

Patient expectations of hypertension and diabetes medication: Excessive focus on short-term benefits

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Abstract

Objectives: The objectives of this study are to assess patient perspectives on their perceived benefits of hypertension and diabetes medications and determine associations between perceived benefits and demographics, adherence, and disease control.

Methods: We interviewed 60 adults with type 2 diabetes and hypertension on oral medications. Participants were asked what benefits they expected from taking their medications. Transcripts were analyzed using a modified template approach. Benefits were categorized into short-term, long-term, or misconceptions (e.g. “medications cure diabetes”). Associations between perceived benefits and demographics, adherence, hemoglobin A1c, and blood pressure were analyzed.

Results: In general, participants had relatively high self-reported medication adherence and well-controlled disease. All participants identified benefits of their hypertension medications; however, only 85% identified benefits of their diabetes medications. Half described only short-term benefits (e.g. lower blood sugar) (48%); almost one-third described both short- and long-term benefits (e.g. prevent complications) (30% and 28%, respectively). In multivariate analysis, participants with higher comorbidity were more likely to name long-term benefits of hypertension medications (odds ratio 13.3 (1.8–97.8), $p=0.01$).

Discussion: Participants perceived short-term benefits of hypertension and diabetes medications more often than long-term benefits; participants with higher comorbidity identified more long-term benefits. Further studies are warranted to determine whether additional education on long-term benefits may improve adherence.

Keywords

Patient beliefs, medication adherence, time perspective, diabetes, hypertension

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Introduction

Hypertension and type 2 diabetes are chronic diseases that increase the risk for morbidity and premature death through complications, such as cardiovascular disease and stroke.^{1,2} Many people with hypertension and diabetes have suboptimal blood pressure and glycemic control,^{3,4} which has been associated with low medication adherence.^{5–7} In addition, previous studies have shown that people who believe that medications are necessary and important have better medication adherence, whereas people who are concerned about the side effects of medications have lower adherence.^{8–11} Few studies have classified the perceived benefits people expect from their chronic disease medications. Perceived benefits

can be categorized into short-term benefits, as in the immediate benefits of medications (e.g. blood pressure lowering), or long-term benefits, as in benefits that are expected to occur in the distant future (e.g. decreased risk of complications). Details about the perceived short-term and long-term benefits people expect from their medications could be an important

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driver of both treatment initiation and long-term adherence and thereby impact disease control for chronic diseases.¹²

We conducted a *pilot* study to understand (1) participants' perceived benefits of hypertension and diabetes medications and (2) associations between their perceived benefits and demographics (age, gender, race/ethnicity, marital status, education, income, comorbidity, duration of disease), medication adherence, and disease control. Patient demographics can impact health (e.g. higher risk of hypertension in older patients) and healthcare (e.g. more access to subspecialists with higher income or more health literacy with higher education). We analyzed these demographics to see whether they also affect how well patients understand their medications. We chose to include adherence and disease control in the analysis to see how understanding of medications translates to those desired downstream effects. We hypothesized that participants who recognized the long-term benefits of their diabetes and hypertension medications would be more adherent and have better disease control.

Methods

Participants

This study was part of a larger study^{13,14} and was intended to provide information to guide the design for a future trial aimed at improving hypertension and diabetes control by understanding patient-related barriers to medication intensification. The Institutional Review Board of The University of Chicago approved the study (protocol #12-1743). A priori, we intended to enroll 60 participants, which we assumed based on prior literature would be a sufficient sample to achieve theme saturation and provide preliminary data.^{15–17}

Patients were selected from the primary care clinic of an urban academic medical center between August 2012 and July 2013. Because the larger study was focused on understanding how patient decision-making was affected by receiving information about the long-term benefits of early diabetes and hypertension control,¹³ the study enrollment was limited to patients with *diabetes and hypertension*. Patients were eligible if they were English-speaking adults, 40–70 years old with both type 2 diabetes for less than 10 years and hypertension for any duration, and if they were taking oral medications for both conditions. Patients were excluded if they were taking insulin, diagnosed with a terminal illness (end-stage renal failure, liver failure, active non-skin cancer), cognitive impairment, or history of stroke or were unable to give informed consent. Because our recruitment site cares for a majority of non-Hispanic Black patients, we used quota sampling to oversample non-Hispanic Whites. Patients meeting inclusion and exclusion criteria were identified by a review of their electronic medical record. Potential participants were contacted via telephone for pre-screening. If eligible, participants were scheduled for in-person interviews.

