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The purpose of this study was to examine the relationship between two different methods of measuring beliefs about drug-taking compliance and the behavior of drug-taking compliance, and to compare the predictive ability of the two methods of measuring beliefs about drug-taking compliance. The belief examined was perceived seriousness, a health belief, in subjects with urinary tract infections.

Subjects completed a pre-drug regimen survey before they began any medications. A post-drug regimen telephone interview was conducted approximately ten days later.

The relationship between each of the two different measures of perceived seriousness and drug-taking compliance was calculated. Both measures of perceived seriousness had a positive relationship with drug-taking compliance. However, the refined measure that was more specific in terms of action, target, context and time had a greater, statistically significant relationship with drug-taking compliance than the measure traditionally used by Health Belief Model researchers.

The ability of the two different measures of perceived seriousness to predict drug-taking compliance behavior was compared. The

refined measure was a significantly better predictor of drug-taking compliance than the Health Belief Model's traditional manner of measuring health beliefs. These results can serve as a way to better understand the problem of noncompliance.

Comparing Measures of Beliefs about Drug-taking Compliance

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COMPARING MEASURES OF BELIEFS ABOUT DRUG-TAKING COMPLIANCE

I. INTRODUCTION

This chapter first focuses on compliance behavior in the health care field. The problems and extent of noncompliance will be discussed. Methods used to measure and improve compliance will be explored.

This chapter next focuses on two theoretical models used to understand and to predict behavior: the Health Belief Model and the Theory of Reasoned Action.

Lastly, this chapter will focus on a method to improve measures of predicting behavior. This method will basically refine measures from the Health Belief Model based upon suggestions from the Theory of Reasoned Action.

COMPLIANCE

Professionals in the health care field are much concerned with the problem of noncompliance. They often prescribe set regimens for individuals with the purpose of preventing, decreasing or eliminating such problems as heart disease, obesity, smoking, glaucoma, tuberculosis and so forth, yet their recommendations are not always followed. Why do individuals go the trouble to seek out health or medical care but fail to comply? This has puzzled experts for years. It would seem that there is a reasonable explanation for the behavior of noncompliance. Numerous studies

have explored the problem and have developed explanations for and methods to reduce noncompliance. But still the problem of noncompliance continues to exist.

What is noncompliance? A number of terms such as non-adherence (to treatment regimens)[1,2], therapeutic alliance[2], hypocompliance[3], and drug-defaulting[4] have been used to describe this particular behavior. These terms refer to the behavior of not following or not complying with some type of medical regimen. Sackett[2] defines compliance as "the extent to which the patient's behavior (in terms of taking medications, following diets or other life style changes) coincides with the clinical prescription." In drug therapy, noncompliance can mean: taking the drug for the wrong purpose, errors in dosage, errors in the time of administration, omission of dosage, improper dosing interval, premature discontinuation of medication, forgotten doses, knowingly skipping doses, and not filling a prescription[3,5-7].

PROBLEMS OF NONCOMPLIANCE

Noncompliance can result in both monetary and nonmonetary costs for the patient. The monetary costs are incurred as a result of additional office visits, hospitalizations and medications required by the noncompliant patient. The nonmonetary costs involve diminished health benefits. Both underutilization and/or overutilization of medications can deprive patients of therapeutic benefits[1,3-5,8]. Initially the effects of underutilization may not be apparent, but later there may be a worsening of the illness. These ill effects may appear as a re-occurrence of an

infection due to premature discontinuation of an antibiotic, refractoriness or resistance to a drug such as those used for tuberculosis, or as an excessive response to other drugs that are being taken concurrently such as digoxin, hydrochlorothiazide, and potassium chloride[3]. Overutilization of a medication can mean excessive doses or doses taken too frequently. Overutilization may cause adverse reactions and other hazards to the patient's health, as well as the financial burden which may result from the need for further medical care.

Health care providers may also feel the costs of noncompliance. They may experience frustration[1,8] and they may believe the patient was compliant when in reality the patient did not take medications as directed. The patient seeking medical advice, yet failing to comply, may waste medical resources. Noncompliance in drug therapy has been associated with increased medical admissions. In one study, 2.9% of 1184 admissions were due to noncompliance of medications in cardiovascular, pulmonary and inflammatory diseases[6]. "About 1/7 of all hospital admissions are drug toxicity related, with an annual cost exceeding $4 billion"[9].

EXTENT OF NONCOMPLIANCE

The problems of noncompliance add to health care costs which are continually rising. By understanding and recognizing the problems that may occur, and avoiding them, professionals may ensure medical therapy that is more beneficial and successful for everyone.

Noncompliance has been measured in numerous studies that have observed different behaviors ranging from appointment keeping[10] to proper drug administration timing[3,5,6,11,12], medication dosage and duration of prescribed medications [6,11,12].

There is a wide variability in consumption of prescribed medications. A review by Marston[13] estimated noncompliance to range from 4 to 92%. Stewart and Cluff[14] also found a wide range in noncompliance, which they estimated to range from 20 to 82% in outpatients. A review of over 50 studies[10] found that complete failure to take medication often ranged from 1/4 to over 1/2 of all outpatients. In another study it was stated that "at least a third of the patients in most studies failed to comply with doctors' orders" and that a third of the studies performed have a noncompliance rate of 50% or more[3,8,15]. Also, some patients even admit that they had never planned to comply[21].

MEASURES OF COMPLIANCE

A closer look at the extent of noncompliance should include the specific methods used to measure drug-taking behavior. A number of methods have been used, which include urinalysis[3,4,8,14], blood assays[3,8], pill counts[3,4,8,14], records of appointments kept[3,8], patient interviews[3,4,14], patient self reporting techniques[8], recording of blood pressure levels (in patients on anti-hypertensive medications)[16], medical monitoring[3], and special recording equipment[14]. From these examples it can be seen that noncompliance can be measured in a number of ways and with varying degrees of accuracy. "Estimates of

the degree of patient adherence to medical regimens seems to be negatively related to the objectivity of the method used to assess adherence"[1]. This makes it difficult to obtain a complete and comparable picture of the extent of noncompliance.

The difficulty of comparing methods which measure compliance is exemplified by pill counts and urinalysis. Pill counts is "the comparison between the amount of medication remaining in the patient's bottle and the amount that should have remained, the latter calculated from the prescription and the length of time for which the medication has been prescribed"[2]. Urinalysis is a process that tests for the presence of the drug and/or its metabolite(s) in the urine[2,4]. Pill counts provide the total amount of medication consumed and an overall indication of compliance, assuming the medication has been consumed by the patient in the prescribed manner. Also, pill counts are inexpensive and practical. In contrast, urinalysis neither gives a quantitative measurement of consumption nor an overall indication of compliance. It measures only the presence of the drug and/or its metabolite(s) in the urine during a given period and not the degree of overdosage or underdosage by the patient. Also, urinalysis is more expensive than pill counts. Comparisons of compliance assessed by pill counts and urinalysis have indicated frequent discrepancies between the two methods[2,17,18]. The discrepancy may be interpreted as the result of overdosage or underdosage on a continual basis as measured by pill counts. Discrepancies show the difficulty in comparing two different

methods of assessing compliance, while comparisons show the practicality of each method.

The accuracy of the numerous methods used in measuring compliance is not known. But it has been noted that urinalysis tests show the highest rate of noncompliance. The lowest rate results when patients are asked about their compliance[1]. Of course this may vary from one situation to another, which makes it important to understand the various factors that have been associated with noncompliance. A combination of methods would theoretically provide more valuable data to more accurately measure compliance, but it may not always be feasible.

STRATEGIES TO IMPROVE COMPLIANCE

Noncompliance has been studied and its contributing factors identified, but what has been done to improve compliance? Various strategies to improve compliance have been tried with varying degrees of success. These strategies include physical, educational, psychological/attitudinal and behavioral means.

The physical means were developed through observation of patient characteristics such as memory, vision, and dexterity. Many individuals fail to take their medications due to forgetfulness and/or the complexity of their medication regimen. To minimize such problems special devices and techniques like the daily medication chart reminder[11], special calendars[5,12,16], dose dispensers, special packaging with instructions (written or oral)[12,19,20] and changes in labeling methods[5] have been devised.

Charts and calendars serve as reminders of when to take medications and as a self monitoring aid. Special packaging, for example, with oral contraceptives, helps to increase the understanding of how and when to take the medication. When the dose size and form of medication are inconvenient, compliance may be inhibited. But with special packaging, this inconvenience may be minimized. The special packaging can serve as a cue or reminder, as with unit dose packaging. Special packaging has had success in many cases[21]. But unfortunately, specially designed packaging, such as prescription containers, can sometimes hinder the compliance of elderly or handicapped individuals because of the difficulty in opening the containers.

A second strategy, education, can also enhance compliance. Verbal explanations or written instructions can help the patient to more fully understand directions on a prescription. When instructions for directions are supplied to the patient the instructions should be as specific as possible. The directions should not be subject to misinterpretation (i.e., label directions such as, "Take as directed"). Educational information that will promote compliance should make the patient aware of the medication's name, general purpose, route by which the medication is to be taken, the amount of each dose, the timing and frequency of administration, the maximum daily dose, how long the medication is to be taken, relevant adverse effects, cautionary information, the need to avoid certain food, medications or activities, the proper storage and handling, as well as renewal instructions[3].

Written instructions can be an advantage over verbal instructions. They can serve as a quick reference for the patient to read when verbal instructions have been forgotten. But written instructions may not always be helpful if a patient is not literate, has poor eyesight, is foreign, or simply ignores the information[37]. The clinician must be aware of problems and make adjustments according to the patient's needs.

The educational process of providing both verbal and written explanations is important. Patients should be encouraged to ask questions even after discussing therapy (i.e., how the medication is to be used or more information about its adverse effects).

The psychological or attitudinal and behavioral approaches are additional strategies that have been studied as means to improve compliance. These approaches involve development or changes in the patient's beliefs, attitudes and behavior. "For a doctor to achieve maximum effectiveness, or for a health message to have an effective impact, the patient's personal, subjective beliefs must be taken into account[40]." Threats or shock[4,8,21-23] to punish the patient for noncompliance have been used, but they have not always improved compliance[21-23]. Rather, they have generally produced negative results. Another way of dealing with the individual's beliefs and attitudes is giving adequate consideration to how extensively the individuals are informed about their therapy. Well-informed patients will not have erroneous or insufficient information that may be detrimental for them in terms of their health beliefs and attitudes (i.e., underevaluation of an illness's severity or the efficacy of medical therapy).

Direct involvement of the patient can also improve compliance[21]. One type of direct involvement is to allow patients to participate in their medication administration before they leave the hospital rather than to give them their medications when they are discharged. Generally, patients receive so much information the day they are to be discharged from the hospital that they do not remember all of what they are told. Allowing patients to become involved with their therapy in advance gives them a chance to get used to their drug regimen, and recognize which medication to take and when to take it. The patients's ability to self-administer medications can be helped further by orienting them to the situation they find themselves in at home.

A number of theoretical models have been developed as a way to understand behavior. These theories have dealt with health-related behaviors such as health, illness, sick-role, and preventive health behavior. These theories have contributed towards explaining and understanding behavior, but they have not been completely successful. One theory that has had satisfactory success in predicting behavior is the Health Belief Model (HBM). It has been applied in both retrospective and prospective studies examining preventive health behavior and other types of health-related behavior. Although the HBM is somewhat successful at predicting behavior and provides a good theoretical framework in explaining behavior, additional modification may further enhance its usefulness. A proposed modification involves refinements suggested by a second theory, the Theory of Reasoned Action (TRA), formulated

by Ajzen and Fishbein[24]. This second theory, and the proposed modification of the measures of the HBM variables, will be discussed following a discussion of the HBM.

