

Perceived Medication Benefits and Their Association with Interest in Using Inhaled Insulin in Type 2 Diabetes: A Model of Patients' Cognitive Framework



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ABSTRACT

This study examined predictors of patient perceived relevance of different diabetes medication benefits and how medication benefit ratings of an inhaled insulin were associated with evaluation of, and interest in, that inhaled insulin.

The study was an Internet survey of a US national sample (N=1094) of adults with type 2 diabetes using different medication regimens. Patients were given a brief description of potential clinical benefits and administration procedures for the study inhaled insulin (based on Technosphere® Insulin, MannKind Corporation). Measures included indicators of medication needs (e.g., weight worry), relevance of potential benefits (e.g., avoiding weight gain), ratings of potential benefits and overall evaluation of the study inhaled insulin relative to patients' current medication, and interest in the study inhaled insulin. Multivariate regression assessed independent associations controlling for demographic and disease characteristics.

Relevance of potential medication benefits was dependent on patient needs: avoiding postprandial hyperglycemia (PPH) was associated with more frequent hyperglycemia and worse perceived diabetes control; avoiding hypoglycemia was associated with more frequent hypoglycemia and fear of hypoglycemia; avoiding weight gain was associated with higher BMI and more weight worry; avoiding discomfort/inconvenience was associated with more perceived treatment restrictions and more negative perceptions of injection. Ratings of the study inhaled insulin for efficacy in avoiding PPH and discomfort/inconvenience were associated with overall evaluation of and interest in the study inhaled insulin; rating of efficacy for avoiding weight gain also was associated with overall evaluation of the study inhaled insulin.

Patients differed in the relevance of different potential benefits; relevance was based on objective and subjective indicators of personal need. Perceived efficacy of the study inhaled insulin for avoiding postprandial hyperglycemia and discomfort/inconvenience were the benefits most strongly related to the evaluation of and interest in the study inhaled insulin.

INTRODUCTION / BACKGROUND

"Drugs don't work in patients who don't take them." (C. Everett Koop, former Surgeon General of the United States).

Medication adoption is clearly the critical juncture in medication use; patients cannot adhere, intensify or persist in using a medication they do not initiate. We propose that two processes are key to better understanding patient adoption of diabetes therapies: 1) what determines the relevance of particular medication benefits to patients, and 2) what benefits are important to patients in comparing which of the relevant medications they will choose/accept. When making an initial decision about medication adoption, patients do not have a personal experience with any medication they have not already used themselves, but they do know what their current situation is, so that their perceived needs may play critical role in the adoption process.

We propose to examine four potential benefits of an inhaled insulin – avoidance of (a) postprandial hyperglycemia, (b) hypoglycemia, (c) weight gain, and (d) discomfort/inconvenience. Specifically, we will examine: 1) factors associated with the relevance to patients of these perceived benefits, and 2) how ratings of these perceived benefits for an inhaled insulin [compared to patients' current therapy] are associated with overall assessment of that medication, including interest in using that medication if it were available.

Based on earlier research, we hypothesize that:

1. Patient characteristics indicating need for a particular benefit will be most strongly associated with the relevance of the corresponding benefit (e.g., perceived glucose control and frequency of hyperglycemia with the importance of avoiding hyperglycemia);
2. Among potential medication benefits, clinical efficacy (avoiding hyperglycemia) and avoiding injection-related discomfort and inconvenience will be the benefits most strongly associated with higher ratings of and interest in using the study inhaled insulin.

METHODS

- The study population was adults from a consumer research panel who self-reported having been diagnosed with type 2 diabetes, nationally representative with regard to age, ethnicity, and geographic location, as well as use of insulin and oral diabetes medication.
- Potential study participants received an e-mail message inviting them to participate in an Internet survey.
- Exclusion criteria included: using an insulin pump, taking an injected medication other than insulin, having used inhaled insulin, not taking diabetes medication, or having lung problems (asthma, reduced lung capacity, any treated lung disease, smoking history).
- Respondents answered questions about demographic, disease and health care characteristics, and health-related beliefs. Participants were then given a description of the study inhaled insulin, after which they assessed this medication (see Measures below). The description was based on Technosphere inhaled insulin (AFREZZA™), indicating the potential clinical benefits and the administration procedure, along with a picture of the inhaler (Figure 1).

METHODS (CONTINUED)

Measures

Health-related beliefs. The questionnaire incorporated four measures (scored 100 to 0), with each multi-item measure calculated as the mean of component items:

- Negative perceptions of injections (5 items, alpha = .74).
- Treatment restrictions on lifestyle (2 items, alpha = .71).
- Weight worry (4 items, alpha = .74).
- Fear of hypoglycemia (1 item).
- Perceived lack of diabetes control, with higher scores indicating worse control (3 items, alpha = .71).