Procedure

In-person, semi-structured interviews were conducted, audiotaped, and transcribed. Interviews were conducted and informed consent was obtained by two trained interviewers. For this study, our main measure was the participant's description of hypertension and diabetes medication benefits. We asked about these benefits separately because evidence from a major trial of patients with type 2 diabetes found that hypertension and diabetes control affected complication rates at significantly different time periods (3 and 10 years, respectively).^{18–20} All participants were asked the following open-ended questions: "What benefits do you expect to receive from taking high blood pressure medicine?" and "What benefits do you expect to receive from taking diabetes medicine?" For each question, the interviewer encouraged participants to name as many benefits as they were able to, until they stated that they could not recall any additional benefits. Medication adherence for both conditions was assessed by asking participants to report how many days they had missed their medicines in the last 7 days; adherence for each condition was asked separately.²¹ Data on age, gender, race/ethnicity, marital status, education, income, comorbidity, and duration of disease were also collected. Other diagnoses and the most recent hemoglobin A1c and blood pressure values were collected for all participants from the electronic medical record. On average, interviews lasted about 1 h.

Statistical approach

We analyzed qualitative data using a modified template approach.²² Text coding was guided by an initial codebook that was further developed and amended during data review. At least three trained reviewers independently reviewed and coded each transcript based on recurring concepts and themes. Reviewers discussed any discrepancies until consensus. Participant responses were then characterized by clinician experts (D.S.G., N.L.) into one of three categories: short-term benefits, long-term benefits, or misconceptions (i.e. benefits that are not supported by clinical evidence (e.g. "diabetes medications cure diabetes")). These responses were reviewed by both clinician experts and discussed until consensus was reached. ATLAS.ti was used to organize qualitative data.

Chi-square and Fisher exact tests were used to assess associations between medication benefits and participant demographics, medication adherence, and disease control. Because of the small sample size, participant data were dichotomized at the median response: age (<60 years vs ≥60 years); marital status (married/coupled vs all others); education (high school, some college, or associates/technical degree vs bachelor's degree or more); income (<US\$50,000 vs ≥US\$50,000); duration of hypertension (<10 years vs ≥10 years); and duration of diabetes (<4 years vs ≥4 years). A question about

Table 1. Characteristics of adult participants with type 2 diabetes and hypertension on oral medications from a primary care clinic of an urban, academic medical center (N=60).

Characteristic	
Age in years, mean (SD)	60.8 (6.3)
Female, n (%)	39 (65.0)
Race, n (%)	
Non-Hispanic Black	35 (58.3)
Non-Hispanic White	19 (31.7)
Hispanic	4 (6.7)
Asian or Pacific Islander	2 (3.3)
Marital status, n (%)	
Married, coupled	31 (51.7)
Divorced, separated, widowed	18 (30.0)
Single	11 (18.3)
Education, n (%)	
High school degree or less	10 (16.7)
Some college, associate degree, or technical program	24 (40.0)
College degree or more	26 (43.3)
Annual income, n (%)	
≤US\$50,000	24 (40.0)
US\$50,000–100,000	17 (28.3)
>US\$100,000	17 (28.3)
Missing	2 (3.3)
HTN duration (years), mean (SD)	10.3 (8.4)
Systolic blood pressure (mm Hg), mean (SD)	133.9 (17.0)
Systolic blood pressure (mm Hg) median (IQR)	130.5 (122.0–144.5)
Diastolic blood pressure (mm Hg) mean (SD)	74.7 (12.0)
Diastolic blood pressure (mm Hg) median (IQR)	75.5 (70.0–81.5)
Number hypertension medications, mean (SD)	2.2 (1.0)
100% adherence to hypertension medications in last 7 days, n (%)	46 (77)
Diabetes duration (years), mean (SD)	4.1 (2.5)
Hemoglobin A1c (%), mean (SD)	7.0 (1.2)
Hemoglobin A1c (%), median (IQR)	6.6 (6.3–7.3)
Number diabetes medications, mean (SD)	1.2 (0.5)
100% adherence to diabetes medications in last 7 days, n (%)	44 (73)

SD: standard deviation; IQR: interquartile range; HTN: hypertension.

medication nonadherence was modified from the Diagnostic Adherence to Medication Scale;²³ responses were dichotomized as follows: missing ≥1 day versus no days in last week. Race/ethnicity was categorized as non-Hispanic Black versus other (non-Hispanic White, Hispanic, or Asian/Pacific Islander) because the majority of the population was non-Hispanic Black. Comorbidity was described using the modified Charlson Comorbidity Index (CCI) and was dichotomized as <4 (low) vs ≥4 (high), since a score of 4 or more is associated with high rates of mortality.²⁴ For disease control, treatment guideline recommendations were used to dichotomize blood pressure (<140/90 mm Hg vs ≥140/90 mm Hg) and HbA1c <48 mmol/mol vs ≥48 mmol/mol (<6.5% vs ≥6.5%).^{25–27} In multivariate analysis, logistic regression models were used to identify associations between perceived medication benefits and participant characteristics, medication adherence, and disease control. SAS 9.3 was used for quantitative analysis; p values less than 0.05 were considered statistically significant.

