Patient and Physician Beliefs About Control over Health: Association of Symmetrical Beliefs with Medication Regimen Adherence

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BACKGROUND: Past work suggests that the degree of similarity between patient and physician attitudes may be an important predictor of patient-centered outcomes.

OBJECTIVE: To examine the extent to which patient and provider symmetry in health locus of control (HLOC) beliefs was associated with objectively derived medication refill adherence in patients with co-morbid diabetes mellitus (DM) and hypertension (HTN).

PARTICIPANTS: Eighteen primary care physicians at the VA Iowa City Medical Center and affiliated clinics; 246 patients of consented providers with co-morbid DM and HTN.

DESIGN: Established patient-physician dyads were classified into three groups according to the similarity of their HLOC scores (assessed in parallel). Data analysis utilized hierarchical linear modeling (HLM) to account for clustering of patients within physicians.

MAIN MEASURES: Objectively derived medication refill adherence was computed using data from the VA electronic pharmacy record; blood pressure and HgA1c values were considered as secondary outcomes.

KEY RESULTS: Physician-patient dyads holding highly similar beliefs regarding the degree of personal control that individual patients have over health outcomes showed significantly higher overall and cardiovascular medication regimen adherence ($p=0.03$) and lower diastolic blood pressure ($p=0.02$) than in dyads in which the patient held a stronger belief in their own personal control than did their treating physician. Dyads in which patients held a weaker belief in their own personal control than did their treating physician did not differ significantly from symmetrical dyads. The

same pattern was observed after adjustment for age, physician sex, and physician years of practice.

CONCLUSIONS: These data are the first to demonstrate the importance of attitudinal symmetry on an objective measure of medication adherence and suggest that a brief assessment of patient HLOC may be useful for tailoring the provider's approach in the clinical encounter or for matching patients to physicians with similar attitudes towards care.

KEY WORDS: patient adherence; physician-patient interaction; health attitudes; chronic illness.

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It is well recognized that health care providers, as well as patients, differ broadly in regard to their health care-related attitudes, beliefs, and expectations^{1–6}. For example, surveys have found that some patients prefer to take a highly active role during the clinical encounter, whereas others prefer to remain passive^{2,3,6}. Similar differences have been observed with regard to physicians, with some holding more autocratic, physician-centered attitudes about clinical interactions, and others holding more egalitarian, patient-centered views^{1,4–6}. However, the degree to which these attitudinal differences may be related to health care outcomes such as medical regimen adherence or to the effectiveness of clinical management is less clear.

Emerging evidence suggests that any attempt to consider the significance of patient or provider attitudes in isolation is insufficient (e.g.,^{1,4–7}). Rather, this perspective suggests that a dyadic consideration of provider and patient attitudes or beliefs is essential to understanding their potential significance in influencing outcomes. Krupat was among the first to argue that the degree of symmetry between physician and patient attitudes may be an important consideration^{1,5,6}. These investigators reported that patients who held similar attitudes to their physician (e.g., regarding preference for health-related information sharing) were more satisfied, more

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trusting, and more likely to recommend the physician to others.

More recently, we have examined whether the degree of patient-provider symmetry in the attitudes held toward health and health care delivery is associated with differences in patient adherence⁴. In one study, we expanded previous assessments of attitudinal differences to include measures of health locus of control (HLOC)⁸ beliefs. The HLOC construct has been one of the most actively studied attitudinal predictors of patients' health-related behavior for decades⁹. Health locus of control is conceptualized as the degree to which a patient attributes the cause of health-related outcomes to internal factors under one's own control (i.e., a patient's own actions) or to external factors (e.g., chance, actions of the provider). Early work with this construct demonstrated that strong "internal" HLOC is associated with more positive adaptation to chronic disease when patient control over the illness or treatment is realistic, but may be maladaptive when there are impediments to exercising personal control¹⁰. In our previous study of physician-patient dyads⁴, we found that, among 146 patients seen by 16 different physicians, patients who were more similar in attitude to their providers, as indicated by HLOC scores, were more satisfied with care and self-reported better regimen adherence than patients whose control-related attitudes were less similar to those of their physicians.