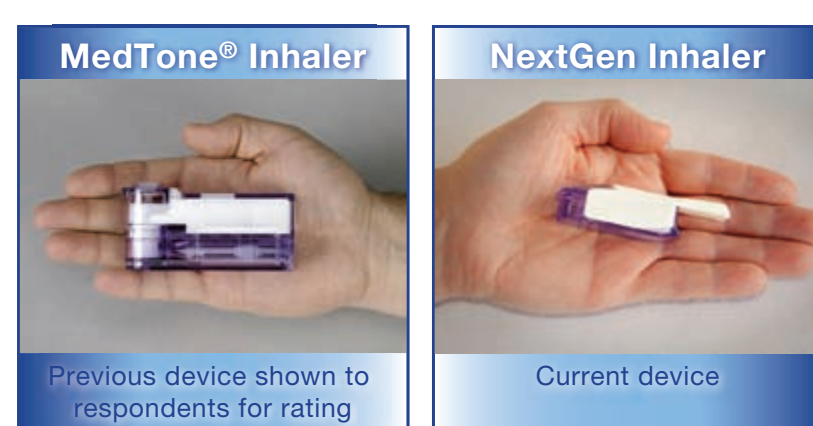
Relevance of medication benefits. There were four single-item measures, each indicating how relevant one of the following benefits was to the patient; response options ranged from "extremely relevant" (= 100) to "not at all relevant" (= 0).

- Avoiding high blood sugars after meals.
- Avoiding low blood sugar.
- Avoiding weight gain.
- Avoiding discomfort and inconvenience.

Study medication assessment. There were seven single-item measures.

- Four measures compared the study inhaled insulin to the patient's current treatment, one item for each of four potential benefits. There were 5 response options ranging from the study inhaled insulin being "much better" (= 50) to "much worse" (= -50) with a midpoint of "about the same" (= 0).
- One item asked for an overall evaluation comparing the study inhaled insulin to the patient's current treatment (with identical response options and scoring as the four items above).
- Interest in using the study inhaled insulin, if it were to become available, was rated using a 5-point scale from "extremely interested" (= 100) to "not at all interested" (= 0).
- Impact of the availability of the study inhaled insulin on willingness to initiate insulin use (asked only among those not currently using insulin) was assessed with a 5-point response scale ranging from "much more willing" (= 50) to "much less willing" (= -50), with a midpoint of "neither more or less willing" (= 0).

FIGURE 1



RESULTS

Characteristics of the study population are presented in Table 1. The main results were obtained by multiple regression analysis of: (1) the relevance of each of the four medication benefits, (2) the overall rating of the study medication, and (3) interest in using the study medication. These analyses included controls for all demographic, health care, disease, and belief factors listed in Table 1.

- All factors indicating need for a particular benefit were associated with the relevance of that benefit.
 - Avoiding postprandial hyperglycemia was associated with more frequent hyperglycemia and worse perceived diabetes control.
 - Avoiding hypoglycemia was associated with more frequent hypoglycemia and fear of hypoglycemia.
 - Avoiding weight gain was associated with higher BMI and more weight worry.
 - Avoiding discomfort/inconvenience was associated with more perceived treatment restrictions and more negative perceptions of injection.
 - Two subjective indicators of need were associated with relevance of a benefit other than hypothesized – treatment restrictions was associated with relevance of avoiding hyperglycemia and weight worry was associated with relevance of avoiding hyperglycemia and hypoglycemia.
- Although all medication benefits had significant relationships to both overall assessment measures prior to their entry into the model, when entered together to assess independent associations only avoiding high blood sugars after meals and avoiding discomfort and inconvenience remained significantly associated with both interest in and overall evaluation of the study medication; avoiding weight gain remained significantly associated with overall evaluation of the study medication.

