Effects of Patient Health Beliefs and Satisfaction on Compliance with Medication Regimens in Ambulatory Care at General Hospitals

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Abstract  Patient non-compliance with therapeutic regimens in ambulatory care settings is prevalent. This study was conducted to clarify the effects of patient health beliefs and satisfaction on compliance behavior. The results of multiple logistic regression analysis for the data of 650 outpatients in 7 general hospitals indicated that self-efficacy regarding compliance behavior, perceived threat to health, patient satisfaction with care, severity of illness scored by the physician, sex and age had significant effects on medication compliance. It is suggested that patient compliance is influenced not only by rationalistic decision making in relevance to health and behavior but also by patient satisfaction with health care, particularly with communication with providers.

Key words: Patient compliance, Patient satisfaction, Quality improvement in health care, Health Belief Model, Social Cognitive Theory, Self-efficacy

Introduction

Patient compliance with prescribed medication regimens is one of the key issues in patient management1) as ultimate outcomes of efficacious treatments usually depend upon patient actions in following the prescribed regimens. Surveys in Japan have revealed rates of medication compliance to be grossly around 50%, with a wide range of from 15 to 80%2−6). These rates are as low as those observed in English-speaking countries7,8). The epidemic of non-compliance is a serious problem in resource utilization as the total cost of the drugs prescribed in ambulatory care is estimated at approximately 1% of the Gross Domestic Product in 1987 in Japan9). Supposing that one third of total medication was discarded by non-compliant patients, approximately 100 billion yen (at 1987 prices) per year would be wasted in the national health care system. It is of social and clinical importance to understand the mechanisms of compliance behavior of patients and to develop strategies to enhance it.

Various approaches have been proposed to explain compliance behavior10,11). The mainstream models used for this purpose are based on cognitive determinants, and the representative example is the health belief model12−14). The model was originally developed to deal with preventive health behavior12,15), and has also been applied to sick-role behavior such as patient compliance to prescribed regimens13). The major components studied by this model in predicting the likelihood of taking health-related action are: (1) perceived threat to health, i.e. perceived susceptibility to illness and perceived seriousness of that illness; (2) belief in the value of a proposed action, i.e. perceived benefits of behavior; and

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(3) perceived costs or barriers involved in the proposed action, i.e. perceived barriers to behavior. On the other hand, in Bandura's social cognitive theory, the key cognitive factors to perform actions are: (1) expectations about the outcomes that will result from one's engaging in a behavior (outcome expectations); and (2) expectations about one's ability to execute that behavior (self-efficacy).

These two models have been extensively used in health-related behavior research. Both are built upon value-expectancy models, which were derived and developed particularly from the seminal work of Kurt Lewin. These approaches describe the behavior of rationalistic decision making under uncertainty and predict it from the values of an outcome and the expectancies that a given action will produce that outcome. Considerable overlaps are expected in the two models, and integration has been attempted by the developers of the models and their associates.

The first purpose of this study is to clarify the effects on patient compliance of perceived benefits, barriers and self-efficacy with regard to compliance behavior, and of perceived threat to health, i.e., to examine the cross-cultural efficacy of the value-expectancy type determinants of compliance in Japanese ambulatory care settings.

Another type of approach to patient compliance refers to patient satisfaction with health care, particularly with patient-provider interaction. Although patient satisfaction seems to be consistently associated with compliance with therapeutic regimens, the mechanisms of satisfaction influencing compliance behavior remain theoretically unclear. It could be argued that the association of patient satisfaction with compliance behavior might be spurious and just confounded by patient beliefs about health and behavior, such as perceived health needs, perceived values of therapies and so on. The second purpose of this study is to clarify the effect of patient satisfaction on the probability of high compliance when controlled for value-expectancy-type beliefs about health and behavior.