THE HEALTH BELIEF MODEL

The Health Belief Model (HBM) formulated by Hochbaum, Kegeles, Leventhal, and Rosenstock[25] is a socio-psychologically oriented theory aimed at predicting health actions. It is based on the work of Lewin[26], which suggests that behavior depends to a large extent upon two variables: 1) the value placed by an individual on a particular outcome, and 2) the individual's estimate of the likelihood that a given action will result in that outcome. This model has been categorized as a value-expectancy theory, which attempts to describe behavior under conditions of uncertainty[27,28]. The value of an outcome for an individual and the individual's expectation that certain actions will result in the desired outcome determine behavior[27]. The HBM's variables deal with the subjective world of the individual and not the objective world of the health care professional. It links the current subjective state of the individual with current behavior. The theory also hypothesizes that an individual's beliefs concerning four subjective elements influence whether he will undertake the health action. These elements are: 1. the individual's perceived level of susceptibility to a particular health condition; 2. the individual's perceived level of seriousness of the consequences of contracting the particular health condition; 3. the individual's estimation of the advocated

health action's potential benefits or efficacy in preventing or reducing susceptibility and/or seriousness; 4. the individual's perceptions of physical, psychological, financial and other costs or barriers involved with the recommended action. Later revisions have added "cue to action" as part of the model to serve as a stimulus to trigger the appropriate action by the individual. In addition, modifying or enabling factors are included as part of the model. Figure 1 shows how these components fit together to form the HBM. Individuals's perceptions or readiness to take actions, modifying factors, and likelihood of action components together influence their health behavior.

Perceived susceptibility

This variable is an element of readiness to take action in terms of a certain disease. Individuals perceive differently the likelihood of personal susceptibility to a condition. At the two extremes of perceived susceptibility, the individual may deny the possibility of contracting a disease, or may express the feeling of being in great danger. The individual may also look at the disease from a statistical view and admit the possibility of contracting the disease but believe this to be unlikely[29]. This view is the individual's subjective risk of contracting a disease.

1

Perceived seriousness

The disease may also be viewed by the individual in terms of its medical consequences in which a concern for the seriousness of the disease is considered, such as its fatal or debilitating consequences for short or long time periods. Similar to perceived susceptibility, this variable is an element of readiness to take

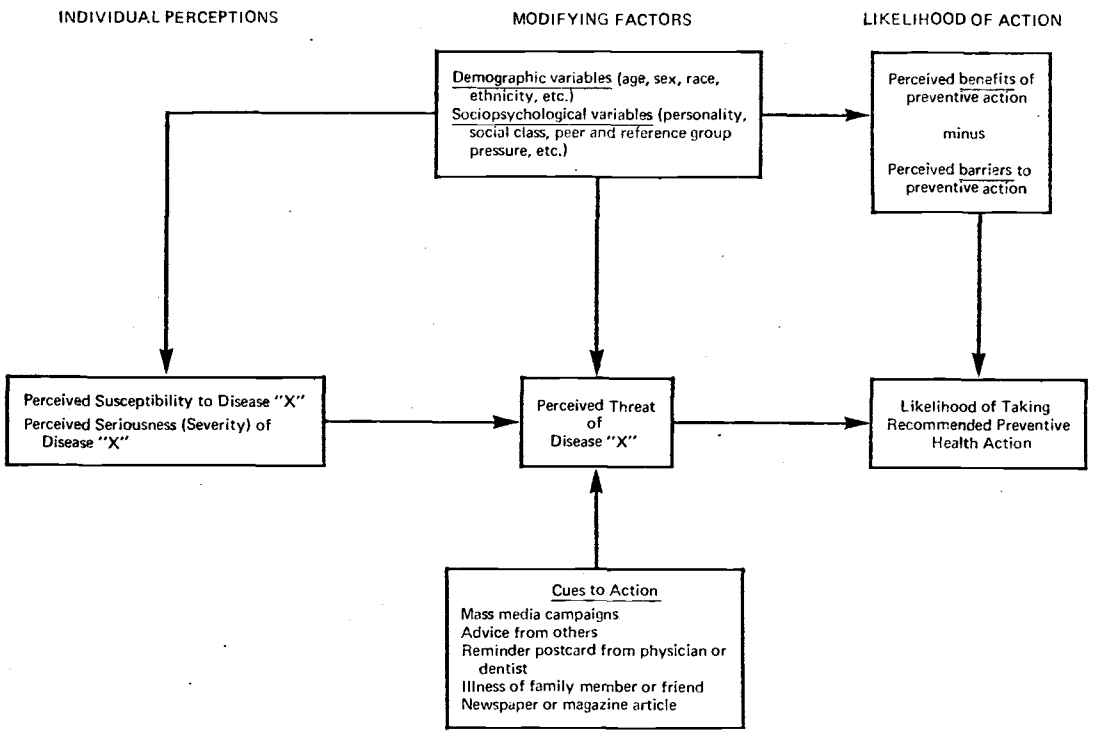

Figure 1. The Health Belief Model
Source: Becker & Maiman (1975, pp. 12)

action and may vary in intensity from individual to individual. The perceived level of seriousness may be assessed through the emotional arousal created by the thought of the disease plus the difficulties from the disease that may be encountered.

Perceived benefits

Accepting their susceptibility to a disease that is believed to be serious will lead individuals toward a perception that action needs to be taken. This perception about taking action then urges individuals toward a selection of different courses of actions that can be taken. The choice among courses of action is influenced by the available alternatives perceived to be beneficial. The alternative perceived as being most able to reduce the susceptibility and/or seriousness of the disease and perceived as having the fewest barriers will be viewed as most beneficial to individuals. The individuals's beliefs about the benefits of taking certain actions is influenced by objective facts concerning the efficacy of the benefits.

Perceived barriers

The individual may perceive an action to be beneficial in reducing the threat of a disease, but at the same time consider the action to be economically costly or consider the action to be a barrier that is inconvenient, painful, or expensive. These negative perceptions of the action may also stimulate conflicting feelings of avoidance. The difference between the patient's perceptions of the benefits of taking action and barriers to taking action contribute to the individual's likelihood of taking action. When the readiness to take action is high and the negative aspects

are low, the recommended action may be taken. A conflict arises when both the readiness to act and barriers to action are high. Sometimes, other options are available to resolve this conflict.

Perceived threat

Generally speaking individuals perceive disease to be threatening to some degree. These perceptions are developed from a combination of perceived susceptibility, perceived seriousness, modifying factors and cues to action. This is not one of the four health beliefs of the HBM.

Cues to action

Cues to action stimulate individuals towards appropriate behavior. Although the levels of perceived susceptibility and perceived seriousness motivate individuals to act, and the perception of benefits (minus barriers) provides the direction of action, it is believed that nothing will happen unless individuals are made aware of the action itself. This is the role of cues to action. The cues may be internal (e.g., perceptions of bodily states or symptoms) or external (e.g., interpersonal interaction, mass media). The intensity of the cues necessary to motivate individuals to act may vary depending upon the level of perceived susceptibility and seriousness. Low levels of perceived susceptibility or seriousness would require stronger cues than high levels of perceived susceptibility or seriousness.

Additional variables

Included among the modifying factors in the model are other variables, which are socio-psychological (e.g., personality,

social class, peer groups) and demographic (e.g., race, age, sex) variables. They act to modify an individual's perceived benefits of taking recommended actions.

The Health Belief Model as presented in Figure 1 demonstrates that the perceived threat of disease is affected by both perceived susceptibility and seriousness, and is influenced by modifying factors that include cues to action. These perceptions and factors determine the likelihood of an individual taking the recommended action. Action, as discussed earlier, may also be influenced by perceived benefits and barriers.

STUDIES SUPPORTING THE HEALTH BELIEF MODEL

Numerous studies have applied the Health Belief Model (HBM) to predict health behavior. These studies have been both retrospective and prospective in nature. Together and individually these studies supported the HBM variables in their ability to predict behavior. Furthermore, the HBM has been applicable not only to preventive health behavior research, but to illness and sick-role behavior research and to other behavior research as well. In the application of the model, individuals need not be continuously nor consciously aware of relevant beliefs applicable to a particular situation. As shown in Figure 2 the model has been further modified to include a motivation aspect.

The HBM research to date has examined health behaviors associated with tuberculosis[30], influenza[31], dental care[32-34], cancers[33], antihypertensive therapy[35], genetic screening[36], and rheumatic fever[37,38]. The contribution of

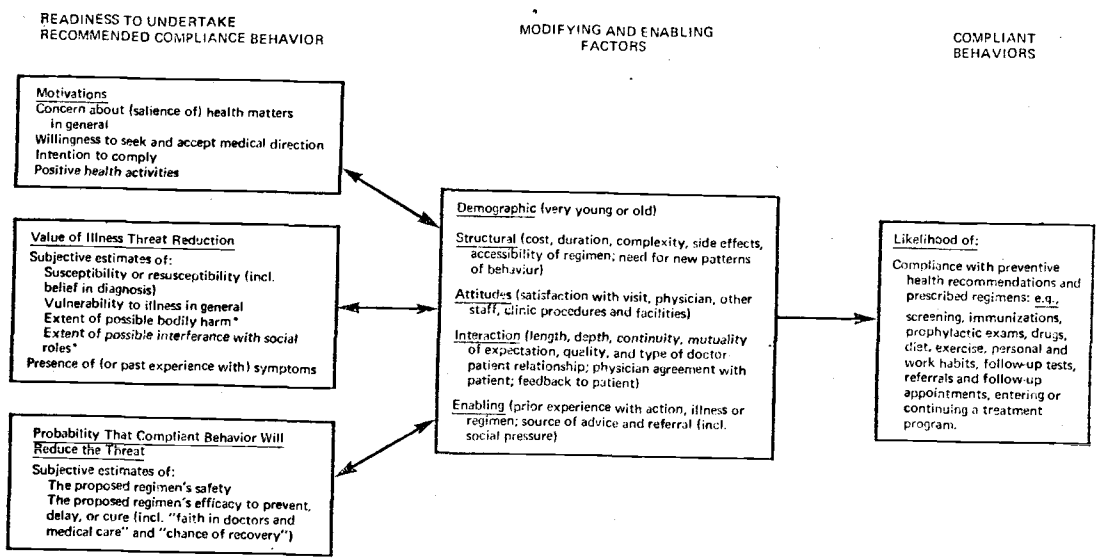

Figure 2. The Health Belief Model modified
Source: Becker & Maiman (1975, pp. 20)

several studies will be discussed in assessing the strengths and weaknesses of the HBM.

Readiness to take action is measured by two variables of perceived susceptibility or vulnerability, and perceived seriousness. Each variable has been investigated in more than one study, but without equal or consistent success. Hochbaum[30] attempted to identify factors underlying the decision to obtain chest X-rays for the detection of tuberculosis. The study showed that a particular action (obtaining a chest X-ray) is a function of two interacting variables: perceived susceptibility and perceived benefits. However, the study was not able to successfully demonstrate that perceived seriousness plays a role in the decision making process. It was speculated that this was due to inadequate measures of the variable.

Kegeles[32] also dealt with perceived susceptibility and perceived seriousness in individuals who were members of a pre-paid dental program. Patients were given access to preventive dental check-ups or prophylactic care in the absence of symptoms. This study measured patients' perceptions of: their susceptibility to a number of dental diseases, the seriousness of the diseases, the benefits of preventive action, and the barriers to those actions. The results from Kegeles' research show that individuals who had low levels of perceptions for all measured variables made no preventive dental visits, while individuals who had higher levels of perceptions of those variables made a greater number of preventive dental visits. Kegeles was able to demonstrate the internal consistency of the model in the predicted direction;

however, the results are not a complete confirmation of the HBM. This study was also limited by its retrospective nature and its small sample size.

A third year follow-up of Kegeles' previous study[33] was done via a mail survey. The purpose of the study was to identify whether beliefs held during the earlier study were associated with behavior in the ensuing three year period. The study showed that perceived seriousness, whether considered independently, or in combination with other variables, was not associated with subsequent behavior. Although this study supported the value of combined variables such as perceived benefits and perceived susceptibility, it was not able to show an association between the perceived seriousness of dental problems and subsequent preventive dental behavior.

