Are Survivors Easier to Control? Why the Association of Glycaemia and Mortality in Critical Care is Real

Vincent Uyttendaele 1, Jennifer Dickson 1, Kent Stewart 1, Geoff Shaw 1, Thomas Desaive 3, J Geoffrey Chase 3
1Centre of Bioengineering, University of Canterbury, New Zealand
2Department of Intensive Care, Christchurch Hospital, New Zealand
3GIGA science group, University of Liège, Belgium

Introduction

Glycaemic control (GC) to improve outcomes in critical care has proven difficult, yielding significant glycaemic variability and hypoglycaemia. The strong association of glycaemia, glycaemic variability and mortality are due to either patient-condition (non-survivors are harder to control) or difference in control (non-survivors and survivors are equally difficult to control). This study uses a clinically validated and patient-specific insulin sensitivity (SI) level to compare metabolic variability (difficulty to control) in survivors and non-survivors with equivalent glycaemic control. Specifically, are non-survivors more variable and thus harder to control?

Clinical data:

Retrospective data from 145 patients who underwent at least 24 hours of insulin therapy on the SPRINT glycanic controller, starting within 12 hours of ICU admission at the Christchurch Hospital ICU, is used. Demographics of this cohort are detailed in Table 1.

Table 1 – Demographic details of 145 patients cohort. Patients started SPRINT within 12 hours of ICU admission and underwent at least 24 hours of GC.

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>Gender (M/F)</th>
<th>APACHE II Score</th>
<th>Yr — (total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>62 (17.70)</td>
<td>54/52</td>
<td>3.13 (2.03 5.44)</td>
<td>91/54</td>
</tr>
<tr>
<td>66 (6.07)</td>
<td>66/59</td>
<td>3.55 (2.03 5.50)</td>
<td>75/44</td>
</tr>
<tr>
<td>41 (5.44)</td>
<td>39/36</td>
<td>3.86 (2.43 8.30)</td>
<td>12/19</td>
</tr>
</tbody>
</table>

Methods

Patient-specific SI and %ΔSI metrics are used to assess controllability between survivors and non-survivors. While SI level tends to determine the total amount of insulin to be titrated, it is variability that determines the risks of insulin therapy and overall controllability (hyper- and hypo-glycaemia).

Overall, similar to higher SI for non-survivors and equivalent variability suggest survivors and non-survivors are equally controllable given an effective glycaemic control protocol.

This outcome suggests that glycaemic level and variability, and thus the association between glycaemia and outcome, is essentially determined by the quality of glycaemic control, and not the underlying patient variability.

Notes: