

How Much Do Patients with Type 2 Diabetes Value Improvements in Dosing Convenience? Results From a Conjoint Study

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BACKGROUND

- Type 2 diabetes (T2DM) is a progressive disease that may require multiple medications to achieve or maintain glycemic targets.
- Medication adherence and persistence are important factors for effective glycemic control.
- Complexity of multiple medication regimens leads to reduced adherence to prescribed therapy and thus a loss of glycemic efficacy.
- Nonadherence to antihyperglycemic agents is associated with an increased risk of hospitalization and mortality and increased costs in patients with T2DM.
- Fixed-dose combinations of antihyperglycemic therapies were developed to reduce pill burden and improve convenience and adherence in patients with T2DM.

OBJECTIVE

To quantify the relative importance of dosing schedules to T2DM patients and to estimate patients' willingness to pay (WTP) for improvements in dosing schedules.

METHODS

Subjects

- Inclusion criteria:
 - Age 18 years or older
 - Currently taking oral T2DM medications
 - Not currently using insulin
 - Not currently using injectable T2DM medications
- Recruitment:
 - Approved by RTI International's institutional review board
 - Recruited from Knowledge Networks' Web panel in the United States in March and April 2011
 - All subjects provided online informed consent
 - Effective sample size = 1,135
 - 20 respondents had no variation in their responses to the choice questions (i.e., they always chose Medicine A or Medicine B)
 - Final sample size for treatment choice modeling = 1,115

Survey Instrument

- A Web-enabled survey instrument was used to collect information.
- Patients chose between pairs of hypothetical T2DM treatments with varying treatment attributes (Figure 1).
- Hypothetical T2DM treatments were defined by (Table 1):
 - Reduction in average glucose (AG) level from a baseline of 206 mg/dL
 - Daily dosing schedule
 - Chance of mild-to-moderate stomach problems
 - Frequency of hypoglycemic events
 - Weight change
 - Additional chance of congestive heart failure (CHF)
 - Out-of-pocket cost of the medication
- Statistical analysis used the pattern of choices to estimate implicit preference weights for treatment attributes.¹⁻³
 - Each patient was presented with 8 choice questions, each of which was followed by a rating question on treatment nonadherence.

Analysis

- Random-parameters logit was used for treatment choice modeling.^{4,5}
 - Preference weight for each attribute level
 - Relative importance of each attribute

Table 1. T2DM Treatment Attributes and Levels

Attribute	Levels
Reductions in AG levels (A1c) (Baseline: 206 mg/dL)	66 mg/dL (2.3%) 58 mg/dL (2.0%) 55 mg/dL (1.9%) 32 mg/dL (1.1%) 20 mg/dL (0.7%)
Daily dosing schedule	1 pill in the morning, 1 in the evening 2 pills in the evening 2 pills in the morning, 1 in the evening 3 pills in the morning, 3 in the evening
Chance of mild-to-moderate stomach problems	10 out of 100 people 23 out of 100 people 25 out of 100 people 30 out of 100 people
Frequency of hypoglycemic events	No hypos 1 to 2 hypos per year 1 to 2 hypos per month More than 2 hypos per month
Weight change	6-pound weight gain 3-pound weight gain No weight change 3-pound weight loss 6-pound weight loss
Additional chance of CHF	No additional chance of CHF Additional 1 out of 100 people Additional 3 out of 100 people
Out-of-pocket cost of the medication	\$0 per month \$25 per month \$100 per month \$200 per month

RESULTS

Demographic Characteristics (N = 1,135)

- Mean age: 62 years (standard deviation [SD] = 11)
- White: 78%
- Female: 46%
- Married: 64%
- College education or higher: 72%
- Employed or self-employed: 37%

Experience with T2DM (N = 1,135)

- Diagnosed with T2DM for at least 5 years: 60%
- Checked blood sugar at least once a day: 46%
- Current daily dosing schedule:
 - Once a day (25%)
 - Twice a day (67%)
 - Three times a day (6%)
- Average (median) number of prescription medications taken [SD]: 1.7 (1.0) [1.1]
- Average (median) number of pills taken a day to treat T2DM [SD]: 2.9 (2.0) [1.9]

Preference Weights (Figure 2)

- Preference weights were consistent with the natural ordering of the levels.
 - Better treatment outcomes were preferred to worse treatment outcomes.
- Preference weights indicate the relative strength of preference for each attribute level.
 - Improvement from 20-mg/dL reduction in AG to a 32-mg/dL reduction in AG had a relative importance of 0.5 (= 1.4 to 0.9).
 - Improvement from 2 pills in the morning and 1 pill in the evening to 2 pills in the evening had a relative importance of 0.3 (= 0.2 to -0.1).