In summary, studies have shown HBM variables to be associated with health-related behavior, but they have also indicated the existence of weakness within the model. The four specific types of beliefs measured in the HBM have not been equally successful or consistent at predicting behavior. In numerous studies, the belief of perceived seriousness did not demonstrate a good correlation with behavior. Perceived seriousness, whether used independently or in conjunction with other variables, was not consistently shown to be associated with subsequent behavior[31,33]. The less than satisfactory correlations between measures of perceived seriousness and behavior in some of the studies may be due to insensitivity and inconsistency in measurements of perceived seriousness. Thus,

wording questions in a more specific manner may help to improve accuracy and precision in measuring perceived seriousness.

It may be possible to improve the ability of the HBM to predict behavior by further refinement of the model's health belief measures. Perceived seriousness would be a good variable to test, since of the four health beliefs measured, it has produced inconsistent and low results most frequently. As discussed in the next section, the Theory of Reasoned Action can be applied to refining measurements of variables of the Health Belief Model.

THE THEORY OF REASONED ACTION

The Theory of Reasoned Action (TRA) suggests that individuals decide whether or not to participate in a given action based on consideration of the action's implications. It assumes that human beings are usually quite rational and make systematic use of information available to them. It also assumes that certain behaviors are under volitional control and are a function of individual's intention to perform or not perform the particular behavior[24]. Individuals's behavioral beliefs in terms of the value of the goal, and their expectation of attaining the goal combine to produce an attitude toward the behavior. The attitude toward the behavior is either favorable or unfavorable with respect to the behavior.

A second type of belief is an individual's belief about another specific person concerning that person's behavioral expectations. This belief is known as normative beliefs, and is influenced by the individual's motivations to comply with that

specific person. Together, normative beliefs and motivations to comply influence subjective norms. Subjective norms are individuals' beliefs about their nonspecific, close, salient "referent others"[2] concerning whether or not they should perform a particular behavior. Together, the attitude and subjective norm influence behavioral intention. Behavioral intention is the individual's intention to perform the behavior, and is the immediate determinant of behavior.

In the TRA, beliefs are the first construct that influence behavior. The beliefs considered here are salient beliefs, not beliefs stored deep in an individual's conscience. They are readily and easily elicited from an individual. As described above, two types of salient beliefs are included in the TRA model: behavioral beliefs and normative beliefs. This framework underlies the TRA (Figure 3), with beliefs being an initial component in the prediction of behavior. The concepts of the TRA are organized in a systematic manner with each concept serving as a determinant of successive concepts, the last of which is behavior. (For the purposes of this study, emphasis will be placed on behavioral beliefs. For more information on other constructs in the TRA see Ajzen and Fishbein[24])

The behavioral beliefs are an individual's estimate of the likelihood of occurrence of the particular action or behavior being examined. Behavioral beliefs are considered together with the individual's evaluation of the consequences of the behavior or outcome. Together, both behavioral beliefs and outcome evaluations determine attitude towards behavior. Measurement of behavioral

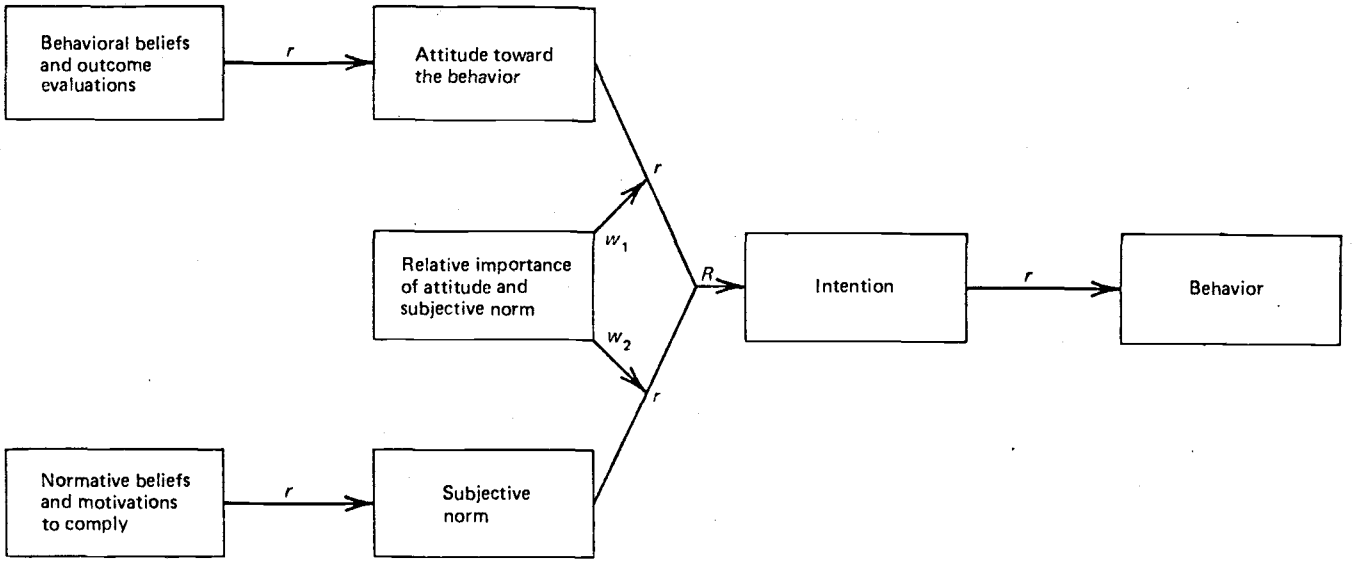

Figure 3. The Theory of Reasoned Action
Source: Ajzen & Fishbein (1980, pp. 100)

beliefs is done in terms of the belief's strength. When a belief is measured, the belief and behavior should correspond in terms of four elements: action, target, context, and time. (See Ajzen and Fishbein for further details on how to calculate the components of the TRA[24]).

The four elements of specificity must be included in the measure of an individual's beliefs. When measures of both beliefs and behavior are consistent in terms of these elements, they allow a better determination of the relationship between the individual's belief and its subsequent construct, attitude toward behavior. Furthermore, these measures also allow for better prediction of behavior, if they are consistent. This consistency means that in measuring the TRA's constructs, questions must be asked that are consistent with regard to action, target, context, and time elements. Where action is the behavior itself (i.e., buying, taking, eating); target is what the behavior is directed towards (i.e., brand, product); context is the situation of the behavior (i.e., for own use, in a given store); and time refers to the temporal period of the behavior (i.e., next week, next year). These elements are necessary, since the individual's belief must correspond to the behavior in terms of action, target, context and time in order to accurately predict behavior.

In summary, the TRA states that beliefs influence behavior, but in an indirect manner and in accordance with specific constraints. The TRA's constructs allow for an accurate prediction of behavior, as long as there is a correspondence

between the constructs in terms of action, target, context, and time elements.

STUDIES SUPPORTING THE THEORY OF REASONED ACTION

When applying the TRA to predict behavior, it is not always necessary to use the complete model[24]. Also, if an immediate determinant of one of the constructs and the construct itself do not demonstrate a relationship that will contribute to the prediction of behavior, it is unlikely that measurements of the immediate determinant's precursor will predict behavior either.

The TRA has been applied to a range of behaviors: from weight loss[41], occupational orientation[42], family planning[43,44], and consumer behavior[45] to voting patterns[46]. The successful results of these studies show the TRA's value as a predictive tool, and more importantly, in understanding behavior. To point out the success and value of this model, certain parts of several studies will be discussed.

Beliefs is the construct from the TRA that initially influences prediction of behavior. The beliefs are salient, and categorized as personal behavioral beliefs. Measurement of beliefs and their use as determinants of subsequent components of the TRA have been successful. Two studies[43,44] measured the salient behavioral beliefs of college women and married women with children concerning birth control use. These data were able to predict attitude toward the use of birth control pills.

In a second study[47], the mothers' beliefs about infant-feeding were used indirectly in assessing the relationship between

attitude toward behavior and actual behavior. Although beliefs were used indirectly in this assessment, they were highly correlated with behavior. This study also shows that when measures of beliefs correspond in terms of action, target, context and time, beliefs can indirectly contribute to the relationship between attitude and behavior. This is because the measures of beliefs were specific in terms of the elements of correspondence.

Consistency in the elements of specificity (action, target, context, and time) is an important point brought out in the TRA. The importance of this consistency is demonstrated in a study[45] assessing consumer behavior. The measurement of three constructs: behavioral intention, attitude toward behavior, and subjective norm were used to illustrate the importance of consistency of the elements of specificity. The degree of the relationships between the constructs was measured. The relationships between behavioral intention and each of its immediate determinants, attitude toward behavior and subjective norm, were both statistically significant. Consistent application of the four elements of specificity was maintained in the measurement of the variables. This is important because predictive accuracy declines when consistency in measuring the variables was not maintained[24].

These examples show how different constructs of the TRA have the ability to directly or indirectly predict behavior. They also show how the TRA's elements of specificity are applied to the measurement of TRA constructs. Both are unique from previous measures of the variables of the HBM, which were not consistent in terms of the elements of specificity. Refining the measurement of

the health belief perceived seriousness, by including the elements of specificity (action, target, context and time) may be just as successful.

REFINEMENT OF THE HEALTH BELIEF MODEL MEASURES

The two models have demonstrated their predictive value; however, they have not been equally successful. Differences in the success of each model may possibly be attributed to dimensional, specificity, and emphasis factors. The HBM is one dimensional in its approach to behavior prediction. It includes only the beliefs dimension. The TRA, by contrast, is multidimensional. In addition to beliefs, it includes attitudes towards behavior, subjective norms, and behavioral intentions.

The second difference is each model's specificity in the measurement of the variables. The HBM is specific in terms of personal health beliefs. These health beliefs are separated into perceived susceptibility, perceived seriousness, perceived benefits, and perceived barriers, but they are not further refined. The TRA includes behavioral beliefs, but the model does not separate it into specific behavioral beliefs. The TRA, as mentioned earlier, requires correspondence between beliefs and behavior in terms that are specific in action, target, context, and time. These four elements refine the measure of beliefs in a specific manner that allows for better correspondence with behavior.

The third difference is a matter of emphasis. The HBM's health belief, perceived seriousness, emphasizes the disease. The TRA's behavioral belief emphasizes the behavior.

Although the measures of beliefs in the HBM may include target, context, and time, they are not applied in the same manner as in the TRA. For example, measures of perceived seriousness have contained some or just one of the elements of target, context and time. But, historically while these other elements may have been included, the measures of beliefs have not corresponded with the action or behavior. Instead, they refer to the disease. In contrast, the TRA's measure of belief requires that action, target, context and time correspond with the behavior. To point out the distinction between the application of the four elements in the HBM and the TRA examples from previous studies will be discussed, using the HBM's perceived seriousness belief to predict behavior.

Patient adherence to antihypertensive therapy was investigated in one study[34] that asked questions about perceived seriousness. An example of the questions used to measure perceived seriousness is, "If you had high blood pressure now, would it still be having the same effect on you five years from now, or would it be having more of an effect, or less?" The question includes only time (now, five years from now) and target (high blood pressure). These elements do not correspond to the behavior. They are not directed at the behavior in question, which is the individual's adherence to antihypertensive therapy. Instead, the question is directed at the disease (high blood pressure) and the effects of the disease. This is characteristic of questions used to measure beliefs in HBM

research. Questions are often directed at beliefs about the disease rather than at beliefs about the behavior. If these questions corresponded more closely to the behavior they would be more specific. As the TRA suggests, there would be a closer correspondence between the belief and the behavior. A more refined measure of perceived seriousness would help to improve its accuracy in predicting behavior. Such a refinement would include closer correspondence between belief and behavior in terms of action, target, context and time.

Perceived seriousness of dental problems was measured in a study on participation in a preventive dental program[39]. The seriousness was measured in reference to perceptions of conditions of both dental health and dental appearance. The health component was measured in the form "Compared to breaking an arm, how bad would it be to get a lot of cavities (lose all your teeth, get bleeding gums)?" The appearance component was measured in the form "Compared to getting acne, how bad would it be to have dirty (crooked, ugly)teeth?"

