Patient Preferences for Frequency of Glucagon-Like Peptide-1 Receptor Agonist (GLP-1RA) Injections in the Treatment of Type 2 Diabetes

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Objectives

- To elicit preferences of injection-naïve patients with type 2 diabetes mellitus (T2DM) for features of glucagon-like peptide-1 receptor agonist (GLP-1RA) injections using a discrete-choice experiment (DCE)
- To test for effect of injection frequency on patient preferences

Materials and Methods

Study Population

- Inclusion criteria:
  - Aged 18 years or older
  - Currently residing in the United States
  - Self-reported physician diagnosis of T2DM
  - Not currently using an injectable treatment for T2DM
- All Global, a survey research company, recruited members from existing online panels
- All participants provided informed consent

Survey Instrument

- A web-enabled survey instrument was developed to administer a DCE following good research practices[1]
  - DCEs, also known as choice-format conjoint analyses, are a valid and reliable approach for quantifying preferences for health interventions[2-4]
  - DCEs provide preference information by recording choices between treatment options, defined in terms of general treatment features (attributes) and the type of each feature (levels)
  - Survey instrument validation included open-ended interviews with 19 patients with T2DM in the United States
- After reviewing patient instructional materials for the currently approved daily and weekly GLP-1RA injectable treatments and conducting qualitative interviews with patients, six attributes were selected to describe the available treatment options (Table 1)
  - Each attribute was described in detail in the survey instrument, and pictures were used to present each level in the choice questions
  - The pain levels describing the two needles were informed by a recent study on reported injection-pain intensity[5]
- Each patient was presented with 10 questions, each including a choice between pairs of designed hypothetical medication profiles (Figure 1)
- An experimental design was used to create the hypothetical medication profiles and profile pairs included in each choice question
- The experimental design:
  - Was developed using SAS Version 9.3 based on a D-efficiency criterion[6,7]
  - Included 40 choice questions, split into four blocks of 10 questions
  - Randomly assigned each patient to a block
- In addition to the data from the choice questions, patient demographic information (e.g., age, gender) and items describing patients' experiences with T2DM and T2DM treatments were collected

Table 1. Attributes and Levels for the Choice Questions

Attribute	Levels
Injection frequency	Once a week
	Once a day
Injection device	Multiple-use pen
	Single-use vial and syringe
	Single-use pen
Needle you use to inject the medicine[a]	Shorter and thinner
	Longer and thicker
Pain associated with the injection[a]	0.21 (less than 1) on a scale from 0 to 20. Between a faint pain sensation and no pain sensation
	3.54 on a scale from 0 to 20. A very weak pain sensation
Need to store the medicine in a refrigerator until the first and/or only use	No
	Yes
Bumps or nodules around the injection site	No
	Yes

[a] The two needle levels were always shown with a corresponding level for pain associated with that needle type; that is, the lower level of pain always appeared with the shorter and thinner needle

Figure 1. Example Choice Question

Analyses

- A random-parameters logit model was used to estimate preference weights for the main effect of frequency and the interactions between frequency and the levels of each of the remaining attributes
  - Separate parameters were not estimated for the pain attribute, because the levels of the pain attribute are perfectly correlated with the levels of needle size
- Preference weights were used to:
  - Calculate the relative importance of each injectable medication feature
  - Calculate predicted choice probabilities that patients would choose a weekly injection versus a daily injection if both options had the same characteristics for all possible profiles included in the design

Results

- Of those eligible injection-naïve patients who consented to participate, 184 patients answered at least one choice question and were included in the analysis
- Table 2 reports baseline patient and disease characteristics

Table 2. Patient and Disease Characteristics (N = 184)

Category	Injection-Naïve Patients
Female	50.0%
Mean age (standard deviation)	60.8 (11.0)
≥ 5 years since diagnosed with T2DM	64.1%
Management of diabetes[a]	
Tries to eat a healthy diet to control blood sugar levels	87.0%
Tries to stay physically active to control blood sugar levels	67.4%
Takes pills or tablets prescribed by doctor to control blood sugar levels	81.5%
Takes pills or tablets to treat T2DM more than once a day	53.8%
Has been taking pills or tablets to treat T2DM for ≥ 5 years	47.8%
Most recent HbA1c level[b]	
< 7%	59.8%
7%-9%	21.7%
> 9%	2.2%

