Abstract

Objective: Glycemic control for patients with type 1 diabetes (T1D) can be achieved either through multiple daily injections (MDI) or insulin pump therapy (IPT). Currently, there is a lack of real-world data on the differences in these treatment options, particularly as they relate to patient-reported outcomes. The objective of this study was to investigate the effect of IPT on health status among patients with T1D.

Methods: Data from unique respondents from the 2009, 2010, and 2011 U.S. National Health and Wellness Surveys (NHWS) were used. Among respondents who were diagnosed with T1D and reported using insulin, those who reported using IPT were compared with those who were not using IPT on summary and domain scores of the SF-12v2 using general linear models controlling for sociodemographic and health history differences.

Results: A total of 1,441 patients reported being diagnosed with T1D and were currently using insulin. Of these patients, 379 reported using an insulin pump (26.3%). Patients using an insulin pump had been diagnosed for longer (26.8 vs. 21.2 years) and were significantly more likely to be female (53.8% vs. 43.3%), be Hispanic white (87.6% vs. 68.6%), have an annual household income of $75K or more (27.7% vs. 16.9%), and be enrolled in a private health insurance (95.0% vs. 94.6%) (all p<0.001). Adjusting for these differences, patients using an insulin pump reported significantly better physical health status (44.76 vs. 42.51, p<0.05) and health utilities (0.71 vs. 0.68). Similar significant differences were observed on domain scores of the SF-12v2.

Conclusions: Although T1D patients with greater healthcare access were more likely to use IPT, even after adjusting for these differences, a significant effect of IPT was observed on health status. These results suggest that IPT may be associated with greater real-world effectiveness, though additional research is necessary.

Introduction

Type 1 diabetes (T1D) is a chronic disease associated with the inability to produce insulin, and, subsequently, reduced glucose-uptake which results in elevated blood glucose levels. This hyperglycemia can cause a number of complications across a variety of organ systems if not properly managed.

Patients with T1D require insulin treatment to maintain glycemic control, and these treatments are administered through multiple daily injections or by using insulin pump therapy (IPT).

Currently, there is a lack of real-world data on the differences in these treatment options, particularly as they relate to patient-reported outcomes.

Methods

Data Source

Data from the 2009, 2010, and 2011 U.S. National Health and Wellness Surveys (NHWS) were used. These surveys are an annual self-administered, internet-based survey from a nationwide sample of adults (aged ≥18 years) that is stratified by sex, age, and race/ethnicity to represent the demographic composition of the US adult population.

Each year the sample size was 75,000 respondents. All respondents provided informed consent, and the study was approved by the Essex Institutional Review Board, Lebanon, New Jersey.

Sample

All unique respondents from the 2009, 2010, and 2011 U.S. NHWS were pooled together for analysis.

Since it is possible for a respondent to complete more than one survey over this three-year period, only the most recent data for a given respondent was kept in these instances.

Among the pool of unique respondents, only those who reported a diagnosis of T1D and using insulin were included.

Measures

Sociodemographics. Each respondent provided information with respect to their sex, age, race/ethnicity, marital status, household income, and health insurance status.

Health Status. Respondents also provided information as to their alcohol use, smoking behavior, exercise behavior, height and weight (used to calculate body mass index), and years diagnosed with T1D.

Health-Related Quality of Life. The Short Form-12 (SF-12v2) version 2 was used as a measure of health status.

The items of the SF-12 are used to calculate two summary scores (physical component summary and mental component summary scores) which are normed to the U.S. population (mean ± standard deviation [SD] = 50 ± 10).

The items of the SF-12 are also used to calculate eight domain scores (bodily pain, vitality, physical functioning, role-physical limitations, role-emotional limitations, mental health, social functioning, and general health) which vary from 0 to 100 and a health utility index which varies from 0 to 1.

Analyses

Chi-square tests and t-tests were used to test for sociodemographic and health history differences between patients using IPT and not using IPT.

Health status differences were examined using ordinal logistic (SLS) regression models with IPT as the independent variable and sex, race/ethnicity, marital status, household income, health insurance possession, exercise behavior, and years diagnosed with T1D as covariates.

All analyses used p<0.05 as the cutoff for statistical significance.

Results

The 1,441 patients who reported being diagnosed with T1D and were currently using insulin, 379 reported using IPT (26.3%).

Patients using IPT were more likely to be female (53.8% vs. 43.3%), non-Hispanic white (87.6% vs. 68.6%), have an annual household income of $75K or more (27.7% vs. 16.9%), and be enrolled in a private health insurance (95.0% vs. 94.6%) (all p<0.001). Adjusting for these differences, patients using an insulin pump reported significantly better physical health status (44.76 vs. 42.51, p<0.05) and health utilities (0.71 vs. 0.68). Similar significant differences were observed on domain scores of the SF-12v2.

Conclusion

These results suggest that IPT may be associated with greater real-world effectiveness, though additional research is necessary.

Table 1. Sociodemographic and Health History Differences between T1D Patients Using IPT and Not Using IPT

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Median (IQR)</th>
<th>t Test</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.4 (19.2)</td>
<td>54.3 (15.3)</td>
<td>-1.06</td>
<td>0.016</td>
</tr>
</tbody>
</table>

No significant differences were observed on the mental component summary score, which is normed to the U.S. population (mean ± standard deviation [SD] = 50 ± 10) (Table 2).

Figure 1. Adjusted Physical and Mental Component Summary Scores between T1D Patients Using IPT and Not Using IPT

Figure 2. Adjusted Health Status Domain Scores between T1D Patients Using IPT and Not Using IPT

Table 2. Diabetic Complication Differences between T1D Patients Using IPT and Not Using IPT

<table>
<thead>
<tr>
<th>Complication</th>
<th>Adjusted Mean Difference (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes Type 1</td>
<td>468.6 (p&lt;0.05)</td>
</tr>
<tr>
<td>Diabetes Type 2</td>
<td>540.3 (p&lt;0.05)</td>
</tr>
</tbody>
</table>

In summary, these results suggest that IPT may be associated with greater real-world effectiveness, though additional research is necessary.

Limitations

- All data were provided through self-report, so there may be inaccuracies in the data.
- The data were not examined for IPT use, so there may be inaccuracies in the data.
- The results of the T1D patients may not generalize to the T1D population.

Conclusions

- IPT is associated with greater real-world effectiveness, though additional research is necessary.
- Although the NHWS sample is broadly representative, the results of the T1D patients may not generalize to the T1D population.

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