Such questions make comparisons using dental health conditions and dental appearances. These measures of the HBM's perceived seriousness construct do not have a specific correspondence between the belief and the behavior in question, which is participation in a preventive dental program. Both questions were used as indicators of the seriousness construct. They did not include the behavior of participating in a preventive dental program. Nor did they include elements of action, target, context or time. The TRA emphasizes the importance of the elements of action, target,

context, and time, since they help to form a closer correspondence between two constructs, such as the health belief, perceived seriousness, and behavior.

The lack of specificity affects the degree of correspondence between the belief and the behavior. The previous examples are typical of the HBM's lack of correspondence between belief of seriousness and behavior. In these examples elements of target, context and time were not considered, nor did they correspond to the behavior in question. The beliefs were related to a disease or its consequence (cavities) and from that relationship a behavior was predicted. If the items measuring beliefs corresponded more closely to the behavior in terms of action, target, context and time, the results may have been more successful.

Because traditional measures of the HBM's variables do not include the four elements of specificity (as in the TRA), it is proposed that measures of HBM beliefs be refined to correspond more closely with behavior. This refinement will make a specific belief dimension from the HBM, perceived seriousness, correspond more closely with behavior in terms of the four elements of specificity (action, target, context and time) from the TRA. Individuals will be asked questions of behavior consistent in action, target, context and time. The questions will be directed toward a behavior and will be more specific. This contrasts with the HBM's usual method of measuring beliefs of perceived seriousness, which does not use elements of specificity. The refinement improves prediction of behavior through the increased specificity of the refined measures. Specificity in the measurement of each component in the

TRA is pointed out by Ajzen and Fishbein[24] as being important for accurate behavior prediction. Specificity is purported to increase correspondence between the model's components and behavior. The increased correspondence will increase the degree of prediction since refining HBM measures by applying the TRA's elements of action, target, context and time introduces more specificity. On the supposition that correspondence is increased with the HBM's refinement, it is proposed that measures of predictability can be improved.

STATEMENT OF THE PROBLEM

Noncompliance in the health field is a problem that affects individuals of all age groups. Its extent is not fully known, but its implications can be serious. Individuals that do not comply with their medical therapy (e.g., by not taking their medicine for an illness as directed), may have a relapse that is worse than the initial occurrence of the illness. Additionally, noncompliance can have economic consequences, such as increased health care costs for both the patient and the health care provider.

GOAL OF THE STUDY

The goal of this study is to examine the relationship between two different methods of measuring beliefs about drug-taking compliance and the behavior of drug-taking, and to compare the predictive ability of the two methods of measuring beliefs about drug-taking compliance. This information will allow a greater understanding of the importance of the way beliefs are measured and

their relative effectiveness when intervention strategies are needed for patients with noncompliant behavior.

HYPOTHESIS

This study will test the following hypotheses:

1. There is a relationship between the individual's perceptions of the seriousness of a specific medical problem and the individual's level of drug-taking compliance.
2. There is a relationship between the individual's perceptions of the seriousness of the consequences of not taking his/her medicine and the individual's level of drug-taking compliance.
3. The individual's perceptions of the seriousness of the consequences of not taking their medicine is more predictive of levels of drug-taking compliance than the individual's perceptions of the seriousness of a specific medical problem.

DEFINITIONS

1. Perceived seriousness has been used interchangeably with perceived severity in a number of studies using the HBM. In this study, perceived seriousness will refer to perceived severity also.

2. Referent others are those individuals that an individual relates to and associates with in making decisions.

II. METHODOLOGY

SUBJECTS

Subjects selected for this study were female students seeking medical care at a university's student health center (SHC). All subjects selected to participate were diagnosed as having uncomplicated urinary tract infections (UTI). Patients with UTI's were chosen to be in the study for several reasons: symptoms of UTI's are easily recognized and associated with the disease, the short duration and non-recurrent status of UTI's and the short length of drug therapy required for UTI's[48-51]. Selection of subjects was performed with the cooperation of both physicians and pharmacists within the center.

PROCEDURES

The study included both pre- and post-drug regimen surveys. The first questionnaire booklet (Appendix C) contained questions that reflected patients' attitudes and beliefs concerning medical care in general, and drug-taking behavior specifically. Also included in the booklet were questions that asked patients for background information such as age, income, education, number of household members and so forth (Appendix C questions 13-22). However, not all of the questionnaire booklet was used for the purposes of this study. The pre-drug regimen questions that apply to this study are shown in Appendices A and B.

The post-regimen telephone interview (Appendix D) contained questions that were similar to those in the previous questionnaire, except for the omission of background information questions. The only part from the post-regimen telephone interview that is applicable to this study are questions 1 - 10 (Appendix D).

Each subject received a questionnaire booklet at the center's pharmacy. The pharmacist on duty explained the purpose of the survey and informed them that they would be contacted within ten days for a telephone interview. Each booklet contained duplicate consent forms with a written explanation of the study for each participant to read and sign.

The questionnaire booklets were completed while the subjects waited to have their prescriptions filled. The length of time to complete each booklet was approximately 20 minutes. To assure confidentiality each questionnaire booklet was placed in a locked metal box in the center's pharmacy.

The telephone interview procedure was followed as suggested by Dillman[52]. After contact was established with the appropriate individual, the interviewer identified herself and refreshed the interviewee's mind by re-stating the study's purpose. The telephone interview was initiated following this interchange of information. If the first attempt at contacting the individual was not successful, further attempts to contact the patient were made.

During the telephone interview the interviewer asked questions concerning the patient's actual drug-taking behavior and her current beliefs and attitudes about medical care, in both general and specific terms, since the intiation of her medical therapy.

Drug-taking behavior was measured by asking questions about: the amount of medication remaining in the prescription bottle, the daily regimen, completion of the medication, and how long the patient took the medication (Appendix D questions 1-10).

The pre-drug regimen questions examined individual subjects' salient beliefs. For this study the questions attempted to measure the patients' salient beliefs about seriousness. This salient belief has already been established as a construct, and has been investigated in other health-related studies. However, as previously discussed, the correspondence between belief and behavior in terms of action, target, context and time elements has not been investigated.

For this study, perceived seriousness, the salient belief construct from the HBM, was measured two ways: first, by measuring the HBM's variable, perceptions of the disease's seriousness, in the traditional way; second, by applying the suggestions from the TRA. The second way is a more refined and a more precise method of measuring perceived seriousness. This refinement process in this study involves the HBM construct perceived seriousness. In this study, questions concerning the behavioral health belief construct, were further refined to be more specific in terms of action, target, context and target.

VARIABLES

The first step in the analysis was to examine the association between the two independent variables, and the dependent variable, drug-taking compliance behavior. Pearson's product-moment

correlation and regression tests were performed using SPSS[53] and results were considered to be statistically significant at the .05 level or less.

The first independent variable measures perceived seriousness in the typical manner of HBM research. It measures the individual's perceived seriousness of a specific medical problem. It is represented by an index score constructed by summing the degree of perceived seriousness of symptoms associated with UTI's (Appendix A, items a,b,d,f-i,m). It will be referred to as "disease seriousness" from this point on. The selection of symptoms to be included in the disease seriousness measurement involved a four step procedure. First, content validity was assessed through evaluation of the literature supporting the use of the symptoms included in the literature[315-318]. Second, Pearson's product-moment correlation coefficient, r, was determined between each symptom associated with UTI's and UTI. Third, the pattern of intercorrelations among these symptoms and the UTI item was examined. Fourth, a reliability test of the index representing the disease seriousness variable was done. Information from these four steps suggested that the construct disease seriousness was valid and reliable.

The second independent variable measures the individual's perceived seriousness of the consequences of not taking her medicine exactly as directed for the next ten days and incorporates the refinements suggested by the TRA. It is represented by a composite index score constructed by summing items measuring individuals' perceptions of seriousness of consequences of

noncompliance (Appendix B), and will be referred to as "consequence seriousness". Questions representing the same symptoms were used to measure disease seriousness and consequence seriousness. Since the questions had shown good correlation with UTI when disease seriousness was measured, this provided face validity for questions in the consequence seriousness index. The pattern of intercorrelations among these symptoms was examined and a reliability test was done.

The dependent variable, the level of each subject's drug-taking compliance was calculated as the difference between the actual amount of medication that remained at the time of the post-regimen telephone interview and the amount of medication that should have been remaining at the time of the post-test interview.

The two independent variables, disease seriousness and consequence seriousness were each correlated with the dependent variable, drug-taking compliance behavior using Pearson's product-moment correlation analysis[53].

Regression analysis was performed using the dependent variable regressed onto the two independent variables separately and then together. The significance of the R^2 values were examined using an F-test[54].

LIMITATIONS

There were limitations in the study. First, the data came from a pilot study which had only 39 subjects. A larger sample size would allow for better verification of the results. Second, this study examined only one of the HBM's health beliefs.

Investigation of the other health beliefs in a similar manner would help in substantiating the ability to improve measurement of all the health beliefs. Third, this study investigated drug-taking compliance in an acute illness. An investigation of refined measures in other illnesses, both acute and chronic, would help to identify its utility in a range of illnesses. Fourth, the study population was obtained from a university setting. Investigation of behavior in other populations would eliminate questions of lack of generality in populations. Lastly, the subjects were all female. A mixed population of both females and males would be useful for comparative purposes and for a varied population.

DELIMITATIONS

In this study we recognized the possibility of a confounding factor being present with the use of more than one type of medication and dosage regimen. Because of this possibility we chose for this study only those individuals that were receiving the same therapeutic treatment

III. RESULTS

Forty pre-drug regimen questionnaire booklets were completed. Thirty-nine follow-up interviews of subjects yielded an overall response rate of 97.5 percent.

SUBJECTS

The subjects ranged in age from 18 to 35 years with a mean of 22.8 years. The majority (81.1%) of the subjects were single and had never been married. Twenty-two percent of the subjects said their health was excellent compared to others their age, while 75% said their health was either good or average compared to others their age.

The subjects indicated whether or not they had ever experienced symptoms of urinary tract infections. Pain when urinating had been experienced by 97.3% of the subjects and of these subjects 60% had experienced it only once or twice. Burning when urinating had been experienced by 83.8% of the subjects, with 53% of these subjects experiencing it only once or twice. Fever had been experienced by 75% of the subjects, of whom 30.8% experienced it only once or twice. Chills had been experienced by 65.7% of the subjects, of whom 21.6% experienced it only once or twice. Blood in the urine had been experienced by 42.9% of the subjects, of whom 80% had experienced it only once or twice. Difficulty when urinating had been experienced by 35.3% of the subjects, of whom 63.6% experienced it only once or twice.

Backache had been experienced by 54.3% of the subjects, of whom 21.1% experienced it only once or twice.

The occurrence of the above symptoms during the 24 hours prior to the survey was also recorded. During that time period 67% of the subjects had pain when urinating. Burning when urinating was experienced by 51% of the subjects. Difficulty when urinating was experienced by 25.7% of the subjects. Chills were experienced by 28.6% of the subjects. Backache was experienced by 25.7% of the subjects. Blood in the urine was experienced by 22.9% of the subjects.

GENERAL DISTRIBUTION

Disease Seriousness

The patient's perceptions of the seriousness of each of the UTI symptoms was recorded. Table 1 shows the percentage and frequency of each level of seriousness for each of the symptoms. Pain when urinating was perceived as being very serious, somewhat serious and slightly serious by 94.6% of the subjects. Chills were perceived to be serious by 64.9% of the subjects. Blood in the urine was perceived as being serious by all of the subjects. Difficulty when urinating was perceived as being serious by 94.6% of the subjects. Burning when urinating was perceived as being serious by 97.3% of the subjects. Fever was perceived as being serious by 78.4% of the subjects. Backache was perceived to be serious by only 73% of the subjects.

Table 1. Patient's perception of seriousness of symptoms.