[a] Percentages do not sum to 100% because patients could provide multiple responses
[b] Percentages calculated including patients with missing data

Relative Importance

- Figure 2 displays the relative importance of changing from daily to weekly injections and the relative importance of changes in the remaining treatment features for each level of injection frequency
  - The vertical bars surrounding each mean relative importance weight denote the 95% confidence interval about the point estimate
- The most important treatment feature was injection frequency
  - Patients preferred weekly injections to daily injections, all else equal
  - Preferences for all other attributes depended on injection frequency
- The relative importances can be compared with each other
  - The relative importance of injecting weekly instead of daily (independent of the effect of injection frequency on preferences for other attributes) was approximately 4.7
  - Switching injection device from a daily single-use pen to a daily multiple-use pen had a relative importance of approximately 0.4
  - Therefore, the change in injection frequency from daily to weekly was more than 10 (= 4.7 ÷ 0.4) times as important as the change from a daily single-use pen to a daily multiple-use pen

Predicted Choice Probabilities

- Table 3 presents the predicted probability that patients would choose a weekly injection versus a daily injection if both options had the same characteristics
  - For each possible combination of device, needle size, need for refrigeration, and bumps or nodules, we calculated the proportion of patients who likely would choose a weekly version of the hypothetical medication and the proportion of patients who likely would choose a daily version of the hypothetical medication
  - For example, if these patients were offered a weekly version and a daily version of a medication injected using a multiple-use pen with a shorter and thinner needle that did not require refrigeration and did not result in bumps or nodules, 61% would choose the weekly alternative and 39% would choose the daily alternative
- In all 24 possible sets of characteristics, the predicted probability of choosing a weekly injection is greater than the predicted probability of choosing a daily injection

Table 3. Predicted Choice Probabilities for Identical Profiles, by Injection Frequency

Injection Device			Needle Size		Need to Store in a Refrigerator		Bumps or Nodules		Predicted Choice Probability	
Multiple-Use Pen	Single-Use Vial and Syringe	Single-Use Pen	Shorter and Thinner	Longer and Thicker	No	Yes	No	Yes	Weekly Injection	Daily Injection
X			X		X		X		61.0%	39.0%
X			X		X			X	83.0%	17.0%
X			X			X	X		84.2%	15.8%
X			X			X		X	94.3%	5.7%
X				X	X		X		87.2%	12.8%
X				X	X			X	95.5%	4.5%
X				X		X	X		95.9%	4.1%
X				X		X		X	98.6%	1.4%
	X		X		X		X		85.8%	14.2%
	X		X		X			X	95.0%	5.0%
	X		X			X	X		95.4%	4.6%
	X		X			X		X	98.5%	1.5%
	X			X	X		X		96.4%	3.6%
	X			X	X			X	98.8%	1.2%
	X			X		X	X		98.9%	1.1%
	X			X		X		X	99.6%	0.4%
		X	X		X		X		69.6%	30.4%
		X	X		X			X	87.7%	12.3%
		X	X			X	X		88.6%	11.4%
		X	X			X		X	96.1%	3.9%
		X		X	X		X		90.9%	9.1%
		X		X	X			X	96.9%	3.1%
		X		X		X	X		97.1%	2.9%
		X		X		X		X	99.1%	0.9%

Limitations

- Patients were asked to choose between hypothetical treatments, but differences can arise between stated choices and actual treatment decisions
- T2DM diagnosis and current treatment were reported by the patient and not confirmed by a physician
- Patients who participated in the survey may have different preferences from patients who did not participate

Conclusions

- The most important feature of injectable treatments for T2DM when choosing among hypothetical treatments was injection frequency; patients preferred weekly injections over daily injections
- Preferences for the other treatment features depended on injection frequency; less desirable injection features were statistically significantly less important to patients if injections were weekly instead of daily
  - For example, a larger and thicker needle was less undesirable if injections were weekly instead of daily
- For all possible injection profiles included in the experimental design, a greater proportion of patients preferred a weekly injection compared with a daily injection

Disclosure

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Figure 2. Relative Importance of Changes in Treatment Features in Injection-Naïve Patients (N = 184)

Note: The vertical bars surrounding each mean relative importance weight denote the 95% confidence interval about the point estimate