Past studies involving the degree of symmetry between patient and provider attitudes have been limited in at least two important ways. First, earlier work has relied on self-ratings of patient adherence. It is well known that patients are often inaccurate in their ability to accurately self-report treatment adherence¹¹. In the present study, we focused on objectively assessed medication refill adherence using the VA Medical Center's electronic pharmacy record. Second, in our earlier study, we used a general, mixed convenience sample of primary care patients, and had no available information about diagnoses or treatment. Thus, the adherence assessment was not anchored to a specific regimen or condition, and the patient sample was highly heterogeneous. In the present study, we focused on patients with confirmed diagnoses of co-morbid diabetes mellitus (DM) and hypertension (HTN) treated in VA-affiliated outpatient primary care clinics.

The majority of patients with DM who are treated in VA facilities also have HTN, and increased emphasis has been placed on the need to control HTN in patients with DM^{12,13}. Patients with DM are believed to get twice the benefit in cardiovascular risk reduction from HTN control compared to non-diabetics¹⁴, and patients with DM require more rigorous HTN control than patients without DM^{15,16}. The population of patients with co-morbid DM and HTN is clearly a prevalent and clinically important group that has frequent contact with health care providers, whose conditions entail substantial self-management demands, and who are at high risk of increased morbidity and mortality.

In sum, the central aim of the study was to examine the extent to which patient and provider symmetry in HLOC beliefs was associated with the primary outcomes of medication refill adherence in patients with co-morbid DM and HTN. Blood pressure and glycemic control were secondary outcomes. Symmetry on the attitudinal HLOC measure was modeled before and after adjusting for patient and provider age, physician sex, patient income level, number of clinic visits between patient and provider during the 24-month index period, and physician years of practice¹⁷⁻¹⁹.

METHODS

Participants

Twenty-seven attending primary care physicians at the VA Iowa City Medical Center and affiliated clinics were contacted regarding the study. Most physicians consented to participate during the intermission of a VA-sponsored continuing medical education (CME) event. Physicians absent from the event were contacted and consented by mail and/or e-mail. Eighteen physicians (67%) consented and returned the study materials.

Patients were identified from appointment records of consented providers to create a dataset of patients grouped within providers. We contacted 517 consecutive patients with a diagnosis of co-morbid DM and HTN (based on ICD-9 codes from a prior clinic visit) seen in primary care clinics at the VA Iowa City Medical Center and affiliated clinics by a participating provider. Eligible patients had an active prescription for an anti-hypertensive medication and an oral hypoglycemic/anti-diabetic agent. Other inclusion criteria included having a home telephone and residing in an independent living environment. Patients were excluded if there was evidence of significant cognitive impairment as defined by a score of less than eight on the Short Portable Mental Status Questionnaire²⁰. Three patients were excluded because of cognitive impairment. Three hundred (58%) of the eligible patients consented to participate. Only two patients were female, and these were excluded from analyses.

In an effort to choose patients who had an established relationship with their provider, patients had seen their provider for at least two appointments prior to the index appointment, within the past 24 months. Care was taken to ensure that each patient's DM and HTN were managed by his/her primary care provider, as opposed to a specialty provider. Fifty-four patients were excluded from the sample because the index conditions were being managed or co-managed by an endocrinologist or cardiologist. Thus, the study sample consisted of 244 patients. The University of Iowa IRB and the VA Research and Development Committee approved all procedures. A summary of the samples is provided in Table 1.

