

The Relationship Between the Health Belief Model and Compliance of Persons with Diabetes Mellitus

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Thirty insulin-treated diabetic individuals were interviewed in their homes 6–12 mo after having attended diabetic education classes at a community hospital. Self-report as well as direct observation were used to measure these patients' level of compliance with their insulin administration, urine testing, diet, hypoglycemia management, and foot care prescriptions. All patients were complying with at least 59% of the points measured. Over one-half of the group indicated compliance with at least 70% of the 61 points measured. However, only 7% complied with every one of the 45 points considered to be necessary for good control of their disease. The group was most compliant with regard to insulin administration and least compliant regarding urine testing. The level of these patients' beliefs regarding their disease (severity and susceptibility, treatment benefits, and barriers) and cues to action were also measured. A correlation of 0.5 occurred between these patients' overall compliance levels and a composite of their level of health belief motivation. The highest levels of correlations between the areas of compliance and the motivators occurred with cues to action. *DIABETES CARE* 3: 594–598, SEPTEMBER–OCTOBER 1980.

The therapeutic regimen of insulin-treated diabetes is complex, of life-long duration, and requires many behavior changes on the part of the patient. Dietary habits and activity patterns must often be altered and the new behaviors of insulin administration and urine testing learned. The success of long-term maintenance therapy for diabetes, as for any chronic illness, depends largely on the extent to which the patient's behavior coincides with clinical prescriptions.^{1–3}

Reviews of compliance literature, concerning all illness regimens, reveal that at least one-third of all patients do not comply with their medical regimens.^{4,5} Sackett's⁵ recent review of compliance literature notes the following trends: patients with symptoms tend to have higher compliance levels, compliance with short-term regimens decreases rapidly from day to day, and the compliance level of patients with long-term therapy is about 50%.

In view of this lack of success, compliance may currently be one of the greatest therapeutic challenges facing the health professions.⁶ However, it is difficult to compare compliance studies because the magnitude of noncompliance varies with the behavior measured, the manner in which it is measured, the amount of deviance accepted, and the point in therapy at which it is measured.

While sociodemographic variables have been found to be

predictive of entry into the health care system, they have not been predictive of compliance levels once treatment has been initiated.⁷ However, the degree and duration of behavioral changes a regimen requires, its complexity, and the degree to which it interferes with past life patterns all have exhibited inverse relationships to compliance levels.^{7–14} These regimen features associated with noncompliant behavior characterize the diabetic regimen. It is complex, requires a large amount of behavioral changes, and is of life-long duration.

The literature indicates, as can be expected, that insulin-treated diabetic patients have a low level of compliance. Hulka et al.¹⁵ found that approximately 18% of their 357 diabetic patients made drug errors. Watkins et al.¹⁶ found that 80% of 60 diabetic subjects administered their insulin in an unacceptable manner, 73% did not follow their diets, 50% exhibited poor foot care, and 45% did not test their urine correctly. Twelve to 18 months later 48% of this patient group were making an even greater number of errors. Williams et al.¹⁷ found that 75% of the diabetic patients they studied had significant deficits in their food intake half of the time, and about 50% had deficiencies all of the time. Williams et al.¹⁸ found a direct relationship between the number of insulin errors made and the duration of the disease process.

While studies of the compliance of diabetic patients have been few in number, generally it has been found that compliance rates are low. The individuals who do manage to adhere to their regimens may succeed because of determinants not associated with the regimen. Some of these variables may be explained by the health belief model. This model is based on the value-expectancy theories of social psychology, which predict that behavior is determined by the subjective value attached to an outcome and the perceived likelihood that certain actions will result in that outcome.¹⁹ The health belief model contains three key elements.²⁰⁻²⁷ First, readiness to take an action is determined by subjective estimates of susceptibility to and the severity of a particular health problem. Second, the feasibility and efficacy of suggested health behaviors are weighed against cost and/or barriers to that behavior. Third, internal or external cues may be needed to motivate initiation of health behaviors. This model proposes that health motivation arises from the belief that the threat of an action is less than the threat of the health deficit.²⁸

Perceived susceptibility seems to account for a large portion of this model's ability to predict compliance with regard to health (preventative) behavior.²⁹⁻³⁴ During acute illness, estimates of its severity have exhibited the greatest relationship to levels of compliance.³⁵⁻³⁹ Efficacy of health behaviors and cues also appear to influence compliance in both health and in acute illness.^{40,41} While this model has been empirically tested regarding health behavior and compliance during the acute sick role, very few studies regarding chronic illness have been done.

To determine the health belief model's association with the compliance levels of persons chronically ill with diabetes mellitus, an interview survey was conducted to answer the following questions.

1. What is the relationship between the compliance levels of persons with diabetes mellitus regarding the specific aspects of their medical regimen (insulin administration, diet, hypoglycemia management, foot care, and uring testing) and the health belief model and its specific aspects (perceived susceptibility, perceived severity, perceptions of benefits, barriers or costs, and cues)?

2. Are there differences in the compliance levels of diabetic individuals when grouped according to the following variables: age, sex, race, marital status, education, satisfaction with medical care, length of time since last office visit, length of time using insulin?

METHODS AND MATERIALS

Thirty diabetic patients with the following characteristics were selected to be interviewed: insulin treated, following a regimen regulated by a physician, 18 yr of age or older, responsible for their own care, and able to speak English.

Subjects ranged in age from 18 to 73 yr, with 80% over age 50 yr. Twenty-eight had adult onset of their disease, 47% had been taking insulin for less than 1 yr, and 23% had been taking insulin for 5 yr or more. Seventy-three percent

of the group were women, one was black, two were college graduates, and six were educated at only the grade school level. Patients were under the care of 26 physicians, 17 of whom were general practitioners.

The interviews conducted in the homes of the subjects gathered information about the patients' compliance levels, health beliefs, and general demographic data.

Compliance measures. A combination of direct observation and self-report was used to measure compliance with insulin administration, hypoglycemia, urine testing, and foot care. Only self-report was used to measure compliance with diet. The 23-item compliance measurement tool was based on the booklet "Diabetes Mellitus: Assessment Guides."⁴² In order to compensate for the literature findings that compliance rates measured by self-report are double those measured by any other method,⁴³ the items measured by direct observation of the investigator received double point values.

Health belief measures. The health belief measurement tool was comprised of 15 statements adapted from the Standardized Compliance Questionnaire.⁴⁴ Three items were used to measure each of the five aspects of the health belief model (perceived susceptibility, perceived severity, perceptions of benefits, barriers or costs, and cues). Responses to each item were made on a five-point Likert scale, on which the subjects indicated their degree of agreement with the statement.

The reliability of this modified Standardized Compliance Questionnaire was checked by a test-retest procedure using a 1-wk interval between administrations. The level of agreement in the responses received from 22 diabetic individuals over the two administrations was 88.6%.

Demographic variables. Data were collected regarding the following variables: age, sex, race, marital status, education, satisfaction with care, time since last visit to physician's office, and length of time insulin had been used.

RESULTS

Compliance levels. The maximum score possible on the compliance measurement tool was 61. This group's scores ranged from 36 to 55. Over one-half of the subjects indicated compliance with at least 70% of the items measured. Previous compliance studies have usually reported compliance as a dichotomous measure rather than a distribution. Therefore, the items on this tool were identified that measured the behaviors necessary for an insulin-treated diabetic person to remain in good control (Table 1). These essential behaviors accounted for 45 points (74%) of the maximum possible. Fourteen of the 30 patients received scores at or above this level. However, only 2 received 45 of their points for carrying out all the behaviors identified as necessary for good control. Therefore, less than 7% of this group of subjects could be considered completely compliant with the essential behaviors. The group was most compliant with regard to insulin administration and least compliant regarding urine testing (Table 2).

Health beliefs and compliance. Table 3 indicates the correlation between the health beliefs and the compliance levels of

TABLE 1
Compliance items necessary for good control

this group of patients. Those subjects who perceived their diabetes to be serious, and responded to cues, tended to be more compliant with their regimen than those who did not have these perceptions. Perceptions of disease seriousness included how much they felt their diabetes limited their daily activities and its effect on the family. While 22 considered their diabetes to be serious, only 14 felt that it limited their activities and 4 believed it affected their family. Cues related to the subjects' intention to comply and general concerns about health. Twelve indicated they "worried a lot about their health" and 13 indicated that "much of what happens to your health is a matter of chance." Ten indicated that "you have to use your own judgment in deciding how much of the doctor's advice to follow."

Twenty-eight of the 30 subjects reported that they be-

TABLE 2
Compliance scores for areas of therapeutic regimen

Therapeutic area	Maximum possible score	Mean score ± SD	Percent score
Total compliance score	61	43.9 ± 4.7	72
Insulin and its administration	20	16.2 ± 2.0	81
Foot care	9	6.9 ± 1.6	77
Hypoglycemia or insulin reactions	10	7.0 ± 2.4	70
Diet	16	10.3 ± 2.3	65
Urine testing	6	3.4 ± 1.3	57

lieved that treatment would control their diabetes. However, most of these patients considered their "treatment" to mean taking insulin. Few included following their diet as part of their "treatment." Six of the subjects who indicated that they had no difficulty in adhering to their diet seemed to have modified their perception of the diet. Rather than using exchange lists or counting calories they just "avoided sweets." In essence they modified their perceptions of dietary prescription to make adherence easier. This may explain the low relationship between perceived benefits and dietary compliance.