Results

Demographics

Table 1 outlines the demographic characteristics of the 60 participants. The mean age of participants was 61 years. A total of 39 (65%) participants were female, and 31 (52%) participants were married; 35 (58%) were non-Hispanic Black, and 19 (32%) were non-Hispanic White; 40% reported some college, associate degree, or technical program, and 43% completed a college degree or more. However, 40% of participants reported an annual household income of less than US\$50,000.

The mean duration of hypertension was 10 years, mean blood pressure was 134/76 mm Hg, and most participants were taking two hypertension medications. The mean duration of diabetes was 4 years, mean HbA1c value was 53 mmol/mol (7%), and most were taking one diabetes medication. About three-quarters of participants reported full

Table 2. Description and frequency of expected benefits of high blood pressure medications from adult participants with type 2 diabetes and hypertension on oral medications from a primary care clinic (N=60).

"What benefits do you expect to receive from taking high blood pressure medicine?"	n (%) ^a
Short-term benefits	47 (78.3)
Control my pressure	41 (68.3)
Fewer headaches	5 (8.3)
Prevent dizziness	4 (6.7)
Decrease my worries	4 (6.7)
Decrease swelling	3 (5.0)
Long-term benefits	31 (51.7)
Decrease risk of stroke	17 (28.3)
Decrease risk of heart disease	14 (23.3)
Improve overall health	10 (16.7)
Live longer	6 (10.0)
Decrease risk of kidney disease	5 (8.3)
Decrease risk of eye disease	1 (1.7)
Decrease risk of complications (in general)	1 (1.7)
Decrease risk of peripheral vascular disease	1 (1.7)
Misconceptions	12 (20.0)
To be able to stop taking blood pressure medication	8 (13.3)
Freedom to eat whatever I want	3 (5.0)
Decrease risk of liver disease	1 (1.7)

^aColumn does not total 100% because participants were asked to name as many medication benefits as possible.

adherence, that is, not missing a single day of hypertension or diabetes medications in the last 7 days (77% and 73%, respectively).

Benefits of hypertension medications

All 60 participants named at least one perceived benefit of hypertension medications. In all, 29 (48%) participants named only short-term benefits, 13 (22%) named only long-term benefits, and 18 (30%) named both short- and long-term benefits. About 48% of participants named only one benefit of hypertension medications, 28% named two benefits, and 15% named three benefits. The remaining 9% of participants named four or more benefits.

Many different benefits from taking hypertension medications were named (Table 2). In total, five distinct short-term benefits and eight distinct long-term benefits were named. Among short-term benefits, participants most frequently mentioned controlling blood pressure (68%). Other short-term benefits were named by less than 10% of participants and included fewer headaches, preventing dizziness, decreasing their worry about their health, and decreasing swelling. Among long-term benefits, participants most frequently named decreasing the risk of stroke (28%) or heart disease (23%) and improving their health (17%). Other long-term benefits were named by 10% or less of participants and

included living longer; decreasing the risk of kidney, eye, or peripheral vascular disease; and decreasing the risk of complications in general.

In bivariate analysis, naming *short-term* benefits of hypertension medications (vs not) was associated with hypertension medication adherence (70% vs 30%, $p=0.03$), but was not associated with participant characteristics or hypertension control. In multivariate analysis, there were no significant relationships between naming short-term benefits and participant characteristics, hypertension medication adherence, or hypertension control.

In bivariate analysis, *long-term* benefits of hypertension medications were named more frequently by women than men (64% vs 29%, $p=0.009$), participants over age 60 (vs <60 years) (62% vs 35%, $p=0.04$), and participants with high comorbidity (CCI ≥ 4 vs CCI < 4 , 63% vs 15%, $p=0.005$). Other participant characteristics, hypertension medication adherence, and hypertension control were not associated with naming long-term benefits. In multivariate analysis, participants with high (vs low) comorbidity were 13 times more likely to identify long-term benefits of hypertension medications (odds ratio (OR) 13.3 (1.8–97.8), $p=0.01$), but age and gender were no longer significant.

