Mobile Health Tool for Long-Acting Insulin Dose Adjustment Improves Glycemia in People with Type 2 Diabetes

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INTRODUCTION

Insulin management can be an arduous process for a person with diabetes (PwD). While mobile health technologies (mHealth) have emerged to help PwDs track blood glucose (BG), whether mHealth tools can be effective for insulin management and dose titration remains unclear.

In this feasibility study, we evaluated the extent to which an mHealth app for long-acting insulin (LAI) dose adjustment can help people with type 2 diabetes make appropriate titration adjustments and improve their glycemic status.

METHODS

Fourteen participants with type 2 diabetes were prescribed a personalized LAI dosage treatment plan by a clinician. (Table 2)

<table>
<thead>
<tr>
<th>Age</th>
<th>63.5 years (mean) ± 7.5 (std)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>5 Females</td>
</tr>
<tr>
<td>Employment</td>
<td>6 Employed</td>
</tr>
<tr>
<td>LAI duration</td>
<td>2.3 years (mean) ± 2.8 (std)</td>
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</tbody>
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Table 1: Sample demographics

The LAI dose treatment plan was created using the Glooko Mobile Insulin Dosing System (MIDS). Clinicians can create a customized treatment plan in MIDS and send it to the participant through the Glooko Mobile App. This application enables clinicians to create insulin titration rules that they can subsequently send to the patient. Treatment plans varied across participants; most were based on the comprehensive type 2 diabetes management algorithm published by the American Association of Clinical Endocrinologist and the American College of Endocrinology (AACE/ACE)3.

Some participants were prescribed simple titration plans with varying fasting BG target ranges (mostly 80-120 mg/dL, some with lower and higher bounds). Titration periods ranged from 1-4 days. During the study period, which lasted between 7-23 days, participants were sent several reminders to check fasting BG and to administer insulin, as well as LAI dose change recommendations based on participants’ fasting BG and individualized treatment plan. Thirteen of the 14 patients were already on some form of LAI prior to the study; one participant was new to LAI.

RESULTS

One participant did not provide any BG data prior to the study and was excluded from the before- vs. during-study comparisons. Compared to average BG levels over a 14-day period prior to the study period, average BG levels during the study period decreased by 18.2 mg/dL (from 163.9 mg/dL to 145.7 mg/dL; P = .046). (Figure 1) The proportion of in-range BG readings (defined as 80 – 180 mg/dL)1 increased by 9% points (from 64.2% to 73.2%; P = .048). (Figure 2)

This improvement in in-range BG readings was paralleled by a reduction in the rate of hyperglycemic events (percentage of BG readings > 250 mg/dL from 14.1% to 3.2%; P = .029) (Figure 3), without a significant increase in the rate of hypoglycemic events (percentage of BG readings < 70 mg/dL from 1.3% to 3.7%; P = .830). (Figure 4)

On average, the recommended LAI dosage increased by 18.7% over initial dosage by the end of the study period (P = .013).

DISCUSSION

We observed promising evidence that a mHealth LAI dose-adjustment app can help PwDs better manage their insulin and glycemic control over just 1-3 weeks. Positive outcomes were linked to titration cycle adherence. This resonates with the broader challenge of treatment adherence in diabetes management. A clinical trial involving larger samples and longer study durations to assess the impact of a similar mHealth insulin dosing system is currently underway (NCT03091712). Overall, PwDs and their care teams have reason for optimism as mHealth continues to evolve to better augment diabetes self-management.

1 The MIDS feature is currently available for investigational Use Only. Limited by Federal (or United States) law to investigational use.
2 AACE/ACE Guidelines, Endocr Pract. 2015;21(Suppl 1).

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