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PRESCRIBING INTENTION AND THE RELATIVE IMPORTANCE OF DRUG
ATTRIBUTES: A COMPARATIVE STUDY OF HMO AND FEE-FOR-SERVICE
PHYSICIANS

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PRESCRIBING INTENTION AND THE RELATIVE IMPORTANCE
OF DRUG ATTRIBUTES: A COMPARATIVE STUDY OF
HMO AND FEE-FOR-SERVICE PHYSICIANS

by

Vijit Chinburapa

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for the Degree of
MASTER OF SCIENCE
WITH A MAJOR IN PHARMACY
In the Graduate College
THE UNIVERSITY OF ARIZONA

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ABSTRACT

This study utilized the Fishbein Behavioral Intention Model as a conceptual framework to compare health maintenance organization (HMO) and fee-for-service (FFS) physicians with respect to: prescribing intention of four beta-blocker drugs for a specific hypertensive patient; the relative importance of seven drug attributes; motivation to comply with colleagues; beliefs regarding each of seven attributes associated with each beta-blocker; and the relative importance of attitude and subjective norm in influencing prescribing intentions. A mail questionnaire was used to obtain data and information from random samples of HMO (n=73; 50% response) and FFS (n=49; 33% response) physicians in the Phoenix and Tucson Metropolitan Areas. No differences were found between the two groups of physicians regarding the variables under the study (i.e., prescribing intention, importance of attributes). Both the aggregate and disaggregate version of the Fishbein's Model explained a significant portion of the variance in prescribing intentions of both groups of physicians. In both groups, attitude was less importance than subjective norm, as assessed by the standardized regression coefficients, in explaining prescribing intentions of the HMO and FFS physicians.

CHAPTER 1

INTRODUCTION

About two-thirds of the patients who visit physicians receive at least one prescription per visit (Stolley and Lasagna, 1969). Drug therapy plays an important role in the delivery of health care and represents about 8% of the total U.S. health care expenditures. Approximately \$25 billion per year is spent on medications in the United States, of which 57% is estimated to be for prescription drugs (Freeland and Schendler, 1983; Gibson, Levit, Lozenberg, Waldo, 1984).

Physicians, through their prescribing decisions, are considered to be the key persons in determining drug use and drug cost. However, prescribing decisions of physicians are neither standard nor always appropriate. Schroder et al (1973) conducted a study in a U.S. medical school and estimated that there were four times the difference in the cost of drugs prescribed by 33 internists who treated a similar group of chronic-disease patients.

Additionally, Melmon (1971) studied drug toxicities and reported that 15 percent of all hospital days were spent to treat adverse drug reactions of which 70 percent were predictable and preventable through rational drug

prescribing. Rational drug prescribing has been defined by Parish (1974) as prescribing that is appropriate, safe, economic, and effective.

As a result, attempts have been made by many health care organizations to improve the way physicians make prescribing decisions. Drug intervention programs have been introduced in several health care settings to educate prescribers and, thus, reduce drug cost and drug-related problems. However, the results from educational programs have not been very satisfactory (Schroder, Kenders, Cooper et al, 1973; Jones, Barks, Bratton et al, 1977). For example, continuing education programs that depend mostly upon the voluntary participation of physicians usually have failed to reach those physicians most in need of training (Lewis and Hassanein, 1970).

Hence, it is important to study the physician prescribing process. Knowledge and better understanding of this process enables health care organizations to develop appropriate strategies to improve drug prescribing. Proper drug use enhances the quality of patient care while containing health care costs. Thus, health care systems can more effectively cope with the changing health care economic environment.

Health maintenance organizations (HMO) and fee-for-service (FFS) practice settings have been associated with differences in physician practice patterns. Several studies

have compared the difference in performance between HMO and traditional FFS physicians. It has been found that the annual spending per patient, hospital admissions and days of hospitalization per capita were lower in the HMO than in FFS practices (Baker, McGee, and Shaddle, 1984; Luft and Trauner, 1981; Luft, 1978, 1980, 1981, 1982; Manning, Leibowitz, Goldbert, et al 1984). One study attributed these differences to a different style of practicing medicine between HMO and FFS physicians (Manning, Leibowitz, Goldbert, et al, 1984).

Therefore, it is important to further study drug prescribing among HMO and FFS physicians. Moreover, it is also meaningful to examine if there are any differences in drug prescribing and the perceived relative importance of various drug attributes in influencing the prescribing decision among these two groups of physicians.

Problem Statement

Drug prescribing is a complex process involving many variables that influence drug selection. Several nonpharmacologic factors such as education of physicians, drug advertising, journals, colleagues, patient demands and expectations, type of practice setting, and physician background variables have been reported to affect physician prescribing behaviors (Hemminki, 1975, 1975a; Miller, 1973,

1974; Smith, 1977; Stolley, Becker, Lasagna, Mc Evilla, and Sloane, 1972; Worthen, 1973).

A few researchers have presented models that attempt to explain drug prescribing. Knapp and Oeltjen (1972), using experimental manipulation, found that physician drug choice was a function of (1) physician expectancy of patient benefit if the drug were prescribed, (2) the magnitude of beneficial effect, (3) the expectancy that side effects could occur, and (4) the magnitude of the side effects. It was found that the relative weightings, given to the four factors when choosing among hypothetical antihypertensive drugs, varied with the disease severity and physician specialty. Despite the significant findings, the study was not without its limitations. The researchers used hypothetical drugs instead of actual drugs. Therefore, the findings might have been confounded by a physician's prior beliefs about actual antihypertensive drugs similar to the hypothetical drugs in the study. Moreover, the physicians might not have fully believed hypothetical drug descriptions that were both more potent and safer than the actual drugs in the market (Hepler, Segal, and Freeman, 1981).