Benefits of diabetes medications

Participants also named many benefits of diabetes medications; however, 9 participants (15%) were not able to name any benefits of their diabetes medication; 29 (48%) participants named only short-term benefits, 5 (8%) named only long-term benefits, and 17 (28%) named both short- and long-term benefits. About 43% of participants mentioned only one benefit; 13% mentioned two benefits, and 17% mentioned three benefits. The remaining 17% of participants named four or more benefits of their diabetes medications.

Table 3 shows the frequency and description of the benefits for diabetes medications identified by participants. The most frequent perceived benefit was to control blood sugars, which was reported by 70% of participants. Six participants (10%) said that delaying insulin was a short-term benefit of their medication, saying, for example, "I can get off with metformin [because] I do not want to be on insulin now." The short-term benefits of weight loss and decreasing dizziness, blurry vision, sweatiness, coma, and thirst were each named by one participant. Participants also named several long-term benefits including decreasing the risk of complications in general (15%) and decreasing the risk of amputation (13%) and eye disease (12%). Other long-term benefits were named by 10% or fewer participants and included improving overall health, living longer, and decreasing the risk of kidney disease, heart disease, stroke, nerve problems, and bladder problems.

In bivariate analyses, higher income (\geq US\$50,000 vs <US\$50,000) was associated with perceiving short-term and long-term benefits of diabetes medications (85% vs 63%,

Table 3. Description and frequency of expected benefits of diabetes medications from adult participants with type 2 diabetes and hypertension on oral medications from a primary care clinic (N=60).

“What benefits do you expect to receive from taking diabetes medicine?”	n (%) ^a
Short-term benefits	46 (76.7)
Control my sugars	42 (70.0)
Delay the need for insulin	6 (10.0)
Decrease dizziness	2 (3.3)
Decrease blurry vision	1 (1.7)
Decrease sweatiness	1 (1.7)
Decrease coma	1 (1.7)
Decrease thirst	1 (1.7)
Weight loss	1 (1.7)
Long-term benefits	22 (36.7)
Decrease risk of complications (in general)	7 (11.7)
Decrease risk of amputation	9 (15.0)
Decrease risk of eye disease	8 (13.3)
Decrease risk of kidney disease	6 (10.0)
Improve overall health	6 (10.0)
Decrease risk of heart disease	5 (8.3)
Decrease risk of stroke	5 (8.3)
Live longer	4 (6.7)
Decrease risk of nerve problems	1 (1.7)
Decrease risk of bladder problems	1 (1.7)
Misconceptions	17 (28.3)
To be able to stop taking diabetes medications	14 (23.3)
Freedom to eat whatever I want	2 (3.3)
Decrease risk of liver disease	1 (1.7)

^aColumn does not total 100% because participants were asked to name as many medication benefits as possible.

$p=0.045$; 47% vs 21%, $p=0.04$, respectively). In multivariate analysis, participants with higher income were 14 times more likely to name a short-term benefit of diabetes medications (OR 14.4 (1.7–123.8), $p=0.02$). Similar to hypertension medications, naming a long-term benefit of diabetes medications was associated with greater comorbidity (43% vs 14%, $p=0.047$). However, in multivariate analysis, this relationship was no longer statistically significant (OR 6.8 (1.0–47.3), $p=0.05$). Perceiving short- and long-term benefits of diabetes medications were not associated with other participant characteristics, medication adherence, or diabetes control.

Comparison of benefits for hypertension and diabetes medications

Although there was a wide range of perceived benefits of hypertension and diabetes medications, more participants named long-term benefits for hypertension medications than for diabetes medications (21% vs 8%), and more participants named any benefit for hypertension medications than for diabetes (100% vs 85%) (both $p=0.02$).

Misconceptions about medication benefits

Participants named several misconceptions about hypertension and diabetes medications. For both hypertension (13%) and diabetes (23%), some participants believed taking medications would help them cure the disease and allow them to stop requiring medications. One participant, for example, said “[I take them] so that [eventually] I won’t have to take the pills anymore.” A few participants also believed their hypertension and diabetes medications would allow them to avoid making lifestyle modifications; for example, one participant said, “I take [the medication] so I can still eat the way I normally ate.”

In bivariate analyses, naming misconceptions for hypertension medications was associated with lower income (33% vs 12%, $p=0.046$), but this association was not significant in multivariate analyses. For diabetes, naming misconceptions about the benefits of medications was associated with lower income (50% vs 12%, $p=0.001$) in both bivariate and multivariate analyses (OR 8.3 (1.1–61.8), $p=0.04$). Misconceptions about the benefits of hypertension and diabetes medications were not associated with other participant characteristics, medication adherence, or disease control.