Subjects and Methods

Subjects

The subjects of this study were 650 (318 males and 332 females) of 899 outpatients in 7 general hospitals who responded to the questionnaires described below. The other 249 were not used in the analysis, because they did not have medication prescribed by doctors. The ages of the subjects for the analysis ranged from 0 to 93 years, and their distribution was as follows: 0-19 years of age, 11.2%; 20-39, 11.5%; 40-59, 28.9%; 60-79, 43.2%; and 80 and over, 5.1%. Of these subjects, 42.0% were from internal medicine, 11.7% from surgery, and the rest from the other departments. The 7 hospitals were secondary to tertiary teaching general hospitals with 300 to 800 beds which played the core role in their serving area and had multi-disciplinary ambulatory care departments. They were among the members of the Model Project for Promotion of Networking in Community Health Services (“Chiiki Iryou Renkei Suishin Moderu Jigyou”) and their locations were spread over Japan (Prefectures of Iwate, Tokyo, Shizuoka, Aichi, Kyoto, Hyogo and Kumamoto). This model project was sponsored jointly by the cities and the prefectures where the hospitals were located and by the Ministry of Health and Welfare, and assisted by the Japan Medical Association. This study used part of a larger dataset of another study conducted to survey patient behavior and networking of hospitals and clinics.

Questionnaire Study

A self-administered questionnaire was handed to patients in the ambulatory care departments of the participant hospitals just after the encounter with the physician. The patients were selected at random by the systematic sampling method utilizing the patient chart ID number, with a 10% sampling rate in 2 days of one week.
of the survey period around March 1991. This questionnaire dealt with their beliefs about their health condition and medication regimens. The responses to these questions were collected by survey assistants inside the hospital building before they left the hospitals on that day. In addition, just after the encounter, the physician rated the severity of illness of the patient. One month later, another self-administered questionnaire, on patient satisfaction with the health care at the institution and on the degree of compliance with the prescribed medication regimen, was mailed out to the patients from each hospital. The questionnaires did not have patient names, but had the survey ID number at the top of the first page of each questionnaire to match the questionnaires delivered at different times. Their responses were to be submitted by mail to the National Institute of Health Services Management, not back to the hospitals, to assure the respondents that the hospital staff in charge of direct care of the patients were structurally prevented from looking into the individual patient's responses. Use of a proxy (for example, a patient's caregiver) was allowed in responding to the questionnaire when the subject could not fill it out, particularly in the cases of pediatric and of some disabled patients. The effective response rate was 60.9% of the total sample. Between the respondent and the nonrespondent groups, there was no significant difference in the mean age or in the mean of the severity of illness score (described below) or in the clinical department distribution, though there was significant difference in the hospital distribution (chi-square = 32.1, df = 6, p < 0.01).

Variables examined

The following variables were examined in this study:

Compliance with Medication Regimen: As shown in Appendix A, three questions were asked about the degree of medication compliance. After the third item was recoded inversely, each item was linearly transformed into a score ranging from 0 to 5, among which the three correlation coefficients were between 0.53 and 0.62 (n = 650, p < 0.001). In order to improve reliability using a larger number of items regarded as conceptually equivalent, the three items were summed up with equal weights. Cronbach's alpha of this new score was 0.79, indicating admissible reliability. The distribution of this score was skewed to higher values with about 40% of the total subjects concentrated at the highest point (Fig. 1). The extreme skewness (-1.92 ± 0.096 (SE)) as well as the extreme kurtosis (5.36 ± 0.096) made the score unsuitable as a dependent variable in linear regression analysis. Since this score could not be transformed to approximate normal distribution, it was recoded into a dichotomy of high (= 1) and low (= 0) compliance groups with a cutpoint level of 80% compliance. The cutpoint value of 80% was adopted by previous studies (27-29) as the threshold to achieve therapeutic goals. This dichotomy indicates the rate of high compliance to be used as a dependent variable in multiple logistic regression analysis.

Patient Health Beliefs: Patient beliefs with regard to health and medication-taking behavior were introduced (Appendix B) through comparison of the health belief model and the social cog-

![Fig. 1 Medication compliance scores in 650 outpatients in 7 general hospitals](image)
Table 1  Variables in Health Belief Model and Social Cognitive Theory

| Health Belief Model                  | Social Cognitive Theory               | Relevant item number
|-------------------------------------|--------------------------------------|----------------------
| Perceived benefits of behavior      | Outcome expectations                  | C 51                 |
| Perceived barriers to behavior      | (Not explicit, but implied in self-efficacy) | C 52                 |
| (Not explicit, but implied in perceived barrier) | Self-efficacy                        | C 53                 |
| Perceived threat to health          | Expectancies about environmental cues | C 72                 |