Table 1. Characteristics of the Sample

Variable	Patients	Physicians
	(n=224)	(n=18)
	M (SD)	M (SD)
Age	68.8 (9.7)	47.2 (10.6)
Sex (n, %)	Male: 224 (100%)	Male: 10 (56%)
Diabetes type (%)	Type II: 199 (89%)	
Years of practice		14.5 (10.4)
HLOC	20.5 (3.8)	19.8 (3.8)
HgA1c	6.89 (1.02)	
SBP	132 (12)	
DBP	72 (8)	
MPR overall	0.14 (.12)	
MPR cardiovascular medication	0.15 (.13)	
MPR diabetic medication	0.11 (.15)	

Notes: M = mean; SD = standard deviation; HLOC = health locus of control; HgA1c = hemoglobin A1c; SBP = systolic blood pressure; DBP = diastolic blood pressure; MPR = medication possession ratio. MPR values reflect the proportion of days that patients have an undersupply of prescribed medications (higher values reflect poorer regimen adherence)

Measures

Internal Health Locus of Control Scale, Form A⁸. The six-item Internal HLOC scale was used to assess beliefs about patients’ personal control over their health outcomes. Items were answered using a five-point Likert format with higher scores indicative of a stronger belief in patient control and a scoring range of 5–30 possible (see Table 2). For the traditional patient form of the measure, individuals responded to items assessing their beliefs and expectations concerning personal control over their own health. Physicians completed a previously adapted⁴ parallel version of the Internal HLOC scale, slightly revised to reflect a physician’s belief about patients’ level of personal control over health outcomes. For example, the original item “I am in control of my own health” became “Patients are in control of their own health.” An internal consistency alpha of 0.64 has been previously obtained for this adapted measure, and a full description of the measure and its reliability has been previously reported⁴.

Medication Refill Adherence. Medication adherence was assessed by refill history for the 13 months prior to enrollment through a validated method that uses automated pharmacy data (i.e., *medication possession ratio*, MPR;^{21,22}). This method assesses the timing of refills and infers the percentage of time patients have an undersupply of drug during the index period. We used refill data for all regularly scheduled cardiac and oral diabetes medications prescribed by the participating physician in the preceding 13 months. The *nonadherence MPR* was calculated as: $\text{Nonadherence} = 1 - (\text{number of days with drug} / \text{number of days in the index period})$. Separate MPR nonadherence scores were computed for cardiovascular medications (CV; e.g., lisinopril, hydrochlorothiazide, pravastatin) and for oral diabetic medications (e.g., metformin, glyburide, rosiglitazone) across all agents taken by the patient and divided by the number of drugs in order to obtain a single, continuous mean MPR score for that category. In addition, an overall MPR was computed reflecting average nonadherence across all prescribed drugs in both categories.

Glycemic Control. The mean of the available hemoglobin A1c laboratory values from all VA outpatient visits, assessed over

18 months prior to study enrollment, was used as an index of glycemic control. HgA1c provides a measure of the average blood glucose over the prior 2–3 months. An average of 2.0 HgA1c values (range 1–4) was available for each patient.

Blood Pressure (BP). The mean of the available systolic/diastolic BP readings obtained in all outpatient clinic visits was assessed over the 18 months prior to study enrollment. An average of 5.1 BP values (range 1–20) was available for each patient. Values were obtained from the VA electronic medical record.

Procedure

Participating physicians completed survey materials at the intermission of a CME event or returned them by mail at a later date. Eligible patients were mailed a packet of baseline questionnaires, including the informed consent documents and HLOC measure 2 weeks prior to their scheduled primary care appointment with the participating physician. One week prior to the appointment, patients received a telephone call from a research assistant who reviewed the consent documents, outlined study procedures, and answered questions. If interested, patients were administered the mental status screen and, if eligible, asked to provide written informed consent and complete the questionnaires. At the patient’s scheduled appointment, a research assistant greeted the patient, received the survey, and gathered additional information concerning the clinic visit following the conclusion of their visit. The focus of the current report is on the pre-visit assessment of patient and physician attitudes; data obtained in the post-visit assessment have been reported elsewhere²³.

