A Comparison of Internet Monitoring with Continuous Glucose Monitoring in Insulin-Requiring Type 2 DM


Background
The advent of new technologies has changed how health care professionals approach diabetes management. Internet platforms have been created that enable patients to upload their SMBG data. Studies have shown that an Internet Blood Glucose Monitoring System (IBGMS) that allows patients to send their blood glucose data to their healthcare provider for review can reduce their A1C when compared to a control population utilizing only SMBG with standard care.

Objective
The purpose of this study was to compare the effects of Real-Time Continuous Glucose Monitoring (RT-CGM) and an Internet Blood Glucose Monitoring System (IBGMS) on Hemoglobin A1C levels (A1C) in patients with type 2 diabetes mellitus (T2DM) treated with insulin.

Research Design and Methods
We enrolled 57 patients with T2DM treated with insulin, either alone or in combination with oral anti-hyperglycemic agents. Inclusion criteria included a recent A1C >7.0%, Internet access, and prior training in SMBG. Patients were randomly assigned to one of two groups, IBGMS or RT-CGM. All patients were provided with a blood glucose meter (Freestyle, Abbott) and test strips for testing three times daily, and were required to perform a laboratory blood test combined with a visit to their endocrinologist at three and six month intervals. When visiting their endocrinologist, all patients were provided with standard office-based care.

Patients in the IBGMS group were trained by the research coordinator to upload their glucose readings every two weeks to a secure, commercially available website (ALR Technologies Inc, Atlanta, Georgia).

Patients in the RT-CGM group were trained by a Registered Nurse familiar with sensor technology to use the “Guardian REAL-Time Continuous Glucose Monitoring System” (Medtronic MiniMed, Inc., Northridge, CA). Both groups sent their reports to their endocrinologist every two weeks. The endocrinologist’s recommendations included changes in therapy, suggestions on testing frequency, lifestyle modifications and/or encouragement to continue with no changes.

Baseline demographic data were collected from patient charts. A1C values were measured using ADVIA Centaur Immunoassay System (Tarrytown, NY). Data were analyzed using a computerized database (Excel, Microsoft). Independent samples t-tests were used to compare the within- and between-group changes. All available data, including patients who had dropped out, were analyzed.

Results
Baseline parameters were not significantly different. After a 6 month follow up, both IBGMS and RT-CGM demonstrated significant within-group improvements in A1C (Table 1). IBGMS and RT-CGM did not show significantly different A1C levels between groups at baseline and 6 months (p > 0.05). Daily insulin dosages for both within and between group data after 6 months were not found to be significantly different from baseline. The use of both IBGMS and RT-CGM significantly improved A1C levels in patients with T2DM treated with insulin in a randomized trial over a six month period.

Table 1 – Measurement of A1C Over Study Period

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>6-months</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT-CGM</td>
<td>8.80 % ± 1.37 %</td>
<td>7.49 % ± 0.70 %</td>
<td>0.0001</td>
</tr>
<tr>
<td>IBGMS</td>
<td>8.79 % ± 1.25 %</td>
<td>7.96 % ± 1.30 %</td>
<td>0.0170</td>
</tr>
<tr>
<td>P</td>
<td>0.496</td>
<td>0.081</td>
<td></td>
</tr>
</tbody>
</table>

P = Baseline versus 6-month follow-up. P* = RT-CGM versus IBGMS

Table 2 – Total Strip Count

<table>
<thead>
<tr>
<th></th>
<th>IBGMS</th>
<th>RT-CGM</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (0-6 m)</td>
<td>428.8 ± 185.7</td>
<td>523.7 ± 124.5</td>
<td>0.044</td>
</tr>
</tbody>
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P = RT-CGM versus IBGMS

Conclusion
• IBGMS and RT-CGM improved A1C values for patients with T2DM treated with insulin.
• At 6 months no statistically significant difference was found between the groups (p > 0.05).
• With comparable efficacy as interventions, IBGMS can be seen as more favourable due to its convenience, affordability, safety and non-invasiveness.