*See Appendix B.  The table\(^{19,20}\) is modified here.

nitive theory (Table 1)\(^{19,20}\). Each variable was asked in a 4-point Likert-type scale. Perceived benefits and barriers to complying with medication regimens were asked about according to the health belief model. The first item denoted the concept of outcome expectation and the second implied the concept of self-efficacy in the social cognitive theory. Perception of one’s own capability of maintaining compliance behavior was also asked, which was regarded as self-efficacy in the social cognitive theory. Perception of one’s own capability of maintaining compliance behavior was also asked, which was regarded as self-efficacy in the social cognitive theory. Perceived prognosis of the disease in the case of receiving no therapies was considered as a perceived threat factor in the health belief model, which was comprised of the expected severity of the future condition and the expected likelihood of being in that condition.

Patient Satisfaction: The questionnaire developed by Hall et al.\(^{30}\) was adopted, since the 12 balanced questions focused on patient-provider interaction issues and were applicable to any kind of patient of any age. This covered overall satisfaction, amount of contact with providers, communication behaviors of providers, humaneness of providers, perceived technical competence of providers, and relief of worry (Appendix C). A five-point Likert-type format was used and the items were summed up after converting those with inverse polarity. The internal consistency reliability was 0.87.

Severity of Illness: Characteristics of diseases could influence compliance behavior. Just after the patient-physician encounter, the physician scored, using a 4-point scale format, the severity of the illness in terms of the degree of needed continuity and intensity of medical management thereafter. The severity categories were: 1 = temporary and curable without any organ damage left by simple or no intervention, 2 = curable without any organ damage only after some continuous intervention, 3 = with irreversible organ damage in the early stage of the disease progress and controllable under easier clinical management and 4 = irreversible organ damage in the advanced stage of the disease and/or possibly fatal without intensive management.

Demographic Variables: Sex and age could reflect cultural differences in health-related beliefs and behaviors as well as differences in disease characteristics. As for age, older people were considered to have chronic diseases in need of continuous compliance with medical therapies more frequently than the younger.

Clinical Department: Clinical department in the ambulatory care service could reflect the type of therapy, which was expected to affect compliance behavior. A dichotomy was introduced, depending upon whether a patient was from the department of internal medicine or not.

Hospitals: The subjects of this study were comprised of the samples from 7 general hospitals. Some were located in rural, some in suburban and the others in urban areas. Hospital difference could reflect differences in cultural and clinical characteristics of patients, communities and healthcare service systems.
Statistical analysis

Differences in the rates of high compliance among the strata of each variable were examined by the chi-square test. Since the rates of high compliance were unable to be calculated in non-existing strata of continuous variables, the differences in the means of the satisfaction score and of age were tested by Student's t-test between high and low compliance groups. Multiple logistic regression analysis was conducted to examine the effects of the ten explanatory variables (perceived benefits, barriers and self-efficacy regarding compliance behavior, perceived threat to health, patient satisfaction, severity of illness, sex, age, clinical department and hospitals) on the rate of high compliance. To confirm the consistency of the results when cutpoints for high and low compliance groups were changed, logistic regression analysis was conducted again at the compliance levels of 70% and 75% for the cutpoint.

Results

The rate of high compliance significantly differed among the strata of self-efficacy expectation, perceived threat, severity of illness scored by physician, sex and clinical department; on the other hand, the rate did not significantly differ among those of perceived benefits, perceived barriers and hospitals (Table 2). The satisfaction score in the high compliance group (48.6±8.6, mean±standard deviation) was significantly higher than that in the low group (43.5±8.9) (p<0.001). Also, the mean age was significantly higher in the high compliance group (55.1±20.1) than that in the low group (44.5±23.8) (p<0.001). The results of multiple logistic regression analysis indicated that self-efficacy expectation, perceived threat, patient satisfaction, severity of illness scored by physician, sex and age were significantly related to the rate of high compliance behavior (Table 3). When the compliance cutpoint was moved to 75% and 70% of the full score, multiple logistic regression showed the same results in terms of the significance of

the explanatory variables, except for age and severity of illness (p>0.05) in the case of the cutpoint of 70% of the full score.

Discussion

The results of this study indicated that self-efficacy in prescribed behavior, perceived threat to health and patient satisfaction have effects on medication compliance of outpatients in some Japanese settings.