Analysis

To examine the effect of patient-physician symmetry with respect to HLOC beliefs on outcomes, patient-physician dyads were classified into three symmetry groups according to similarity of their HLOC scores. Dyads having the lowest patient-physician difference were assigned to the “symmetrical” group, with the defining cutoff difference chosen such that approximately one-third of the dyads would be in this group. The remaining dyads were assigned to the “patient high/physician low” group if the patient HLOC score exceeded that of the physician (reflecting a stronger belief in patient control over health) or to the “patient low/physician high” group if the physician HLOC score exceeded that of the patient. Data analysis utilized hierarchical linear modeling (HLM;²⁴) to account for clustering of patients within physicians. Both patient and physician were treated as random factors. HLM analyses were used to examine the extent to which patient and physician symmetry in HLOC beliefs were associated with our primary outcome and medication refill adherence (cardiovascular medications; diabetes medications; all medications) as well as our secondary clinical outcomes (BP, HgA1c). Symmetry on the attitudinal measure was an independent variable in all models. Covariates in the adjusted models included patient income, age, and number of visits, and physician age, sex, and years of practice. We also performed follow-up pairwise comparisons, if the corresponding global test for a given dependent variable was significant, using the Tukey multiple

Table 2. Internal Health Locus of Control Scale Items

Patient
If I get sick, it is my own behavior that determines how soon I get well again
I am in control of my health
When I get sick, I am to blame
The main thing that affects my health is what I myself do
If I take care of myself, I can avoid illness
If I take the right actions, I can stay healthy
Physician
If a patient gets sick, it is his/her own behavior that determines how soon he/she gets well again
Patients are in control of their own health
When a patient gets sick, he/she is to blame
The main thing that affects patients’ health is what they themselves do
If patients take care of themselves, they can avoid illness
If patients take the right actions, they can stay healthy

Table 3. Symmetry Category Dyad Frequencies and Corresponding Dyad-Difference Ranges

Symmetry category	Frequency	Range of <i>d</i>
Patient low/physician high	57 (25.4%)	-24 to -3
Symmetric	87 (38.8%)	-2 to 2
Patient high/physician low	80 (35.7%)	3 to 11

Notes: *d* = patient HLOC score-physician HLOC score; N=224 dyads

comparison adjustment for *p*-values. Tests were performed using the SAS PROC MIXED. All tests were two-tailed with alpha=0.05.

RESULTS

Table 1 shows the sample characteristics. Fifty-four patients were excluded because index conditions were being managed or co-managed by another provider. Thirteen patients failed to complete any part of the survey, while seven were missing some or all of the HLOC and were also excluded, resulting in a final sample size of 224 dyads. Inspection of a scatter plot of the patient and physician HLOC scores showed that the patient scores had a similar distribution across physicians. Table 3 shows the number of dyads in each of the three symmetry groups and the corresponding cutpoints that define these groups.

Table 4 shows the covariate-adjusted means and both unadjusted and adjusted overall model test results. Global adjusted tests showed a HLOC symmetry effect for overall MPR ($F_{2,202}=4.13$, $p=0.02$), CV MPR ($F_{2,202}=3.86$, $p=0.02$), and diastolic blood pressure ($F_{2,164}=3.24$, $p=0.04$), but not for diabetic MPR ($F_{2,142}=1.93$, $p=0.15$). Follow-up pairwise comparisons showed the "symmetrical" group to have significantly higher overall medication adherence for overall MPR and CV MPR and lower diastolic blood pressure compared to the "patient high/physician low" HLOC group, but not compared to the patient low/physician high group. Patient MPRs for the symmetrical dyads evidenced an overall average absence of medication on 12% of prescribed days over the 13-month

assessment period compared to 18% of prescribed days among the dyads in which patients held higher control beliefs than their physicians, the latter reflecting a 50% higher rate of refill nonadherence. Although the global and follow-up tests for oral diabetic MPR did not attain significance, a similar trend existed, with the "symmetrical" group having higher medication adherence compared to the "patient high/physician low" HLOC group (Tukey pairwise $p=0.136$). For a difference of this magnitude (0.14 vs. 0.09), posthoc power computation showed the power to be less than 0.50. Unadjusted results mirrored those described above. We note that patient age was the only significant covariate in the adjusted models reflecting better medication adherence, better glycemic control, and lower diastolic blood pressure with advancing age.