RESULTS (CONTINUED)

TABLE 1

Sample Profile	
Measures	Total (n = 1094)
Demographics	
Age (years)	57.4 ± 10.5
Female	50.6 (554)
Race/Ethnicity	
White	77.6 (849)
Black	11.2 (123)
Hispanic	8.0 (87)
Other Race	3.2 (35)
Education	5.1 ± 1.6
Income (thousands of \$)	51.1 ± 35.8
Health Care	
<i>Health Care Provider</i>	
PCP	82.4 (902)
Endocrinologist	15.0 (164)
Other HCP	2.6 (29)
<i>Health Insurance</i>	
No Insurance	6.2 (68)
Private Insurance	69.4 (760)
Medicare Insurance	10.3 (113)
Military Insurance	7.2 (79)
Medicaid Insurance	6.8 (75)
Disease	
Pen Use	9.7 (106)
Duration of DM	10.1 ± 8.3
<i>Hypoglycemia</i>	
NA	8.5 (93)
None	30.3 (332)
Occasionally	53.7 (587)
Frequently	7.5 (82)
<i>Hyperglycemia</i>	
NA	8.5 (93)
None	16.4 (179)
Occasionally	49.4 (540)
Frequently	25.8 (282)
BMI	35.9 ± 8.6
No. of Comorbidities	2.1 ± 1.3
Depression	18.6 (204)
Beliefs	
Poor DM Control	33.7 ± 18.2
Hypoglycemia Fear	41.7 ± 30.1
Weight Concern	54.6 ± 24.0
Negative Injections	42.9 ± 24.3
Treatment Restrictions	36.0 ± 27.3
Study Medication Benefit Relevance	
Avoid High BG	70.8 ± 28.1
Avoid Low BG	63.8 ± 30.8
Avoid Weight Gain	72.2 ± 30.1
Avoid Discomfort & Inconvenience	65.6 ± 31.3
Study Medication Benefit Rating	
Avoid High BG	18.0 ± 20.9 ^a
Avoid Low BG	15.9 ± 21.0 ^a
Avoid Weight Gain	19.5 ± 22.2 ^a
Avoid Discomfort & Inconvenience	20.1 ± 23.4 ^a
Study Medication Assessment	
Comparison to Current Medication	18.9 ± 24.6 ^a
Interest in Using	68.5 ± 27.9
Impact on Insulin Initiation	28.7 ± 23.1

Note: Cell entries are mean ± standard deviation or % (n).

NA: Not Ascertained.

^a Mean is significantly (p < 0.001) different from rating of no difference from current medication (= 0).

DISCUSSION

This study yields several findings regarding correlates of diabetes medication benefit relevance:

- The relevance of potential medication benefits is independently related to each of the categories of factors examined in the study – patient demographic characteristics, disease traits and experiences, and health-related beliefs.
- The relevance of several potential benefits of diabetes medications tends to vary consistently with a number of patient characteristics. That is, any given factor (e.g., female sex) tends to be associated in the same direction, albeit to a greater or lesser degree, with the relevance of each benefit examined.
- The strongest correlates of the relevance of a benefit are the objective and subjective indicators of need for that benefit. Moreover, few of the need factors were associated with the salience of a benefit other than that for which it indicates need; thus, these associations exhibit both sensitivity and specificity.

The study also yields several findings regarding correlates of overall assessment of the study medication compared to patients' current treatment.

- The findings generally parallel those reported above for benefit relevance; the overall assessment measures are independently related to every category of factor examined in the study, and they tend to vary consistently with patient characteristics.
- Both objective and subjective factors indicative of need for medication benefits are associated with overall assessment of the study inhaled insulin even when ratings of the benefits of that medication are controlled.
- Among the benefit ratings only avoiding high blood sugars after meals and discomfort/inconvenience have consistently strong independent relationships with overall assessment of the study medication; avoiding weight gain has a weaker and less consistent, albeit significant, independent relationship.

Summary

- Taken together these two sets of findings help identify which medication benefits are most important to patients. Results suggest that patients will evaluate diabetes medications primarily in terms of their ability to control postprandial hyperglycemia and reduce discomfort and inconvenience.
- The current study indicates that avoiding discomfort and inconvenience may have an impact of roughly the same size as efficacy in controlling postprandial hyperglycemia.
- In earlier studies we found that the impact of convenience on facilitating better self-care was a major factor in patients' and physicians' decisions about initiation of diabetes treatment. Thus, convenience should not be dismissed as unimportant from a clinical or payor perspective.

Research Implications

- We need additional research to examine the benefit profiles of different medications and the trade-offs patients make in choosing medications. The ultimate goal of such research should be to determine whether these benefit profiles affect real-life decisions and actions, such as medication initiation, adherence, intensification, and persistence.

Clinical Implications

- Patients may choose their diabetes medications based on the benefits identified here – avoiding high blood glucose and discomfort/inconvenience, so it is important not to underestimate the demands made by the treatment regimen; uncomfortable and inconvenient treatments may be rejected by patients even if they are effective.
- Respondents not taking insulin in this study indicated that they would more willing to initiate insulin therapy if a more convenient insulin delivery system that provided good glucose control were available.

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