Symptom	Level of Seriousness				
	Very Serious	Somewhat Serious	Slightly Serious	Not Serious	Total
Pain when urinating	18.9%	35.1%	40.5%	5.4%	100.0%
	(7)	(13)	(15)	(2)	(37)
Chills	0.0%	27.0%	37.8%	35.1%	100.0%
	(0)	(10)	(14)	(13)	(37)
Blood in the urine	67.6%	27.0%	5.4%	0.0%	100.0%
	(25)	(10)	(2)	(0)	(37)
Difficulty when urinating	16.2%	56.8%	21.6%	5.4%	100.0%
	(6)	(21)	(8)	(2)	(37)
Burning when urinating	13.5%	43.2%	40.5%	2.7%	100.0%
	(5)	(16)	(15)	(1)	(37)
Fever	8.1%	32.4%	37.8%	21.6%	100.0%
	(3)	(12)	(14)	(8)	(37)
Backache	2.7%	21.6%	48.6%	27.0%	100.0%
	(1)	(8)	(18)	(10)	(37)

Consequence Seriousness

The patients's perceptions of the seriousness of the consequences of not taking their medicine was recorded. Their responses to the perceived seriousness items were used to construct the consequence seriousness index. Table 2 shows that 97.3% of the patients perceived the consequences of not taking their medication for pain when urinating as being serious. The consequences of not taking medication for chills was perceived as being serious by 85.7% of the subjects. The consequences of not taking medication for blood in the urine was perceived as being serious by 93.9% of the subjects. The consequences of not taking medication for difficulty when urinating was perceived as being a serious by 97.2% of the subjects. The consequences of not taking medication for burning when urinating was perceived as being serious by all subjects. The consequences of not taking medication for fever was perceived as being serious by 88.2% of the subjects. The consequences of not taking medication for backache was perceived as being serious by 80% of the subjects.

Drug-taking Compliance

The level of drug-taking compliance was determined for each of the subjects. The level of compliance was based on the difference between the actual amount of medication remaining and the amount that should have been remaining at the time of the post-drug telephone interview. Figure 4 shows the distribution of the level of drug-taking compliance. A score of zero meant that all of the pills had been taken. The number of pills remaining ranged from zero to more than eight pills and the mean was 2.03 pills. More

Table 2. Patient's perception of the seriousness of the consequences of not taking the medicine.

Consequences	Level of Seriousness: Very Serious	Somewhat Serious	Slightly Serious	Not Serious	Total
Pain when urinating	35.1%	48.6%	13.5%	2.7%	100.0%
	(13)	(18)	(5)	(1)	(37)
Chills	14.3%	20.0%	51.4%	14.3%	100.0%
	(5)	(7)	(18)	(5)	(35)
Blood in the urine	60.6%	27.3%	6.1%	6.1%	100.0%
	(20)	(9)	(2)	(2)	(33)
Difficulty when urinating	25.0%	50.0%	22.2%	2.8%	100.0%
	(9)	(18)	(8)	(1)	(35)
Burning when urinating	30.6%	44.4%	25.0%	0.0%	100.0%
	(11)	(16)	(9)	(0)	(36)
Fever	23.5%	20.6%	44.1%	11.8%	100.0%
	(8)	(7)	(15)	(4)	(34)
Backache	5.7%	25.7%	48.6%	20.0%	100.0%
	(2)	(9)	(17)	(7)	(35)

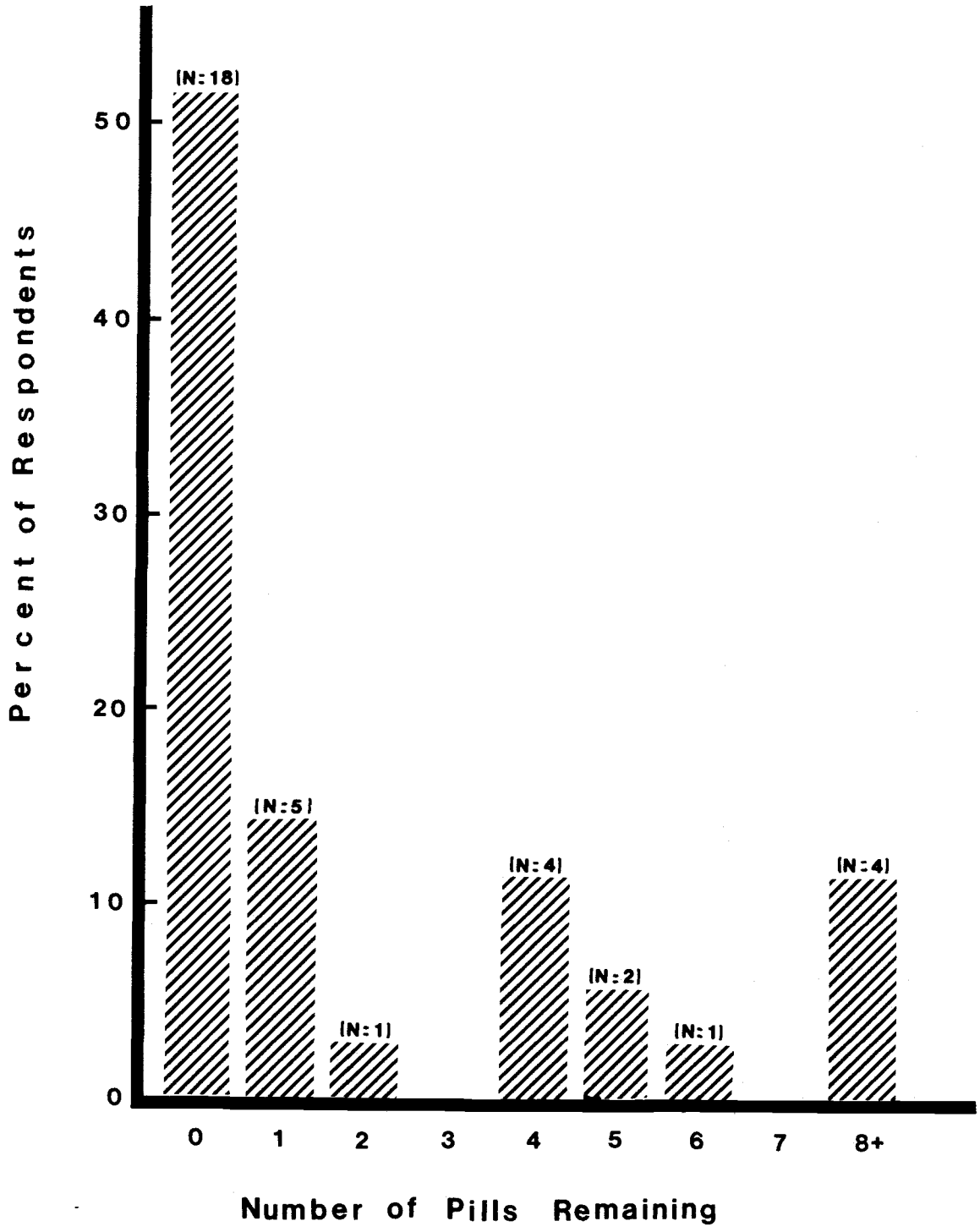

Figure 4. Drug-taking Compliance Levels

than half of the subjects (65.7%) had levels of one or less pills remaining at the time of the interview. (The sample size for the the level of drug-taking compliance was 35 subjects.)

DISCRIMINANT AND CONVERGENT VALIDITY OF THE CONSTRUCTS

The two independent variables, disease seriousness and consequence seriousness, are hypothesized to be two distinct constructs. This was done through demonstrating discriminant and convergent validity using the technique suggested by Campbell and Fiske[55]. The intercorrelational matrix (Table 3) contains the items used to construct the disease seriousness index and the consequence seriousness index. The intercorrelational matrix was separated into three sections: the upper left section shows the intraconstruct correlations for items included in the disease seriousness index, the lower left section shows the interconstruct correlations for the items included in the disease seriousness and consequence seriousness indices, and the lower right section shows the intraconstruct correlations for the items included in the consequences seriousness index. Examination of the matrix shows the two intraconstruct sections to have more statistically significant correlations than the interconstruct section. The average inter- and intra-construct correlations is shown in Table 4. The average correlation for the disease seriousness construct was .407. The average correlation for the consequence seriousness construct was .477. The average interconstruct correlation was only .259. This finding indicates that, on the average, items measuring the consequence seriousness and disease seriousness

Table 3. Intercorrelation matrix containing items from both disease seriousness and consequence seriousness.

Item+	X1	X2	X3	X4	X5	X6	X8	X9	X10	X11	X12	X13
Pain when urinating (X1)	-											
Chills (X2)	.29	-										
Blood in the urine (X3)	.46*	.40*	-									
Difficulty when urinating (X4)	.34*	.39*	.29	-								
Burning when urinating (X5)	.75*	.56*	.47*	.44*	-							
Fever (X6)	.08	.65*	.25	.35*	.38*	-						
Pain when urinating (X8)	.59*	.34*	.38*	.19	.58*	.22	-					
Chills (X9)	-.10	.44*	.13	.23	.23	.46	.33	-				
Blood in the urine (X10)	.20	.04	.12	.01	.18	-.07	.42*	.46*	-			
Difficulty when urinating (X11)	.20	.18	.10	.38*	.28	.17	.63*	.63*	.55*	-		
Burning when urinating (X12)	.25	.29	.30	.11	.53*	.44*	.52*	.35*	.46*	.44*	-	
Fever (X13)	-.14	.45*	.14	.15	.16	.55*	.33	.81*	.39*	.44*	.39*	-

+ Items X1 to X6 are from disease seriousness and items X8 to X13 are from consequence seriousness.

* $p < .05$.

Table 4. Correlation coefficient averages for the three constructs in Table 1.

Construct	Average
Disease seriousness	.4067 ±.1638
Consequence seriousness	.4767 ±.1325
Disease and consequence seriousness	.2592 ±.1596

constructs were more related within each construct than they were with each other. These findings provided discriminant and convergent validity of disease seriousness and consequence seriousness constructs.

CONSTRUCT INDICES

Disease Seriousness

Table 5 shows the zero order correlations between UTI's and the perceived seriousness of the symptoms associated with UTI's. Examination of Table 5 indicates that all symptoms except backache have a statistically significant relationship with UTI.

Examination of Table 6 shows that backache consistently has the lowest correlation among each of the symptoms. Secondly, Table 6 shows that all of the items, except backache, have at least four statistically significant coefficients.

The overall alpha was equal to .97986. Examination of Table 7 shows that alpha values ranged from .976 to .980 when an item was deleted. The alpha values did not change much when an item was deleted. However, when backache was deleted, alpha reached its highest level of .980.

The items included in the disease seriousness index were chosen based on the information from Tables 5 - 7. Items in the disease seriousness index include: pain when urinating; chills; blood in the urine; difficulty when urinating; fever; and, burning when urinating. Backache was the only item to be excluded in the disease seriousness index. It was excluded for the following reasons: first, backache was the only symptom correlated with

Table 5. Pearson's product-moment correlations between symptoms associated with urinary tract infections and urinary tract infections.

SYMPTOMS	r
Pain when urinating	.49*
Chills	.51*
Blood in the urine	.41*
Difficulty when urinating	.34*
Burning when urinating	.65*
Fever	.43*
Backache	.21

* $p < .05$.

Table 6. Intercorrelation matrix of symptoms associated with urinary tract infections from question 5 measuring perceived seriousness of disease.

Symptoms	X1	X2	X3	X4	X5	X6	X7
Pain when urinating (X1)	-						
Chills (X2)	.29	-					
Blood in the urine (X3)	.46*	.40*	-				
Difficulty when urinating (X4)	.34*	.39*	.29	-			
Burning when urinating (X5)	.75*	.56*	.47*	.44*	-		
Fever (X6)	.08	.65*	.25	.35*	.38*	-	
Backache (X7)	.08	.27	-.12	.09	.38*	.32	-

* $p < .05$.

Table 7. Cronbach's alpha reliability values for measures of the seriousness of urinary tract infections.

Item	Alpha if item deleted
Pain when urinating	.978
Chills	.977
Blood in the urine	.976
Difficulty when urinating	.977
Burning when urinating	.975
Fever	.978
Backache	.980*
Urinary tract infection	.976

* The highest alpha value.

urinary tract infections that was not statistically significant (Table 5); second, backache had the fewest number of statistically significant intercorrelations of all the symptoms (Table 6); third, the alpha value of the index was highest when backache was deleted (Table 7).

