Abstract

- Continuous Glucose Monitoring (CGM) measures interstitial glucose and displays trend arrows.
- Trend Arrows provide dynamic data on the direction & rate of change of glucose, and provide an opportunity to make adjustments to prevent hypoglycaemia and hyper-glycaemia.
- Effective strategies for adjusting insulin for trend arrows are lacking.
- The JDRF CGM Study Group recommended a 10/20% adjustment (10% for 1 arrow; 20% for 2 arrows). Bolus dose is increased for up arrows, and decreased for down arrows. This requires a mathematical calculation with each arrow, limiting the tool’s uptake in paediatrics.
- We developed a Trend Arrow Adjustment Tool, based on the insulin sensitivity factor (ISF). The child only needs to remember 2 numbers, the adjustment for 1 arrow and the adjustment for 2 arrows.

Trend Arrow Adjustment Tool

<table>
<thead>
<tr>
<th>ISF mmol/L</th>
<th>↓ or ↑ (units insulin)</th>
<th>↓↓ or ↑↑ (units insulin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.5</td>
<td>3</td>
</tr>
<tr>
<td>1.5</td>
<td>1.75</td>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
<td>0.75</td>
<td>1.2</td>
</tr>
<tr>
<td>3</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>3.5-4</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>4.5-5</td>
<td>0.3</td>
<td>0.6</td>
</tr>
<tr>
<td>5.5-6</td>
<td>0.25</td>
<td>0.4</td>
</tr>
<tr>
<td>7-8</td>
<td>0.2</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Methods

- Counterbalance crossover study
- 20 subjects from CHEO diabetes clinic
- Eligibility criteria:
  - Age 5-18 yrs
  - Type 1 diabetes > 1 year
  - Use of pump and CGM for > 3 months
- Hospital visit – trend arrows triggered through exercise /juice. Standardised meal with insulin bolus adjusted for arrows using TAAT/10/20%.
- Home based assessment- subjects used TAAT/10/20%/ignored arrows for 1 week each, arrows recorded in logbook
- Carelink used to collect sensor glucose data for 4 hours after each arrow
- Analysed to determine % time glucose
  - In target 4-10mmols/L
  - Low < 3.9mmols/L;
  - High >10.1mmols/L

Results

Conclusions

- TAAT as effective as 10/20% adjustment. in achieving postprandial glucose targets
- Trend towards less hypoglycaemia with use of either tool vs ignoring arrows.
- Significantly fewer errors when TAAT used compared to 10/20% method
- TAAT was the preferred method for future use by children/youth and parents
- TAAT is a simple, well received method of adjusting insulin for CGM trend arrows.

References

4. What are the quality of life the real benefits and trends associated with real-time continuous glucose monitoring? A survey of current users. Diabetes Technology & Therapeutics, 2013
5. Use of DirectNet Applied Treatment Algorithm (DATA) for diabetes management with a real time continuous glucose monitor. Pediatric Diabetes, 2013

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