Comparison of two algorithms for basal bolus insulin therapy in hospitalised patients with diabetes mellitus type 2

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Background

- Hyperglycemia is a common occurrence in hospitalized patients.
- Hyperglycemia is a strong predictor of adverse clinical outcome in a range of diseases and can lead to a prolonged hospital stay.

GlucoTab system

Gluco management system with a workflow-integrated algorithm for basal-bolus insulin therapy (REACTION algorithm based on modified RABBIT 2 algorithm, Umpierrez, Diabetes Care 2007)

Initiation of insulin therapy

- Confirmed by physician
- In patients with pre-existing insulin therapy based on total daily dose (TDD)
- In insulin-naive patients based on body weight, age, renal function
- % of TDD as basal insulin (glargine)
- % of TDD as bolus insulin (aspart) distributed over the day with meals
- Pre-meal glucose target 100–140 mg/dl (5.6–7.8 mmol/l)

Insulin dose adjustment

- TDD is adjusted once daily (confirmed by MD)
- During ward rounds
- Depending on glycemic control during the preceding 24 h
- Bolus insulin dose adjustment (confirmed by nurse)
- 4 times daily (morning, noon, evening, bedtime)
- Influencing factors:
  - Current blood glucose
  - Planned meal ingestion
  - Insulin sensitivity

Therapy profile and glycemic control

- Graphic overview of preceding insulin therapy, blood glucose values and meals

Aim

To compare two versions of the REACTION algorithm for glycemic management running on the GlucoTab system in hospitalised patients with type 2 diabetes (T2D) at the general ward.

Design

- Open, non-controlled feasibility study

Intervention

- 2 versions of the REACTION algorithm were used, each algorithm was tested in 15 patients

- Initial algorithm
  - TDD was divided into ½ basal insulin, ½ bolus insulin with meals
- Refined algorithm
  - Bolus insulin dose was redistributed over the day; TDD and the 50 : 50 ratio remained unchanged

Inclusion criteria (main)

- T2D
- 18–90 years

Exclusion criteria (main)

- Impaired renal function (serum creatinine ≥ 3.0 mg/dl)
- Pregnancy
- Terminal illness

Patient characteristics

<table>
<thead>
<tr>
<th>Initial algorithm</th>
<th>Refined algorithm</th>
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</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>age (years)</td>
<td>69±10</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>27±16</td>
</tr>
<tr>
<td>DM (mg/dl)</td>
<td>100±34</td>
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Glycemic control

- Mean blood glucose over the first ten study days for the initial (open circles) and refined algorithm (closed circles)

Adherence to GlucoTab system

- Glycemic management
  - Insulin doses were comparable for the two versions of the algorithm
- The refined version of the REACTION algorithm could improve glycemic control without increased risk of hypoglycemia
- Adherence to insulin dosing advice generated by both algorithms was high

Conclusions