Consequence Seriousness

Examination of Table 8 shows the relationship between the patient's perceptions of consequences of seriousness of noncompliance. Table 8 does not show any clear patterns among the symptoms associated with urinary tract infections. Backache does not differ from the other symptoms as it did with the disease seriousness index.

The overall alpha was .94014. Table 9 shows that alpha ranged from .922 to .942 when specific items were deleted.

All items in question 7 (Appendix B) except backache were used to construct the consequence seriousness index. Backache was excluded because it was not shown to have a statistically significant correlation with UTI in the disease seriousness index (Table 5), and it had a low intercorrelation average (Table 8).

CORRELATIONAL ANALYSIS

Table 10 shows a positive relationship between disease seriousness and drug-taking compliance behavior. This indicates that as perceptions of seriousness of the disease increase, the level of drug-taking compliance behavior also increases.

Table 10 also shows a positive relationship between the consequence index and drug-taking compliance behavior. This

Table 8. Intercorrelation matrix of consequences measuring perceived seriousness of drug-taking compliance.

Symptoms	X8	X9	X10	X11	X12	X13	X14
Pain when urinating (X8)	-						
Chills (X9)	.33	-					
Blood in the urine (X10)	.42*	.46*	-				
Difficulty when urinating (X11)	.63*	.63*	.55	-			
Burning when urinating (X12)	.52*	.35*	.46*	.44*	-		
Fever (X13)	.33	.81*	.39*	.44*	.39*	-	
Backache (X14)	.18	.65*	.36*	.44*	.40*	.57*	-

* $p < .05$.

Table 9. Cronbach's alpha reliability values for measures of the seriousness of consequences of non-compliance.

Item	Alpha If Item Deleted
Pain when urinating	.937
Chills	.922
Blood in the urine	.933
Difficulty when urinating	.929
Burning when urinating	.942
Fever	.926
Backache	.925

Table 10. Correlations[1] Between Drug-taking Compliance and the Independent Variables, Disease Seriousness and Consequence Seriousness

	Independent Variable	
	Disease Seriousness	Consequence Seriousness
Drug-taking Compliance	r=.2029 N.S.	r=.3898 p<.05

1. The sample's mean score was used for calculations where data was missing. This yields a more conservative estimate of the association.

indicates that a relationship between consequence seriousness and level of drug-taking compliance behavior does exist, and that as perceptions of seriousness of the behavior increases, the level of drug-taking compliance increases.

PREDICTION OF COMPLIANCE: A COMPARISON

Table 11 shows the R and R^2 values for drug-taking compliance regressed onto disease seriousness and consequence seriousness separately and then both together. The regression containing only disease seriousness had R^2 =.0412, while the regression with only consequence seriousness had an R^2 value equal to .1520; and the regression with both disease seriousness and consequence seriousness together had R^2 = .1535. These R^2 values indicate that consequence seriousness alone accounts for 15.2% of total variance in the prediction of drug-taking compliance, while disease seriousness alone accounts for only 4.1% of total variance in the prediction of drug-taking compliance. Furthermore, consequence seriousness represents 99% of the total variance when both consequence seriousness and disease seriousness are included in the equation.

Examination of Table 11 shows that only two of the regressions equations were statistically significant. The consequence seriousness and consequence seriousness and disease seriousness regression equations were statistically significant. The disease seriousness equation alone was not statistically significant.

The information from Table 11 shows that a difference in the predictive ability of the two constructs exist. The refined

Table 11. Multiple R and R^2, and F values for drug-taking compliance regressed onto disease seriousness and consequence seriousness separately and together.

Variable	R	R^2	F	Sig.
Disease seriousness	.2029	.0412	1.589	.215
Consequence seriousness	.3898	.1520	6.630	.014
Disease and consequence seriousness	.3917	.1535	3.263	.050

measure that included the elements of action, target, context and time accounted for a greater proportion of the drug-taking compliance variable than the traditional HBM measure.

Further testing was performed using an F-test. The R^2 values for consequence seriousness and disease seriousness together and disease seriousness alone were used to calculate the F value. The calculated F value was F*=4.7759 and the F value obtained from an F table[56] was F= 4.116 with α=.05.

The two F values are not the same. The F-test indicates that F*>F at α= .05, which means that the addition of the second construct, disease seriousness, did not contribute significantly to the prediction of drug-taking compliance behavior.

The refined measure of seriousness is more predictive of drug-taking compliance than the typical HBM measures of seriousness. This supports the hypothesis that the measure of the construct which is more specific in terms of action, target, context and time is more predictive than the measure of the subjects' perceptions of the seriousness of the disease. Even when the two constructs are used together the construct that is measured in more specific terms of action, target, context and time elements adds significantly more than the construct not specific in any of the elements.

The results of this study show that the two measures of perceived seriousness, disease seriousness and consequence seriousness, are not the same. The measurement of perceived seriousness was improved by using the refined measure of the patient's perceptions of the seriousness of the consequences. This measure, which utilized elements of specificity: action, target,

context and time, had a closer relationship with drug-taking compliance behavior and was also more predictive of drug-taking compliance behavior than the unrefined, traditional measure of the patient's perception of the seriousness of the disease.

ENDNOTE

1. F-test[54] formula to confirm whether the R^2 with the addition of the second variable is significantly greater than the R^2 with only the first variable increased is calculated as follows:

$$F^* = \frac{(R^2_1 - R^2_2)(N - m1 - 1)}{(1 - R^2_1)(m1 - m2)}$$, degrees of freedom: m1-m2, N-m1-1.

Where: R^2_1= the R^2 with the larger number of independent variables.
R^2_2= the R^2 with the smaller number of independent variables.
N = the number of cases.
m1 = the number of independent variables in R^2_1.
m2 = the number of independent variables in R^2_2.

IV. DISCUSSION

The only statistically significant correlation between drug-taking compliance behavior and the independent variables was with the patient's perceptions of the consequences of not taking the medication as directed. This finding suggests that refined and specific measures are better measures of perceived seriousness. The specificity in measuring perceived seriousness is suggested by Jette et al[57] as being important. There can be a better understanding of patient beliefs and behavior through the use of specific measures. This can be useful for diagnostic purposes, for example, in patients's medical history.

The findings of this study are consistent with the suggestion that condition-specific measures of perceived seriousness are distinct from general measures of perceived seriousness[57]. This study not only investigated a specific condition, but it also demonstrated a difference in the two measures of perceived seriousness. The more specific measure, patients' perceptions of the consequences of not taking medication as directed, was a better predictor of drug-taking compliance than the less specific measure, patients's perceptions of the seriousness of the disease. This difference in measures indicates that health care providers should be as specific as possible when asking for information and giving information. Health care providers should refer to specific conditions and use specific terms. Because patients will better understand the information, noncompliant behavior in patients can be reduced.

Implications from this study, first, suggest that items used to measure health beliefs, such as perceived seriousness, should be refined. They should not be measured in the traditional manner of the HBM. Measures that are specific can eliminate the inconsistent or non-significant findings reported in past HBM research. The refined method narrows the scope of a belief, so that a more precise measurement of a particular belief can be made. This allows a closer correspondence between the belief and the behavior. Behavior is predicted more accurately because of this close correspondence. Health care providers can have a better understanding of the likely behavior of their patients.

Secondly, measurements of beliefs should be constructed in a consistent manner throughout the different studies of health beliefs. The studies should use similar terminology, phrasing and employ multiple questionnaire items. This will allow objective comparisons of different studies' results.

Lastly, health care providers should be educated about the value of being specific and precise when communicating with both patients and other health care providers. Such knowledge can make health care providers more aware of the importance of phrasing questions precisely. This knowledge can also be useful for purposes of patient education, intervention strategies for patient compliance and the educational diagnosis process in health care. Health care providers that are precise and specific in their communication can avoid being misunderstood by patients and decrease the likelihood of noncompliance by patients. Patients may want to comply with directions given to them, but fail to comply

because the information is poorly understood. Additionally, information that is specific and well communicated can avoid misunderstanding with other health care providers because of poor provider-provider; or patient-provider communication. This is very important when more than one health care provider is involved with a particular patient's therapy.

As this study shows, there may be a difference in behavior prediction depending upon the specificity or degree of refinement of questions asked or how information is given. Specificity can be useful for the improvement of compliance through better understanding by both the patient and the health care provider.

A more refined measure is better able to predict behavior than an unrefined, less specific measure. Questions that include the elements of action, target, context and time are more specific and are tailored to a specific behavior when used in a manner that is consistent with Ajzen and Fishbein's[24] use of these elements. This provides more individualized patient care which is often necessary. Further, questions that are better formulated can provide more accurate indications of a specific patient behavior such as drug-taking compliance.

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APPENDIX

APPENDIX A

Question 5 from the Pre-drug Regimen Survey

Q-5 If you were to happen to get one of the following medical problems, please tell us whether you would consider it to be very serious, somewhat serious, slightly serious, or not serious at all. (Circle one number for each medical problem.)

		VERY *SERIOUS*	SOMEWHAT *SERIOUS*	SLIGHTLY *SERIOUS*	NOT SERIOUS
a.	PAIN when urinating	1	2	3	4
b.	CHILLS.	1	2	3	4
c.	HIGH BLOOD PRESSURE	1	2	3	4
d.	BLOOD in the urine.	1	2	3	4
e.	CANCER.	1	2	3	4
f.	DIFFICULTY when urinating . . .	1	2	3	4
g.	BACKACHE.	1	2	3	4
h.	BURNING when urinating.	1	2	3	4
i.	FEVER	1	2	3	4
j.	DENTAL CAVITIES	1	2	3	4
k.	HEART ATTACK.	1	2	3	4
l.	a COMMON COLD	1	2	3	4
m.	a URINARY TRACT INFECTION . . .	1	2	3	4
n.	the FLU	1	2	3	4

APPENDIX B

Question 7 from the Pre-drug Regimen Survey

Q-7 For each of the following medical problems, if you were NOT to take the medicine for your infection exactly as directed [redacted], how serious would the consequences be for you? Would the consequences be not serious at all, slightly serious, somewhat serious, or very serious? (Circle one number for each medical problem.)

	VERY SERIOUS	SOMEWHAT SERIOUS	SLIGHTLY SERIOUS	NOT SERIOUS
a. PAIN when urinating	1	2	3	4
b. DIFFICULTY when urinating .	1	2	3	4
c. BLOOD in the urine	1	2	3	4
d. FEVER	1	2	3	4
e. CHILLS.	1	2	3	4
f. BACKACHE.	1	2	3	4
g. BURNING when urinating. . .	1	2	3	4

(PLEASE GO ON TO THE NEXT PAGE)

APPENDIX C

Pre-drug Regimen Survey

00042

HEALTH BELIEFS ABOUT TAKING DRUGS

We would like to invite you to take part in a study which looks at the reasons why people do or do not take their medications as they should. We hope to find out if the way you feel, or the way other people feel about you, has an effect on whether you take your medicine or not. You are being asked to participate because you are a patient in this clinic.

If you decide to help, you will be asked to fill out this questionnaire and participate in a short telephone interview in about 10 days. In the questionnaire and interview you will be asked to tell us about some of your attitudes and beliefs about medical care in general, and the taking of medicine in particular. Just try to answer the questions the best you can. If you don't want to answer any question, you don't have to. If you have a lot of trouble answering a question, just leave it blank and go on to the next question. Come back to it after you have finished all of the rest. THIS IS NOT A TEST. There is no right or wrong answer to any of the questions. We want to know how you and other patients FEEL about these things. Please answer each question by itself. People from all walks of life are being asked to help. So, some of the questions may not sound exactly right for you. Just try to answer the questions the best you can.

If you do not want to help us today, you do not have to. It is entirely up to you. It will not affect your medical treatment or how your doctor feels about you. Your responses will remain totally confidential. No one in the clinic or community will see your answers. We make this promise because we must protect your privacy, and because we hope it will help you to answer the questions more honestly.