The concept of self-efficacy is defined as the perception of one's own competence in achieving a specific behavior, and the introduction of this concept as distinct from outcome expectation has been regarded as the major contribution of the social cognitive theory in explanations of behavior modification and maintenance. Bandura argues that self-efficacy influences all aspects of behavior, including acquisition and maintenance of behavior through effects on the amount of effort in the face of obstacles, emotional distress reactions, thought patterns and so on. The present results can suggest, for practical settings, that to ask patients of their self-efficacy in following prescribed behavior would be helpful in predicting their compliance and that the self-efficacy would be a possible effective target for intervention to enhance compliance. The validation of such suggestions will require further empirical evidence.

The perceived threat (i.e., expected prognosis of disease in case of receiving no therapies) also had a high coefficient among the belief variables studied. Rosenstock refers to the threat concept, noting that "the combined level of susceptibility and severity provided the energy or force to act." Based upon Bandura's social cognitive theory, this threat concept can be regarded as cognitively based "incentive motivators," that is, another key concept in addition to self-efficacy and outcome expectations in that theory. Through symbolic representation of foreseeable consequences, future outcomes can be converted into motivators of behavior.
Table 2  Results of chi-square tests for the effects of eight variables on high compliance rate in 650 outpatients in 7 general hospitals

<table>
<thead>
<tr>
<th>Variables</th>
<th>Scores</th>
<th>Number of subjects</th>
<th>High compliance rate (%)</th>
<th>Chi-square test*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived benefits*</td>
<td>1</td>
<td>10</td>
<td>50.0</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>11</td>
<td>81.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>231</td>
<td>75.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>398</td>
<td>78.4</td>
<td></td>
</tr>
<tr>
<td>Perceived barriers* (recoded inversely)</td>
<td>1</td>
<td>31</td>
<td>67.7</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>91</td>
<td>73.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>300</td>
<td>76.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>228</td>
<td>80.7</td>
<td></td>
</tr>
<tr>
<td>Self-efficacy*</td>
<td>1</td>
<td>11</td>
<td>54.5</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>9</td>
<td>44.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>266</td>
<td>71.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>364</td>
<td>83.0</td>
<td></td>
</tr>
<tr>
<td>Perceived threat*</td>
<td>1</td>
<td>45</td>
<td>62.2</td>
<td>p&lt;0.005</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>69</td>
<td>79.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>258</td>
<td>72.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>278</td>
<td>83.5</td>
<td></td>
</tr>
<tr>
<td>Severity of illness scored by physician*</td>
<td>1</td>
<td>134</td>
<td>63.4</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>255</td>
<td>76.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>184</td>
<td>82.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>77</td>
<td>89.6</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>1</td>
<td>318</td>
<td>p&lt;0.01</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>0</td>
<td>332</td>
<td></td>
</tr>
<tr>
<td>Clinical department</td>
<td>Internal medicine</td>
<td>1</td>
<td>273</td>
<td>p&lt;0.01</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>0</td>
<td>377</td>
<td></td>
</tr>
<tr>
<td>Hospital</td>
<td>A</td>
<td>1</td>
<td>137</td>
<td>NS</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>2</td>
<td>136</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>3</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>4</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>5</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>6</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>7</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

* NS: p>0.05
= The degree of each item increases as the item score gets larger.
Table 3  Results of multiple logistic regression for the effects of 10 predictor variables on high compliance rate in 650 outpatients in 7 general hospitals