DISCUSSION

The present study builds on previous research and theory^{1,4}, suggesting that similarity in health-related attitudes held by the physician and patient is a significant correlate of patient-centered outcomes such as medication regimen adherence. The present data are the first to demonstrate the importance of attitudinal symmetry on a measure of adherence that was not reliant on patient self-reports and that was anchored to a specific regimen and medical condition. Specifically, in physician-patient dyads holding highly similar beliefs regarding the degree of personal control that individual patients have over health outcomes, both overall and cardiovascular medication regimen adherence was significantly higher than in dyads in which the patient held a stronger belief in their own personal control than their treating physician's beliefs regarding patients in general. A similar pattern was observed for diastolic, but not for systolic, blood pressure. This pattern was observed in models both adjusted and unadjusted for several patient and physician characteristics. These statistically significant differences in medication adherence appear to be clinically significant as well given the approximately 50% higher rate of nonadherence in the asymmetrical group, which corresponds to an absolute group difference of approximately 0.50 SD^{25,26}. The significant group differences in diastolic blood pressure appear less clinically meaningful. Significant

Table 4. Adjusted Means and Adjusted and Unadjusted Test Results

Outcome	Symmetry category			<i>F</i> (<i>df</i>)	<i>p</i> -value (unadj)	<i>p</i> -value (adj)	Significant pairwise comparisons (adj) ^b
	Patient low/physician high	Symmetric	Patient high/physician low				
HgA1c	6.76	6.88	6.90	0.21 (2, 138)	0.92	0.81	
SBP	132.66	131.80	131.63	0.09 (2, 107)	0.85	0.92	
DBP	71.82	70.81	74.04	3.24 (2, 164)	0.04 ^a	0.04 ^a	2<3
MPR overall	0.15	0.12	0.18	4.13 (2, 202)	0.01 ^a	0.02 ^a	2<3
MPR CV	0.15	0.13	0.18	3.86 (2, 202)	0.01 ^a	0.02 ^a	2<3
MPR diabetic	0.12	0.09	0.14	1.93 (2, 142)	0.13	0.15	

Notes: unadj: unadjusted; adj: adjusted for patient age, income and number of visits, and physician age, sex (patients are all males), and years of practice. *F* values are for the adjusted model and test the null hypothesis that the three symmetry groups have equal means. HgA1c = hemoglobin A1c; SBP = systolic blood pressure; DBP = diastolic blood pressure; MPR = medication possession ratio; CV = cardiovascular. Higher MPR ratios reflect poorer adherence. A >/< sign reflects a statistically significant ($p<0.05$) between the two symmetry categories

^aSignificant global test for equal group means at alpha=0.05

^bSignificant at alpha=0.05 using a Tukey multiple comparison adjustment. (1) Patient low/physician high group; (2) symmetric group; (3) patient high/physician low group

symmetry effects were not observed for oral diabetic medication adherence or for HgA1c values.