The compliance level of foot care was measured by both observation and self-report. Since few of these subjects had foot care problems, the compliance scores in this area may have been spuriously high. However, the correlation results indicate that those subjects who believe their disease to be serious tended to give themselves better foot care. Also, those who perceived themselves as more susceptible were more likely to carry a source of sugar, wear diabetic identification, and be able to describe the signs and symptoms of hypoglycemia.

Demographic variables and compliance. No significant differences were found in compliance levels when subjects were grouped according to marital status, sex, age, years of schooling, satisfaction with care, length of time using insulin, or time since last office visit.

DISCUSSION

The levels of compliance found must, of course, be considered in light of this study's limitations. All the diabetic individuals interviewed had attended classes in the past 6–12 mo. Their motivation or willingness to learn may have resulted in higher levels of compliance than might be found in insulin-treated counterparts who do not attend such classes. The classes being taught in a hospital in the afternoon favored the attendance of the urban dweller who is unemployed, disabled, retired, hospitalized, a student, or a homemaker.

Another limitation to the generalizability of these results is the manner in which compliance was measured. While direct observation may provide the most reliable method of measuring behavior, increased supervision in and of itself has been shown to improve compliance rates.^{3,41,43}

Some of the incidental findings suggest that this group of diabetic individuals had continued health teaching needs after their class attendance. Many in the group did not consider diet to be part of their "treatment." To most, "treatment" meant taking insulin and testing their urine.

Two subjects were found to be having insulin reactions daily, but did not recognize them as such. Both were able to list the signs and symptoms of hypoglycemia and denied ever experiencing a reaction. Yet during the interview it became apparent that they were experiencing reactions. One woman complained of feeling weak and sweating at the same time each morning. Another complained of lightheadedness when she drove to get her son from school each day. Dietary

TABLE 3
Correlations between compliance levels and health belief motivators

Compliance	Health belief motivators (HBM)					
	Total HBM score	Perceived susceptibility	Perceived benefits	Cues	Perceived barriers	Perceived severity
Total compliance score	0.50*	0.23	0.01	0.4†	0.12	0.42†
Insulin and its administration	0.40†	0.20	0.33	0.54*	0.1	0.17
Diet	0.20	-0.25	-0.01	0.33	-0.03	0.25
Hypoglycemia or insulin reactions	0.08	0.48*	-0.27	-0.19	0.21	0.09
Foot care	0.30	0.21	-0.11	0.14	0.01	0.47*
Urine testing	0.34	0.18	0.20	0.21	0.23	0.07

* $P < 0.01$; † $P < 0.05$.

manipulations were suggested and subsequent follow-up a week later revealed resolution of the problem. The inability of these women to identify their hypoglycemic reactions as such, even though they knew which signs and symptoms to look for, suggests that this knowledge was not at the level where it could be utilized.

The relationship found between the health beliefs and compliance levels of this group of subjects is similar to that found by Levanthal et al.³² regarding health behaviors. However, a correlation of the magnitude found in this study ($r = 0.5$) indicates that these health belief motivators could only account for approximately 25% of the variation in the compliance of this sample.⁴⁵ A much higher level of correlation between these variables would be necessary to be able to use these motivators as reliable clinical predictors.

Kirscht⁴¹ does not regard the health belief model as useful for clinical prediction but views the model as a useful perspective on illness behavior in need of further development. Kasl⁴⁶ has suggested that the following variables be added to adapt this model for increased clinical applicability to chronic illness: referral systems, role of significant others, doctor-patient relationship, and social presentation of symptoms and illness.

In this sample the "cues motivators" was found to be the aspect of the health belief model that had the most frequent number of the higher correlations with compliance behavior. While these findings should be considered little more than suggestive, they support Kasl's⁴⁶ line of conjecture and Becker⁴⁰ and Rosenstock's⁴⁷ contention that the role of cues is central to the health belief model. Previous studies have shown that belief and attitudes are amenable to change, although it is not known as yet whether attitudes precede behavior changes or vice versa.^{31,37,48} Of importance is that compliance behavior is likely to be influenced by a constellation of attitudes which are amenable to change and that changes might be facilitated by long-term follow-up care.

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