<table>
<thead>
<tr>
<th>Predictor variables (range of points)</th>
<th>Regression coefficient (standard error)</th>
<th>Estimated odds ratio* (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived benefits (1-4)</td>
<td>-0.078 (0.096)</td>
<td>0.86 (0.59-1.24)</td>
</tr>
<tr>
<td>Perceived barriers (1-4)</td>
<td>0.063 (0.066)</td>
<td>1.14 (0.88-1.47)</td>
</tr>
<tr>
<td>Self-efficacy (1-4)</td>
<td>0.271 (0.088)**</td>
<td>1.72 (1.22-2.43)</td>
</tr>
<tr>
<td>Perceived threat (1-4)</td>
<td>0.116 (0.057)**</td>
<td>1.26 (1.01-1.57)</td>
</tr>
<tr>
<td>Patient satisfaction (12-60)</td>
<td>0.016 (0.006)**</td>
<td>1.03 (1.01-1.06)</td>
</tr>
<tr>
<td>Severity scored by physician (1-4)</td>
<td>0.133 (0.063)*</td>
<td>1.30 (1.02-1.66)</td>
</tr>
<tr>
<td>Sex (Male=1 Female=0)</td>
<td>0.274 (0.102)**</td>
<td>1.73 (1.16-2.58)</td>
</tr>
<tr>
<td>Age (0-93)</td>
<td>0.007 (0.003)**</td>
<td>1.01 (1.01-1.02)</td>
</tr>
<tr>
<td>Clinical department</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Internal medicine=1 Others=0)</td>
<td>0.075 (0.113)</td>
<td>1.16 (0.75-1.81)</td>
</tr>
<tr>
<td>Hospital**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>0.085 (0.331)</td>
<td>1.19 (0.43-3.24)</td>
</tr>
<tr>
<td>B</td>
<td>0.103 (0.398)</td>
<td>1.23 (0.45-3.38)</td>
</tr>
<tr>
<td>C</td>
<td>0.238 (0.893)</td>
<td>1.61 (0.57-4.56)</td>
</tr>
<tr>
<td>D</td>
<td>0.014 (0.042)</td>
<td>1.03 (0.29-3.65)</td>
</tr>
<tr>
<td>E</td>
<td>0.029 (0.105)</td>
<td>1.06 (0.36-3.11)</td>
</tr>
<tr>
<td>F</td>
<td>0.134 (0.522)</td>
<td>1.31 (0.48-3.56)</td>
</tr>
<tr>
<td>G</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p<0.05
** p<0.01
* Odds ratio of the probability of high adherence in one-point increase of each score
** The hospital differences were introduced by use of 6 dummy variables: (1,0,0,0,0,0) was assigned to Hospital A, (0,1,0,0,0,0) to B, (0,0,1,0,0,0) to C, (0,0,0,1,0,0) to D, (0,0,0,0,1,0) to E, (0,0,0,0,0,1) to F and (0,0,0,0,0,0) to G.

Consistent with the theories and the previous findings, the results indicate that the perception of threatening future outcomes is one of the important determinants of compliance behavior.

Perceived benefits and barriers regarding behavior did not show significant relations to compliance. For one explanation of these negative findings, it should be noted that these data on patient beliefs were collected inside the hospitals, in contrast to the measurements of satisfaction and compliance, which were collected by the mail-back method. In such circumstances, in view of their hospital staff, patients will feel reluctant to express anything of possible discredit to the doctor's conduct, which was supposed to negate the statistical relations between compliance and reported beliefs about benefits and barriers of therapies.

Patient satisfaction had a significant effect on compliance as observed in previous studies. However, its mechanism has not been theoretically elaborated. There is one argument proposed by Janis that "referent power" will work effectively in helping patient compliance behavior. Referent power is designated as a major determinant of social influence, i.e., when one becomes a "significant other" whose signs of acceptance are highly rewarding, one can retain referent power and influence a person's behavior. Janis notes, "Professionals are most likely to have referent power when their clients perceive them not only as useful and likable but also as benevolent, admirable, and accepting." Health care providers who have satisfied patients are supposed to influence patient compliance behavior positively through referent power. Further studies should be conducted to examine the role of referent power in the mechanisms of pa-
tient satisfaction affecting compliance behavior.

It is noteworthy that patient satisfaction was significantly correlated (Kendall's rank correlation coefficient) with patient beliefs of benefits (0.133, p<0.0001), barriers (0.137, p<0.0001) and self-efficacy (0.112, p<0.0001) regarding compliance behavior. The existence of direct interaction between satisfaction and cognitive perceptions is suspected, and Ley34) suggests that patient satisfaction is directly affected by cognitive understanding. However, these results can be a reflection of an indirect relation between satisfaction and behavior. That is, successful patient-provider communication will improve patient satisfaction on the one hand, leading patients to believe in the efficacious regimens, and cause high self-efficacy resulting in high compliance on the other hand. In such a case, the crude association between satisfaction and compliance is considered to be superimposed by indirect association due to the correlation of satisfaction with the compliance-related health beliefs. Therefore, direct effects of satisfaction influencing compliance should be clarified by controlling the compliance-related health beliefs in multivariable statistical analysis, as was done in this study.

