Risking Health to Avoid Injections

Preferences of Canadians with type 2 diabetes

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Improved glycemic control reduces the risk of long-term diabetes complications (1–3). However, subcutaneous insulin injections represent a barrier to achieving “optimal” blood glucose levels, particularly among type 2 diabetic patients (4). Indeed, some patients even delay initiation of therapy to avoid injections (5). This study used conjoint analysis to quantify the relative importance that Canadian patients with type 2 diabetes place on short-term treatment outcomes and on the frequency of insulin injections.

RESEARCH DESIGN AND METHODS — A total of 1,886 patients enrolled in a Canadian consumer panel (n = 70,000) were mailed a questionnaire. Study entry criteria were age ≥18 years and self-reported type 2 diabetes.

The choice format conjoint questionnaire was designed to reveal the relative importance patients place on various health outcomes and treatment attributes associated with insulin therapy. This format offers advantages over other methods of quantifying health care preferences (6–11). The questions comprised 12 hypothetical treatment choices, including varying numbers of daily insulin injections using an insulin pen (one to three injections), levels of glucose control (optimal, suboptimal, and poor as fasting plasma glucose levels of 4–7, 7.1–10, and >10 mmol/l, respectively), HbA1c (A1C) levels (<7, 7–8.4, and >8.4%), and numbers of mild-to-moderate hypoglycemic events per month (<1, 1–2, >2). Insulin pens were chosen over other methods of subcutaneous insulin delivery because they are the predominant method used in Canada (12). One alternative in each question was a constant reference condition. For patients using insulin, all attributes of the constant reference condition were set to the patient’s current treatment; for insulin-naïve patients, the reference condition represented standard treatment for patients new to insulin (one injection per day of insulin plus oral antidiabetic agents and 1–2 hypoglycemic events per month) and the patient’s current level of glucose control.

Conditional logit analysis (13) was used to estimate absolute importance weights for improvements in attribute levels, namely reducing injection frequency from three times a day twice a day, reducing injection frequency from twice a day to once a day, improving glucose control from “poor” to “suboptimal,” and improving glucose control from “suboptimal” to “optimal.” Importance weights were expressed relative to the largest estimated mean importance weight difference, which was assigned a value of 1. The level of significance was set at P < 0.05.

RESULTS — We obtained and analyzed a regionally and culturally representative sample of 936 eligible Canadian diabetic patients. Approximately half (49.64%) of the mailed surveys were returned. The sample included 179 French-language surveys, 45 English-language surveys from Quebec, and 712 English-language surveys from other provinces. Patient characteristics are shown in Table 1.

For determination of relative importance weights, patient data were stratified according to insulin use (naïve versus experienced), sex, and age (Table 1). The largest importance weight (set to 1) was for improving glucose control from “suboptimal” to “optimal” among patients aged 18–44 years. For all patients (P = 0.0298), on average, and all subgroups, the relative importance weight for improving glucose control from “poor” to “suboptimal” was greater than the relative importance weight for improving glucose control from “suboptimal” to “optimal” (P values for the subgroups are as follows, corresponding to the order of the subgroups in Table 1: 0.0890, 0.1347, 0.2277, 0.3468, 0.5095, 0.6220, 0.1909, 0.0779, and 0.2114). For all patients, on average, and for most subgroups, the relative importance weight for reducing the number of injections from twice a day to once a day was greater than the relative importance weight for reducing the number of injections from three times a day to twice a day. The reverse was true for patients using insulin and for patients aged 18–44 years.

A comparison of the relative importance weights for reducing the number of injections from twice a day to once a day with those for improving glucose control from “suboptimal” to “optimal” levels showed that, on average, reducing the number of injections was as important as improving glucose control for all patients. Both improvements are equally important among male and female patients, although the mean value for reducing the number of injections from twice a day to once a day is greater for men than for women.

Among insulin-experienced patients, the mean relative importance weight for improving glucose control was positive and significant (P < 0.0001 for both improvements), while the relative importance weight for reducing the number of injections was zero (P = 0.0159 for reducing from three times a day to twice a day, 0.9436 for reducing from twice a day to once a day). In contrast, among insulin-
naïve patients, the mean relative importance weight for reducing the number of injections was 1.61 times higher than the mean relative importance weight for improving glucose control, but this was not statistically significantly different. The relative importance weight for reducing from three times a day to twice a day was significantly different from that for improving glucose control \( (P = 0.1380) \); however, reducing from twice a day to once a day was significantly different from improving glucose control \( (P = 0.0007) \).

Relative importance weights for reducing the number of injections were stable across all age-groups. In contrast, the mean relative importance of improving glucose control declined with advancing age.

**CONCLUSIONS** — To the best of our knowledge, this is the first study to quantify the relative importance of various aspects of insulin therapy. Canadian patients with type 2 diabetes place significant value on reducing the number of daily insulin injections and on improving glucose control. On average, patients indicated that reducing the number of injections from twice a day to once a day is as important as improving glucose control from “suboptimal” to “optimal” levels. For most patients, reducing the frequency of insulin injections from three times a day to twice day was less important than reducing the frequency from twice a day to once a day. Most patients perceived that improving glucose control from “poor” to “suboptimal” levels was significantly more important than improving control from “suboptimal” to “optimal” levels. This may be due to the greater risk of complications in poorly controlled versus suboptimally controlled patients and to the fact that poor control may be associated with noticeable symptoms, whereas suboptimal control is probably not.

Insulin-experienced patients place significant value on improving glucose control and much less value on reducing the frequency of injections. In contrast, insulin-naïve patients perceived reducing the frequency of insulin injections from twice a day to once a day to be as important as improving glucose control from “suboptimal” to “optimal.” This latter result is disconcerting in view of the clinical importance of maintaining “optimal” glycemic control. More intensive and persuasive diabetes education may be needed to better impart the importance of glucose control, while less burdensome methods of insulin delivery may remove this barrier to effective insulin therapy. Either strategy may also encourage earlier initiation of insulin therapy among insulin-naïve type 2 diabetic patients.

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**References**

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