Thank you very much for helping us today.

Sincerely,

L. Douglas Ried, Ph.D.
Oregon State University
College of Pharmacy

ep

Signature _____

Today's date _____

First, to find out how you are are feeling, we would like to ask you some questions about your health in general. For each of the statements below, circle the number of the ONE best answer for you.

Q-1 Compared to other people your age, is your health:

1 EXCELLENT
2 GOOD
3 AVERAGE
4 FAIR
5 POOR

Q-2 Would you say that any health problems keep you from doing a lot of things you would like to do, just certain things, or can you do almost anything you wish? (Circle one answer)

1 MUCH RESTRICTION OF ACTIVITY
2 SOME RESTRICTION OF ACTIVITY
3 CAN DO ALMOST ANYTHING

Q-3 Next, we would like to ask you some questions about your past experience with certain, specific medical problems. First, please indicate whether or not you have ever experienced any of the medical problems listed below. If you have, please indicate whether you have experienced it only once or twice, occasionally, or frequently.

	YES	NO	IF "YES" ONCE OR TWICE	OCCASIONALLY	FREQUENTLY
a. PAIN when urinating	1	2	1	2	3
b. DIFFICULTY when urinating .	1	2	1	2	3
c. BLOOD in the urine	1	2	1	2	3
d. FEVER	1	2	1	2	3
e. CHILLS.	1	2	1	2	3
f. BACKACHE.	1	2	1	2	3
g. BURNING when urinating. . .	1	2	1	2	3

Q-4 Next, we would like to ask you about your experiences with these same medical problems within the past 24 hours. First, have you experienced any of the medical problems listed below within the past 24 hours? If you have, please indicate whether you think that it was not severe, slightly severe, somewhat severe, or very severe?

	YES	NO	IF "YES" NOT SEVERE	SLIGHTLY SEVERE	SOMEWHAT SEVERE	VERY SEVERE
a. PAIN when urinating	1	2	1	2	3	4
b. DIFFICULTY when urinating .	1	2	1	2	3	4
c. BLOOD in the urine	1	2	1	2	3	4
d. FEVER	1	2	1	2	3	4
e. CHILLS.	1	2	1	2	3	4
f. BACKACHE.	1	2	1	2	3	4
g. BURNING when urinating. . .	1	2	1	2	3	4

(PLEASE TURN THE PAGE)

Q-5 If you were to happen to get one of the following medical problems, please tell us whether you would consider it to be very serious, somewhat serious, slightly serious, or not serious at all. (Circle one number for each medical problem.)

	VERY SERIOUS	SOMEWHAT SERIOUS	SLIGHTLY SERIOUS	NOT SERIOUS
a. PAIN when urinating	1	2	3	4
b. CHILLS.	1	2	3	4
c. HIGH BLOOD PRESSURE	1	2	3	4
d. BLOOD in the urine.	1	2	3	4
e. CANCER.	1	2	3	4
f. DIFFICULTY when urinating . . .	1	2	3	4
g. BACKACHE.	1	2	3	4
h. BURNING when urinating.	1	2	3	4
i. FEVER	1	2	3	4
j. DENTAL CAVITIES	1	2	3	4
k. HEART ATTACK.	1	2	3	4
l. a COMMON COLD	1	2	3	4
m. a URINARY TRACT INFECTION . . .	1	2	3	4
n. the FLU	1	2	3	4

Q-6 How likely is it that you will take the medicine for your infection exactly as directed [redacted]? (Circle one answer.)

1 VERY LIKELY
2 SOMEWHAT LIKELY
3 NOT TOO LIKELY
4 NOT LIKELY AT ALL

Q-7 For each of the following medical problems, if you were NOT to take the medicine for your infection exactly as directed [redacted], how serious would the consequences be for you? Would the consequences be not serious at all, slightly serious, somewhat serious, or very serious? (Circle one number for each medical problem.)

	VERY SERIOUS	SOMEWHAT SERIOUS	SLIGHTLY SERIOUS	NOT SERIOUS
a. PAIN when urinating	1	2	3	4
b. DIFFICULTY when urinating .	1	2	3	4
c. BLOOD in the urine	1	2	3	4
d. FEVER	1	2	3	4
e. CHILLS.	1	2	3	4
f. BACKACHE.	1	2	3	4
g. BURNING when urinating. . .	1	2	3	4

(PLEASE GO ON TO THE NEXT PAGE)

Q-8 If you take the medicine for your infection exactly as directed [redacted], how likely is it that you will: (Circle one number for each statement.)

		VERY LIKELY	SOMEWHAT LIKELY	SOMEWHAT UNLIKELY	VERY UNLIKELY
a.	miss school or work?	1	2	3	4
b.	get well?.	1	2	3	4
c.	have pain when urinating?. . .	1	2	3	4
d.	have further health complications?	1	2	3	4
e.	have difficulty urinating? . .	1	2	3	4
f.	not be able to do the things you need to do?.	1	2	3	4
g.	have blood in your urine?. . .	1	2	3	4
h.	not have your symptoms relieved or cured?	1	2	3	4
i.	have a fever?.	1	2	3	4
j.	get sicker?.	1	2	3	4
k.	have chills?	1	2	3	4
l.	make you family happy?	1	2	3	4
m.	have a backache?	1	2	3	4
n.	please your doctor?.	1	2	3	4
o.	have a burning feeling when urinating?.	1	2	3	4
p.	have a bad reaction to the medicine?.	1	2	3	4
q.	get another urinary tract infection?	1	2	3	4
r.	feel good?	1	2	3	4
s.	have your urinary tract infection go away?	1	2	3	4

(PLEASE TURN THE PAGE)

Q-9 Not everyone agrees about the "goodness" or "badness" of things which happen to them because of their health. Often times they don't agree about just how good (or bad) it is either. Below are questions asking how YOU feel about certain things. You will find pairs of opposite words with numbers in between. Think about how good or bad YOU feel it is and then circle one of the numbers which best describes how YOU feel. (Remember, there is no right or wrong answer.)

AN EXAMPLE:

If you think your television set works good most of the time, you might circle the number "2" below, like this:

GOOD 1 (2) 3 4 5 6 BAD

But if you think your television set works badly a little more often than it works good, you might circle the number "5", like this:

GOOD 1 2 3 4 (5) 6 BAD

		GOOD					BAD
a.	missing school or work is.	1	2	3	4	5	6
b.	getting well is.	1	2	3	4	5	6
c.	having pain when urinating is.	1	2	3	4	5	6
d.	having further health difficulties is. . . .	1	2	3	4	5	6
e.	having difficulty urinating is	1	2	3	4	5	6
f.	not being able to do the things you need to do is.	1	2	3	4	5	6
g.	having blood in your urine is.	1	2	3	4	5	6
h.	not having your symptoms relieved or cured is	1	2	3	4	5	6
i.	having a fever is.	1	2	3	4	5	6
j.	getting sicker is.	1	2	3	4	5	6
k.	having chills is	1	2	3	4	5	6
l.	making your family happy is.	1	2	3	4	5	6
m.	having a backache is	1	2	3	4	5	6
n.	pleasing your doctor is.	1	2	3	4	5	6
o.	having a burning feeling when urinating is .	1	2	3	4	5	6
p.	having a bad reaction to the medicine is . .	1	2	3	4	5	6
q.	getting another urinary tract infection is .	1	2	3	4	5	6
r.	feeling good is.	1	2	3	4	5	6
s.	having your urinary tract infection go away is.	1	2	3	4	5	6

(PLEASE GO ON TO THE NEXT PAGE)

Q-10 Below are pairs of opposite words which have been found to describe people's beliefs and attitudes about taking their medicine. We would like to find out how YOU feel. Taking the medicine for your infection exactly as directed [redacted]?

good	1	2	3	4	5	6	bad
harmful	1	2	3	4	5	6	helpful
foolish	1	2	3	4	5	6	wise
important	1	2	3	4	5	6	unimportant
safe	1	2	3	4	5	6	dangerous
worthwhile	1	2	3	4	5	6	worthless
hard	1	2	3	4	5	6	easy
healthy	1	2	3	4	5	6	unhealthy
convenient	1	2	3	4	5	6	inconvenient
inexpensive	1	2	3	4	5	6	expensive
smart	1	2	3	4	5	6	dumb

Q-11 Below are statements that express beliefs about health and medical care. For each statement, circle the one number which best tells us whether you strongly agree, agree, disagree, or strongly disagree with the statement.

	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
a. My good health is largely a matter of good fortune.	1	2	3	4
b. No matter what I do, if I am going to get sick, I will get sick. . . .	1	2	3	4
c. Doctors can rarely do very much for people who are sick	1	2	3	4
d. I intend to take the medicine for my infection exactly as directed [redacted].	1	2	3	4
e. Many times doctors do not help their patients to get well.	1	2	3	4
f. Recovery from illness requires good medical care more than anything else	1	2	3	4
g. If I get sick, my own behavior determines how soon I will get well again.	1	2	3	4
h. My body seems to resist illness well.	1	2	3	4
i. I will probably not be able to take the medicine for my infection exactly as directed for the next 10 days	1	2	3	4

(PLEASE TURN THE PAGE)

Q-11 (continued)

		STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
j.	There is nothing more important than good health.	1	2	3	4
k.	Luck plays a big part in determining how soon I recover from an illness	1	2	3	4
l.	There are many things I care about more than my health	1	2	3	4
m.	I seem to get sick easier than other people do	1	2	3	4
n.	If I take the right actions, I can stay healthy.	1	2	3	4
o.	There are things which I can do to keep from having another urinary tract infection	1	2	3	4
p.	I am in control of my health.	1	2	3	4
q.	Doctors can almost always help their patients feel better.	1	2	3	4
r.	When there is something going around I usually catch it	1	2	3	4
s.	If it's meant to be, I will stay healthy	1	2	3	4
t.	Most things that affect my health happen to me by accident.	1	2	3	4
u.	If I take care of myself, I can avoid illness	1	2	3	4
v.	If you don't have your health, you don't have anything	1	2	3	4
w.	Good health is of only minor importance in a happy life.	1	2	3	4
x.	When I get sick I am to blame	1	2	3	4
y.	Most people get sick easier than I do .	1	2	3	4
z.	Most of the people who are important to me think I should take the medicine for my infection exactly as directed [redacted]	1	2	3	4

(PLEASE GO ON TO THE NEXT PAGE)

Q-12 Some things which are true about some people, are not true about others. Generally speaking, which of the following are true about you? (Circle the ONE best answer that applies to you.)

	ALWAYS TRUE	OFTEN TRUE	RARELY TRUE	NEVER TRUE
a. I feel angry.	1	2	3	4
b. I do what my spouse thinks I should do	1	2	3	4
c. I lose my temper.	1	2	3	4
d. I feel ashamed of myself.	1	2	3	4
e. People would be better off without me.	1	2	3	4
f. I do what my good friends think I should do	1	2	3	4
g. I know the people living in my neighborhood quite well	1	2	3	4
h. My daily activities are stressful	1	2	3	4
i. I do what my doctors think I should do	1	2	3	4
j. Most of the time I do not really feel like a member of the neighborhood where I live	1	2	3	4
k. I don't feel worth much	1	2	3	4
l. In general, I am usually tense.	1	2	3	4
m. I do what my family thinks I should do	1	2	3	4
n. Usually I feel free to stop by and visit with most people in my neighborhood	1	2	3	4
o. I get into arguments a lot.	1	2	3	4
p. I feel under pressure	1	2	3	4

Finally, we would like to ask a few additional background questions to help interpret the results of the study.

Q-13 About how many days in the past six months were you too sick to go to work or school, or to carry out your normal daily activities?
_____DAYS

Q-14 What is your present age?
_____YEARS OF AGE

Q-15 How many people live in your household, including yourself?
_____NUMBER OF PEOPLE

(PLEASE TURN THE PAGE)

Q-16 How many adult relatives does your family have living within 50 miles of your home (other than the ones living in your own household)? A rough estimate is O.K.

