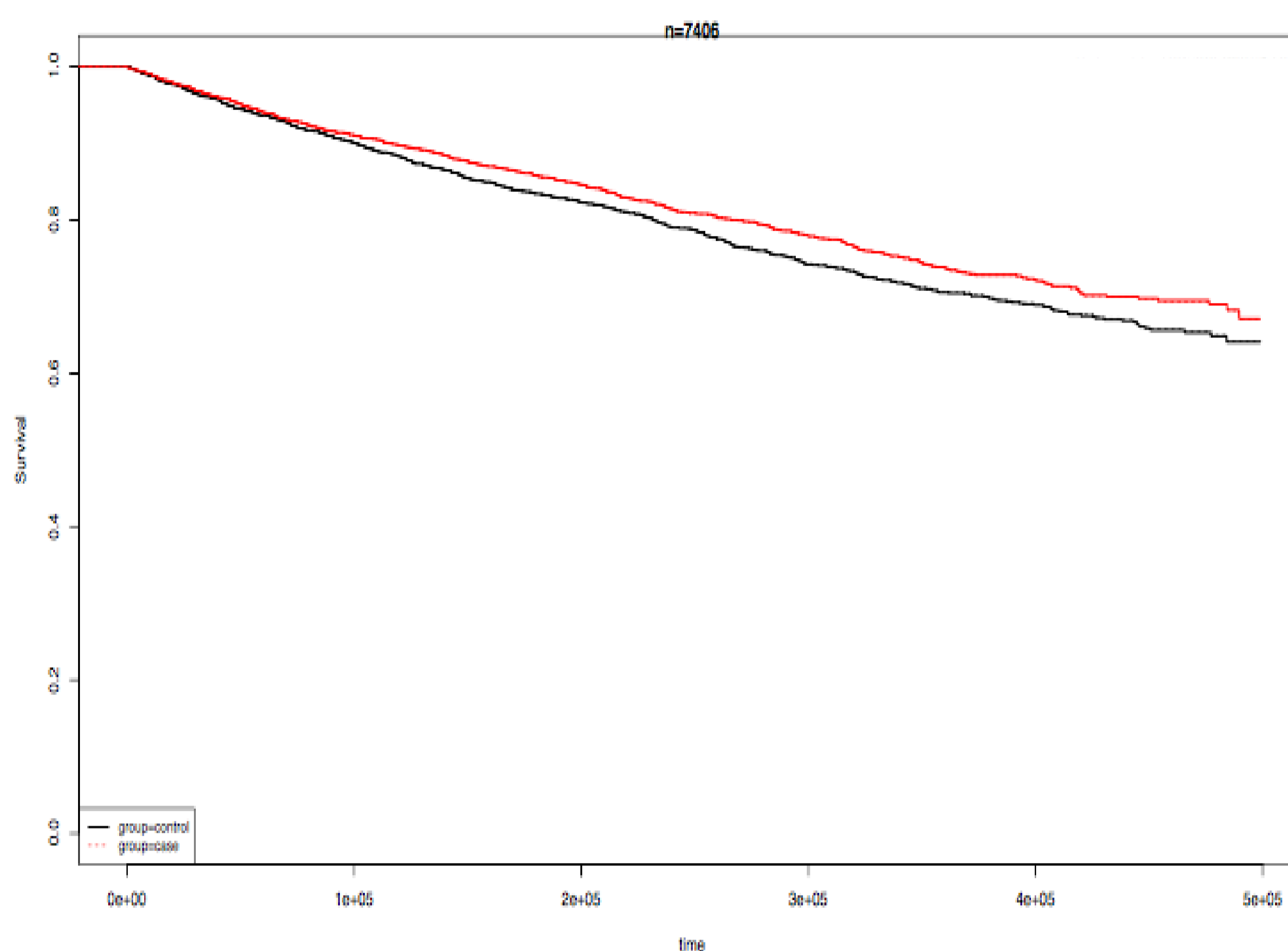


Figure 2
Legend: 6 year survival analysis of individuals with median CBG in upper 50% (≥ 148.5 mg/dl) (red) vs those with IQR in lower 50% (black). 3755 matched pairs, matched for age, duration of diabetes, duration of admission, CBG IQR and number of episodes of hypoglycaemia. OR for mortality (upper vs lower 50%) 0.87

References

1. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care* 2004;27:1047–1053.
2. Frontoni S, Di Bartolo P, Avogaro A, Bosi E, Paolisso G, Ceriello A. Glucose variability: an emerging target for the treatment of diabetes mellitus. *Diabetes Res Clin Pract* 2013;102:86–95.

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