The severity of illness scored by physicians was significantly related to compliance behavior in the predicted direction. This variable was considered to reflect the degree of medical necessity of compliance behavior.

Sex and age were significantly related to compliance even when the other variables were statistically controlled, while their effects on compliance were not consistent in past studies8). The age variable was considered to still reflect disease characteristics not expressed in the severity of illness index used in this study. Further research findings should be accumulated to determine the effects of sex and age on compliance behavior in Japanese settings.

In this study, two explanations for the validity of the compliance cutpoint value are possible: (1) Previous studies such as those of Sacket et al.27), Haynes28) and Gilbert et al.29) regarded 80% as the lower threshold for medication therapies to be clinically effective, with some empirical evidence, and adopted it as the cutpoint to distinguish compliance and non-compliance. (2) The results were consistent regarding the effects of the patient satisfaction and health beliefs on compliance when the compliance cutpoint was moved in the range between 70 and 80%.

One limitation of this study was that medication compliance was reported only by respondents themselves, without direct observation of behavior or objective measures such as pill-count and biochemical monitoring. Nevertheless, findings were accumulated that compliance measured by self-report was highly correlated with other types of measures21,35,36). This study had several strengths in its measurement design. The questionnaires were to be returned to an independent research institution (not to the provider organizations as is usual with Japanese compliance studies), which prevented biased responses caused by patient anxiety about the healthcare providers scrutinizing the individual questions. Moreover, compliance behavior was asked about in a non-judgmental fashion using an anonymous format. The high internal consistency of the compliance scale is another strength of the reliability of measurement. Further prospective studies with pretest measures are needed to confirm the theoretical causal mechanisms of patient compliance behavior.

Acknowledgment

We thank Dr. K. Murata, Department of Public Health, Faculty of Medicine, University of Tokyo for his valuable suggestions.

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Appendix A Questionnaire items on medication compliance

Please answer the following questions on your medication-related behavior in the last one month.

1. To what degree did you comply with the doctor's directions to take the prescribed medication?
   
   1  2  3  4  5  6
   not at all rarely sometimes fairly often most of the time completely

2. Please indicate on the scale below (0-100%) to what degree you complied with the doctor's directions to take the prescribed medication.

   0% 10 20 30 40 50 60 70 80 90 100%

   0% compliant (not at all compliant)

   100% compliant

3. How much of the medication to take did you not use or discard?
   
   1  2  3  4  5  6
   all almost all fairly much a little little none

Appendix B Questionnaire items on patient health beliefs related to medication compliance

C51-53.
Do you agree or disagree with the following sentences on taking medication as the doctor indicated?
C51. It will be beneficial to me.
C52. It will cost me (in terms of time, financial and human resources).
C53. I think I am capable of following the medication regimen as prescribed.

Note) The answer categories are: 1 = disagree, 2 = weekly disagree, 3 = weekly agree and 4 = agree.

C72. Do you think your illness will get better or worse if you stop receiving medical care?

Note) The answer categories are: 1 = better, 2 = a little better, 3 = a little worse and 4 = worse.

Appendix C Patient satisfaction items (Hall et al. 27)

Do you agree or disagree with the following sentences about the health care you received?

1. I am perfectly satisfied with the health care I have been receiving.
2. There are some things about the health care I have been receiving that could be better.
3. The amount of time I’ve spent with health care providers is certainly adequate.
4. I have not had as much contact with health care providers as I think I should have had.
5. My health care providers have completely explained the reasons for examination procedures or medical tests.
6. My health care providers could have listened more carefully to what I had to say.
7. My health care providers have always treated me with utmost respect.
8. My health care providers could have been kinder and more considerate of my feelings.
9. I have an extraordinary amount of confidence in the health care providers I’ve been seeing.
10. I have some doubts about the ability of my health care providers.
11. The health care I’ve been receiving relieves me completely of worry and uncertainty.
12. There are some health issues that I feel my health care providers have not given enough attention to.

Note) The answer categories are: 1 = strongly agree, 2 = weakly agree, 3 = indifferent, 4 = weakly disagree and 5 = strongly disagree.