┌─── _____NUMBER OF RELATIVES
(If "none" go to Question Q-17)

---->16a How often do you, yourself, talk to one or more of these relatives--either on the telephone or face-to-face? (Circle one number)

1 DAILY
2 SEVERAL TIMES A WEEK
3 A FEW TIMES A MONTH
4 A FEW TIMES A YEAR
5 NEVER

Q-17 About how many "good" friends do you have living within 50 miles of your home?

┌─── _____NUMBER OF FRIENDS
(If "none", go on to Question Q-18).

---->17a. How often do you talk to one or more of these friends--either on the telephone or face-to-face?

1 DAILY
2 SEVERAL TIMES A WEEK
3 A FEW TIMES A MONTH
4 A FEW TIMES A YEAR
5 NEVER

17b. How often do you talk to neighbors (other than relatives or "good" friends)--either on the telephone or face-to-face?

1 DAILY
2 SEVERAL TIMES A WEEK
3 A FEW TIMES A MONTH
4 A FEW TIMES A YEAR
5 NEVER

Q-18 What is your present marital status? (Circle one number.)

1 NEVER MARRIED
2 MARRIED
3 DIVORCED
4 SEPARATED
5 WIDOWED
6 OTHER (Please specify_____)

Q-19 Are you presently: (Circle one number.)

1 EMPLOYED
2 UNEMPLOYED
3 RETIRED
4 OTHER (Please specify_____)

(PLEASE GO ON TO NEXT PAGE)

Q-20 Are you a male or a female? (Circle number.)

1 MALE
2 FEMALE

Q-21 Which of the following best describes the highest grade YOU have completed in school? (Circle one number.)

01 8th GRADE OR LESS
02 GRADES 9 THROUGH 11
03 HIGH SCHOOL GRADUATE OR EQUIVALENT
04 TECHNICAL OR TRADE SCHOOL BEYOND HIGH SCHOOL
05 SOME COMMUNITY COLLEGE
06 COMMUNITY (TWO-YEAR) COLLEGE DEGREE OR CERTIFICATE
07 SOME FOUR YEAR COLLEGE OR UNIVERSITY
08 COLLEGE OR UNIVERSITY DEGREE (BACHELOR'S)
09 SOME GRADUATE SCHOOL
10 GRADUATE OR PROFESSIONAL DEGREE
11 OTHER (Please specify_____)

Q-22 What was the total combined income of your household in 1982, before taxes? Your best estimate is fine. (Circle one number.)

1 LESS THAN $5,000
2 $5,000 to $9,999
3 $10,000 to $14,999
4 $15,000 to $19,999
5 $20,000 to $24,999
6 $25,000 to $29,999
7 $30,000 to 34,999
8 OVER $35,000

(THANK YOU FOR YOUR COOPERATION)

If you have any further comments, please tell us in the space below!

APPENDIX D

Post-drug Regimen Survey

Oregon State University
(1984 Study)

NAME:_____

PHONE #:_____+_____

ADDRESS:_____

CITY: _____

20046

Hello. Is this (first and last name)?
(IF NO. Does(first and last name) live there?)
(IF YES. Is (first name) there?)
(IF YES. May I speak to (first name)?)
(IF NO. When would be a good time to call back? SEE CHART.)
(IF YES. WAIT UNTIL THE PERSON IS ON THE PHONE AND THEN START THE INTERVIEW FROM THE NEXT PARAGRAPH.)
(IF NO. When would be a good time to call back? SEE CHART.)
(IF NO. The number I was calling is _____.)
(IF WRONG NUMBER, TERMINATE WITH,E.G.: I am sorry to have bothered you.)
(IF CORRECT NUMBER. Did (first and last name) live there before?)
(IF YES. May I have the new phone number?)
(IF NO, TERMINATE WITH, E.G.: I am sorry to have bothered you.)
(IF YES, CONTINUE TO THE NEXT PARAGRAPH TO START THE INTERVIEW.)

This is (Interviewer's name) at Oregon State University. I am calling from the College of Pharmacy in Corvallis. We are doing a follow-up of the individuals that filled out a questionnaire 10 days ago at (location site). The purpose of the questionnaire was to look at the reasons why people do or do not take their medication as they should. Your telephone number was obtained from the Pharmacy at the Student Health Center.

The questions I need to ask should take about 15 minutes. I will be happy to answer any questions that you may have about the study, either now or later. Shall we begin?

Date	Time	Interviewer	Result	Code for Recalls

Abbreviations:

NA = No answer
NH = Not home
WR = Will return(when)
REF = Refused(when, why)
IC = Interview completed
PIC = Partially completed
WN = Wrong number
DISC= Disconnect

Code for Recalls:

A =
B =
C =

(1) You received some medicine for your infection, have you finished all of it?

1 YES

2 NO
(If no)

(2) By counting out the number of tablets left in your medicine bottle, can you tell me how many are left? (Y/N)_____. How many? _____.

(3) How many times each day did you take your medicine, one, two, three, or four times a day?

1 ONE
2 TWO
3 THREE
4 FOUR

(4) Did you ever forget a dose?

1 NO

2 YES
(If yes)

(5) What did you do when you forgot your dose? _____

_____

(6) Did you:

a. Take an extra dose that day or the next day? or

1 YES
2 NO

b. Just forget about taking your dose?

1 YES
2 NO

(7) Why did you forget to take your medicine? _____

_____

(8) Did you take your medicine exactly as directed for all 10 days?

1 YES
2 NO

(9) Did you take your medicine with water?

1 YES
2 NO

(10) Did you take your medicine with, before, or after meals?

1 WITH
2 BEFORE
3 AFTER

(PLEASE TURN THE PAGE)

(11) Next, I would like to find out about your beliefs concerning the importance of your medicine and its effect in the treatment of your infection. To do this, first I will start a sentence, and then I would like you to tell me how important you consider it to be. For example, "Taking my medicine exactly as directed is...", please tell me whether you consider it to be very important, somewhat important, slightly important, or not important. Do you have any questions? If not, let's start.

	VERY IMPORTANT	SOMEWHAT IMPORTANT	SLIGHTLY IMPORTANT	NOT IMPORTANT
a. Taking my medicine exactly as directed is	1	2	3	4
b. Finishing all my medicine is...	1	2	3	4
c. Taking all my medicine to treat my infection is.....	1	2	3	4
d. Decreasing the severity of my infection is	1	2	3	4
e. How important is your medicine in decreasing the seriousness of your infection?.....	1	2	3	4
f. Taking my medicine in order to get well is	1	2	3	4

(12) I have a list of words opposite in meaning which have been found to describe people's beliefs and attitudes about taking their medicine. I would like to find out how YOU feel. First, I will state the sentence, "Taking the medicine for my infection exactly as directed for the last 10 days was?", and then I would like you to respond with one of four words to describe your feelings. For example, do you feel that taking themedicine for your infection exactly as directed for the last 10 days was very good, good, bad, or very bad?

Taking themmedicine for your infection exactly as directed for the last 10 days was?

a.	very good 1	good 2	bad 3	very bad 4
b.	very foolish 1	foolish 2	wise 3	very wise 4
c.	very important 1	important 2	unimportant 3	very unimportant 4
d.	very safe 1	safe 2	dangerous 3	very dangerous 4
e.	very worthwhile 1	worthwhile 2	worthless 3	very worthless 4
f.	very hard 1	hard 2	easy 3	very easy 4

(PLEASE TURN THE PAGE)

(13) Now, we would like to find out about your experiences with certain, specific medical problems. I have a list of medical problems from which I would like to find out whether you have experienced any of them. And if you have experienced any of the medical problems, then I would like to find out how serious you felt the medical problem to be. Please tell me whether you consider it to be very serious, somewhat serious, slightly serious, or not serious at all. Do you understand the procedure so far? Before I start asking about any of the medical problems I would like you to think back to 10 days ago, when you were in the docto'r office. Think of the medical problems that you were experiencing. Now, I will start with the questions, unless you would like some further explanation.

TEN DAYS AGO did you have any.....? (If yes) Please tell me whether you considered it to be very serious, somewhat serious, slightly serious, or not serious at all.

			"If YES"			
	YES	NO	VERY SERIOUS	SOMEWHAT SERIOUS	SLIGHTLY SERIOUS	NOT SERIOUS
a. PAIN when urinating.....	1	2	1	2	3	4
b. CHILLS.....	1	2	1	2	3	4
c. BLOOD in the urine.....	1	2	1	2	3	4
d. DIFFICULTY when urinating.....	1	2	1	2	3	4
e. BACKACHE.....	1	2	1	2	3	4
f. FEVER.....	1	2	1	2	3	4
g. BURNING when urinating..	1	2	1	2	3	4

(14) Next, we would like to find out about your current experiences with the same specific medical problems that were asked about in the last set of questions. The same procedure will be followed, except this time we would like to find out about your current experiences. (That is if the patient currently has any of the medical problems.) First, I would like to know if you are currently experiencing any of the medical problems. If you are, please tell me whether you consider it to be very serious, somewhat serious, slightly serious, or not serious at all. I will start with the questions now, unless you would like some more explanations.

CURRENTLY, do you have any.....? (If yes) Do you consider it to be very serious, somewhat serious, slightly serious, or not serious at all?

			"If YES"			
	YES	NO	VERY SERIOUS	SOMEWHAT SERIOUS	SLIGHTLY SERIOUS	NOT SERIOUS
a. PAIN when urinating.....	1	2	1	2	3	4
b. CHILLS.....	1	2	1	2	3	4
c. BLOOD in the urine.....	1	2	1	2	3	4
d. DIFFICULTY when urinating.....	1	2	1	2	3	4
e. BACKACHE.....	1	2	1	2	3	4
f. FEVER.....	1	2	1	2	3	4
g. BURNING when urinating..	1	2	1	2	3	3

(PLEASE TURN THE PAGE)

(15) Lastly, I would like to learn about your beliefs concerning both health and medical care. In this question, first I will make a statement that expresses beliefs about health and medical care. Then I would like you to tell me how much you agree or disagree with the statement. Please tell me whether YOU strongly agree, agree, disagree, or strongly disagree with each of the statements. Do you have any questions? Shall we start?

	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
a. My taking my medicine exactly as directed by my doctor was important in treating my urinary tract infection successfully.....	1	2	3	4
b. If I get another urinary tract infection, I will take my medicine just as my doctor directs me to do.....	1	2	3	4
c. There are things which I can do to keep from having another urinary tract infection.....	1	2	3	4
d. Taking the medicine exactly as directed by my doctor for the past 10 days was worthwhile.....	1	2	3	4
e. My symptoms were well treated.....	1	2	3	4
f. Taking the medicine exactly as directed for all 10 days was important.....	1	2	3	4
g. Getting well by taking my medicine exactly as directed by my doctor is the best way to get better.....	1	2	3	4
h. Taking the medicine exactly as directed for all 10 days was not worthwhile.....	1	2	3	4
i. Even if I had not taken my medi- exactly as directed for all 10 days, I would have probably still gotten well.....	1	2	3	4
j. Recovery from illness requires good medical care more than anything else.....	1	2	3	4
k. If I take the right actions, I can stay healthy.....	1	2	3	4

(PLEASE TURN THE PAGE TO CONTINUE)

(15) continued

		STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
l.	There are things which I can do to keep from having another urinary tract infection.....	1	2	3	4
m.	Taking the medicine was worthwhile..	1	2	3	4
n.	If I get sick, my own behavior determines how soon I will get well again.....	1	2	3	4
o.	Doctors can rarely do very much for people who are sick.....	1	2	3	4
p.	Luck plays a big part in determining how soon I revocer from an illness.....	1	2	3	4
q.	Most things that affect my health happen to me by accident.....	1	2	3	4
r.	Most of the people who are important to me think I should take my medicine for my infection exactly as directed by my doctor.....	1	2	3	4
s.	Doctors can almost always help their patients feel better.....	1	2	3	4
t.	I am in control of my health.....	1	2	3	4

That finishes all of the questions that I have to ask you. Thank you for your time and cooperation in helping with this study. If you have any comments or questions, I will be happy to discuss them with you.