Importance Weights (Figure 3)

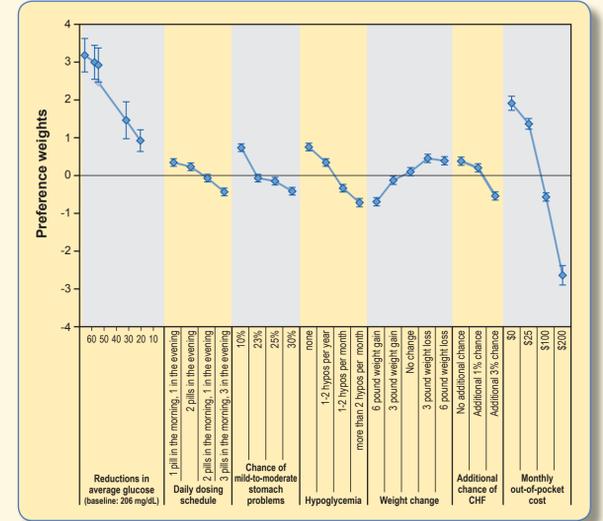
- Monthly out-of-pocket cost of medication was the most important attribute, assigned an importance weight of 10.
- Remaining attributes (importance weight) in decreasing order of importance were:
 - Reductions in AG (5.0)
 - Frequency of hypoglycemia events (3.2)
 - Chance of mild-to-moderate stomach problems (2.5)
 - Weight change (2.5)
 - Additional chance of CHF (2.0)
 - Daily dosing schedule (1.7)

Willingness to Pay (Table 2)

- WTP is the mean maximum monetary equivalent of an improvement in treatment outcomes.
 - Patients were willing to pay \$35.52 monthly to move from 3 pills twice daily to 1 pill twice daily.
 - Patients were willing to pay \$30.72 monthly to move from 3 pills twice daily to 2 pills once daily.

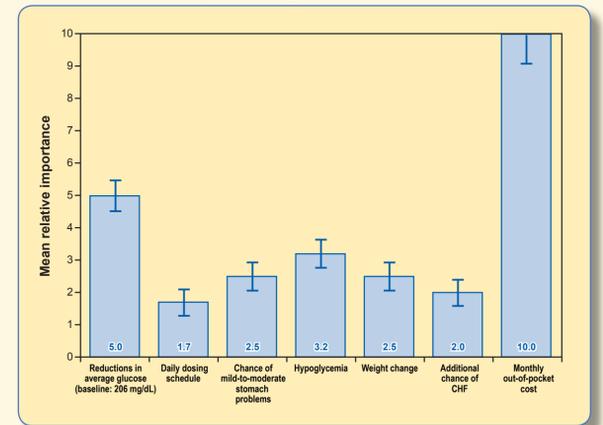
Figure 1. Example Choice Question

Figure 2. Preference-Weight Log Odds Relative to Mean Effect of Zero (N = 1,115)



Note: Vertical bars denote 95% confidence intervals.

Figure 3. Attribute Relative Importance Weights (N = 1,115)



Note: Vertical bars denote 95% confidence intervals.

Table 2. Willingness-to-Pay Estimates for Improvements in Daily Dosing Schedule (N = 1,115)

Improvements in Daily Dosing Schedule		WTP (95% CI)
From	To	
3 pills in the morning, 3 in the evening	1 pill in the morning, 1 in the evening	\$35.52 (\$25.65, \$44.89)
3 pills in the morning, 3 in the evening	2 pills in the evening	\$30.72 (\$21.18, \$40.05)
3 pills in the morning, 3 in the evening	2 pills in the morning, 1 in the evening	\$17.66 (\$9.37, \$29.11)
2 pills in the morning, 1 in the evening	1 pill in the morning, 1 in the evening	\$20.61 (\$12.72, \$30.58)
2 pills in the morning, 1 in the evening	2 pills in the evening	\$14.55 (\$7.70, \$25.90)
2 pills in the evening	1 pill in the morning, 1 in the evening	\$6.05 (-\$9.96, \$14.75)

CI = confidence interval.

CONCLUSIONS

- Patients with T2DM were willing to accept tradeoffs among treatment efficacy, treatment-related side effects, and treatment cost.
- Although somewhat less important than other factors associated with oral antihyperglycemic therapy, reducing pill burden through reductions in the frequency of dosing or number of pills per dose is meaningful and of value to patients with T2DM.

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DISCLOSURE

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