Discussion

Our study suggests that an important knowledge gap exists among people with type 2 diabetes and hypertension regarding the short- and long-term benefits of hypertension and diabetes medications. While the most important benefit of these medications is to decrease the long-term risk of complications by improving disease control, these benefits were named by less than half of participants for hypertension and a third of participants for diabetes. We also found that participants named short-term benefits more frequently than long-term benefits; nearly half of the participants expected only short-term benefits from hypertension and diabetes medications. Furthermore, in bivariate analysis, participants who named short-term benefits of hypertension medications had higher medication adherence.

Our findings are consistent with the limited previous literature that shows that people associate hypertension and diabetes with symptoms (e.g. headache or dizziness for hypertension and thirst or increased urination for diabetes) and may use the presence of symptoms to decide when to take medications.^{8,9} There is a clear opportunity for patient education to improve medication adherence and persistence. Increasing patient knowledge of the vital, intermediary role of medications in improving glycemic and blood pressure control in order to reduce the long-term complications of diabetes and hypertension would seem fundamental and critical. In addition, providers should consider reminding patients about the asymptomatic nature of hypertension and diabetes and disavow the reliance some patients may have on experiencing symptoms to determine whether they should take their

medications. Future studies should examine whether refocusing patients onto the long-term benefits of medications or emphasizing short-term benefits improves patient adherence. Because our study included patients with high self-reported medication adherence and was small, we were underpowered to evaluate associations between perception of medication benefits and adherence or disease control.

We found that participants with more comorbidity had better awareness of the long-term benefits of hypertension medications. We postulate that participants with higher comorbidity were more aware of long-term medication benefits because they were more likely to have first-hand knowledge about the complications associated with hypertension and diabetes. However, patients who have not experienced complications from chronic diseases are less likely to be aware of them, even though they may have the most to gain from the long-term benefits of hypertension and diabetes medications.²⁸ Future studies are necessary to understand how to translate the increased awareness of the long-term benefits understood by people with more comorbidity to those with less comorbidity. Promising models to facilitate this knowledge transfer could be through the use of peer coaches or text messages, both of which have been effective at reducing glycemic levels.^{29,30}

We also found that several participants had significant misconceptions about their chronic disease medications. Misconceptions that diabetes medications can cure diabetes and allow them to avoid lifestyle changes have been previously reported,^{31,32} as has patient expectations that they can discontinue medications when their blood pressure is controlled, and self-monitored blood glucose is normal.^{6,33} While these beliefs may occasionally be true, it is rare that patients with hypertension or diabetes are able to discontinue medications permanently. Data from the Framingham Heart Study suggest that less than 1% of people with hypertension would be able to stop medications permanently,³⁴ and a study of managed care people with type 2 diabetes found that less than 1% of people per year were able to discontinue diabetes medications and only 0.004% were able to discontinue diabetes medications for 5 years.³⁵ Informing people on the lifelong need for diabetes and hypertension may be an important step to increasing medication knowledge and adherence.

This study has several strengths and limitations. It is one of few studies to ask people details about their perceived benefits of their hypertension and diabetes medications. This study elucidates large deficits in patient knowledge regarding their hypertension and diabetes medications, which provides new insight into why patients may not adhere to these medications. However, the study findings may have limited generalizability because it was conducted at a single academic institution, where participants were relatively well-educated and had well-controlled hypertension and diabetes and high levels of self-reported medication adherence. On the other hand, the high level of education among participants suggests that even greater deficits in knowledge may be present in other populations. Also, our study was underpowered to

identify differences in medication beliefs as a result of the high levels of self-reported medication adherence.

Participants described the short-term benefits of hypertension and diabetes medications more frequently than the long-term benefits, and participants with higher comorbidity named more long-term benefits. Providers should consider educating patients about the relationship between disease control and complications and the central role medications play for most patients.

Conclusion

In total, our findings suggest that many patients have an incomplete understanding of the long-term benefits of their hypertension and diabetes medications; patients who had higher comorbidity had a more complete understanding on their long-term benefits. Increased patient education regarding the long-term benefits of chronic disease medications may be necessary to improve adherence and disease control.

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Declaration of conflicting interests

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Ethical approval

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Informed consent

Written informed consent was obtained from all subjects before the study.

Supplemental material

Supplemental material for this article is available online.

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