Interestingly, it was the subgroup of physician-patient dyads marked by high patient and low physician control beliefs that demonstrated poorer medication regimen adherence on two of three such metrics. That is, patients with stronger health-related control expectations appear to show significantly poorer adherence when managed by providers who hold lower expectations about the degree of control that patients can conceivably assert over health outcomes. This pattern is consistent with previous psychological theory that individuals who value or expect control in an important domain display increased negative affect and are more likely to engage in maladaptive behavioral responses when control is threatened or constrained in some way²⁷. We have previously suggested that patients' attempts to reassert control when they perceive it is threatened—either by the objective constraints of a clinical situation or by their perceptions of the clinical context—may be an important explanatory mechanism for some cases of nonadherence^{23,28}. Although speculative, one interpretation is that patients with high control beliefs displayed poorer adherence when interacting with providers holding more skeptical beliefs about patient control over health due, in part, to a perception of restricted opportunities to exercise control.

These data have potentially important relevance to clinical practice. First, the current results suggest that the feasibility of matching patients and providers based upon similarity on the HLOC attitudinal measure should be examined. Whether such matching is done explicitly or whether patients are informed which available providers have similar attitudes and are allowed to make their own selection (e.g.,²⁹), these data suggest that patients who are “matched” with providers holding similar attitudes will exhibit better medication regimen adherence. An alternative approach could involve instructing physicians in tailoring their practice style to better fit an individual patient's attitudes or expectations. Evidence exists to suggest that providers do adapt their practice style as a function of certain patient background characteristics^{17,30–32}. Our belief, however, is that the key element in any approach to tailoring the physician-patient interaction is the availability of readily obtained information about patient attitudes or preferences. The current results suggest that the brief, HLOC instrument provides a snapshot of a patient's health-related attitudes that could guide provider efforts to tailor their approach to a particular patient's orientation. Such real-time access to information regarding patient preferences and expectations could, for example, be used to more strongly engage selected patients in treatment decisions and self-management processes while offering less patient involvement and greater provider control with other patients.

These results should be tempered by certain study limitations. Physicians and patients were sampled from a single VA site, and it is possible that the resulting sample of older male, predominantly Caucasian, veterans may not be representative of patients in other settings. The pattern of results involving attitudes and medication adherence may differ in certain ethnic minority patient groups or in female patients. Moreover, while the response rate among eligible physicians was fairly high (74%), it was lower (58%) among eligible patients, and it is possible that the final samples were not representative of their larger populations, making it necessary to use caution in generalizing these results. Our assessment of patients' medi-

cation adherence was limited to a single method based on automated pharmacy records within the VA. Although the use of refill records to assess adherence has become increasingly common (e.g.,³³), this method does not ensure that a patient is taking the drug as directed. Moreover, non-VA medications may not be as reliably accounted for in the available electronic VA record as are VA prescribed and filled prescriptions. It is also the case that the calculation of MPR values may not account for some “mid-course” changes to a regimen. For example, if a drug was abruptly discontinued by the provider, the MPR value for the drug may be artificially reduced by the number of days remaining on the prescription. For these reasons the MPR metric should be interpreted with appropriate caution. Nevertheless, evidence firmly supports the validity of the MPR method with strong associations reported between pharmacy records and other measures of adherence and with drug serum levels and clinical effects^{34–36}. A recent review of adherence assessment in hypertension concluded that the MPR is the “best available measure” for assessing adherence using retrospective data³⁴. Perhaps most importantly, although the MPR method has limitations, there is no reason to believe that these limitations reflect a systematic bias that differs across our attitudinal subgroups.

Finally, while effects were found on measures representing adherence to both cardiovascular and overall medication regimens, an effect was not found on adherence to oral diabetic medications. Note, however, that the pattern of differences observed for adherence to diabetic medications paralleled that seen for the other outcomes, and a posthoc power computation showed low power (<0.50), suggesting that the lack of an effect may have been a function of limited statistical power. These limitations notwithstanding, the present data suggest that symmetry between patient and provider beliefs about health-related control is associated with patient adherence. Further work is needed to directly examine whether an assessment of patient beliefs about control over health may be a useful tool for enhancing adherence when used either as a guide for tailoring the approach that the provider takes in the clinical encounter or when used to match patients to physicians with similar attitudes towards care.

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