Harrell and Bennett (1974) utilized the Fishbein Behavioral Intention Model to study physician prescribing behavior of five actual drugs used to treat adult-onset diabetes mellitus. In this study, the Fishbein Behavioral Intention Model that utilized multiple regression equations

yielded statistically significant squared multiple correlation coefficients. Thus, it supported the theoretical framework that physician prescribing intention is a function of (1) subjective beliefs that a particular drug possesses or is associated with the attributes in question, (2) the subjective evaluation of those attributes, (3) the normative beliefs that colleagues would recommend the drug to be prescribed, and (4) the motivation to comply with colleagues. In addition, the researchers studied the relationship between actual prescribing behavior and prescribing intention. It was reported that although the product moment correlation coefficients (r) between the two variables were significant across the five drugs under study, the relationship was not very strong. They concluded that several uncontrolled variables such as patient conditions, multiple drug brand usage, detail persons, and various sources of drug information in the practice setting might intervene between behavior intention and actual behavior. Therefore, the researchers concluded that the behavior intention was preferred to actual behavior in the study of attitude and beliefs as it was easier to measure and was more highly correlated to evaluative beliefs than was actual behavior.

Harrell and Bennett's study, like Knapp and Oltjen's used only two drug attributes: efficacy and side effects, as independent variables in predicting physician

prescribing intentions. Other important drug attributes were excluded. For example, drug cost, patient compliance, and reputation of the pharmaceutical manufacturer might also have contributed significantly to the explanation of variation in physician prescribing intention. This might help explain why only 26 percent of the variation in prescribing intention was explained by the model.

Lilja (1976), in his study of drug prescribing of 118 general practitioners in Sweden, also used multiple regression analysis to determine the relative importance of three drug attributes - efficacy, side effects, and cost - in determining the physicians' overall attitude toward antibiotic and antidiabetic drugs. It was found that high efficacy was the most important decision criterion for choosing both types of drugs. Side effects were the second most important criterion in choosing antidiabetic drugs, while cost was the second in importance in choosing antibiotic drugs. The three drug attributes included in the study accounted for 53.8% of the total variation for antidiabetic drugs and only 30.3% of the total variation for antibiotic drugs. The researcher suggested that a higher degree of explanation could have been obtained if more drug attributes had been included in the study.

Two points can be drawn from these studies. First, the researchers possibly could have explained more of the variation in physician prescribing behavior if other

important drug attributes, beyond drug efficacy, side effect and cost, were included in the studies. Furthermore, Miller (1974) pointed out that "although these attributes (considered in the prescribing process) can be listed and described, little is known about their relative importance".

Secondly, the relative importance of three drug attributes: efficacy, side effects, and cost, determined in the earlier studies, might vary by type of health care setting and also might vary over time. For instance, it might be possible that the rapidly changing health care economics and highly competitive health care market in the late 1980's have changed physician perceptions of the relative importance of attributes associated with a drug. Physicians in a cost-conscious health care environment might be more sensitive to drug cost or other drug attributes than their colleagues in a less cost-conscious era. The physicians in different working conditions and practice settings might also weigh differently the relative importance of each drug attribute.

Purpose of the study

This study was conducted to determine the relative importance of various drug attributes and subjective norms in explaining prescribing intentions of health maintenance organization (HMO) and fee-for-service (FFS) physicians. The differences between the two groups of physicians

regarding the prescribing intention, the motivation to comply with colleagues, drug attribute beliefs, and subjective norms were also examined using the Fishbein Behavioral Intention model. Drug attributes included in the study were: high efficacy, low side effect, low cost, high patient compliance, convenient dosage schedule, credible drug manufacturer, and reliable sources of drug information to justify prescribing decisions.

The Fishbein Behavioral Intention Model which is operationalized in the form of a multiple regression equation has been shown to be useful by several researchers in predicting and understanding behavioral intention (Fishbein, 1966; Ajzen and Fishbein, 1969, 1970, 1972; Fishbein et al, 1970; Ajzen, 1971; Hornik, 1970; De Vries and Ajzen, 1971; Carlson, 1968; Mc Ardle, 1972; Glassman, 1971; Jaccard and Davidson, 1972; Harrell and Bennett, 1974; Fisher and Pathak, 1980; Edmondson, 1981). In addition, the multiple regression analysis used in the model is a powerful tool in studying human behavior. Kerlinger and Pedhazer (1973) have pointed out that multiple regression takes into account the fact that natural phenomena are usually complex and require the inclusion of multiple independent variables to predict and understand a phenomenon. The statistics obtained from multiple regression such as multiple correlation coefficient, squared multiple correlation, standardized regression coefficient

and squared semipartial correlation, are also useful in interpreting the data and determining the strength of the relationship between the dependent variable and a set of independent variables. The relative contribution of each independent variable can be assessed by calculating the standardized regression coefficient or squared semipartial correlation coefficient.

The knowledge gained by this study as to the relative contribution of drug attribute beliefs, and subjective norms toward prescribing intention would be useful in the development of interventional or educational programs related to physician prescribing. It would also be useful and applicable to drug marketing research as to drug product design, drug product positioning, and the development of drug advertising and promotional strategies.

Theoretical Framework

The Fishbein Behavioral Intention Model was modified slightly and used as a conceptual framework to study and explain drug prescribing (See Figure 1). The disaggregate version of the model is symbolically represented as follows:

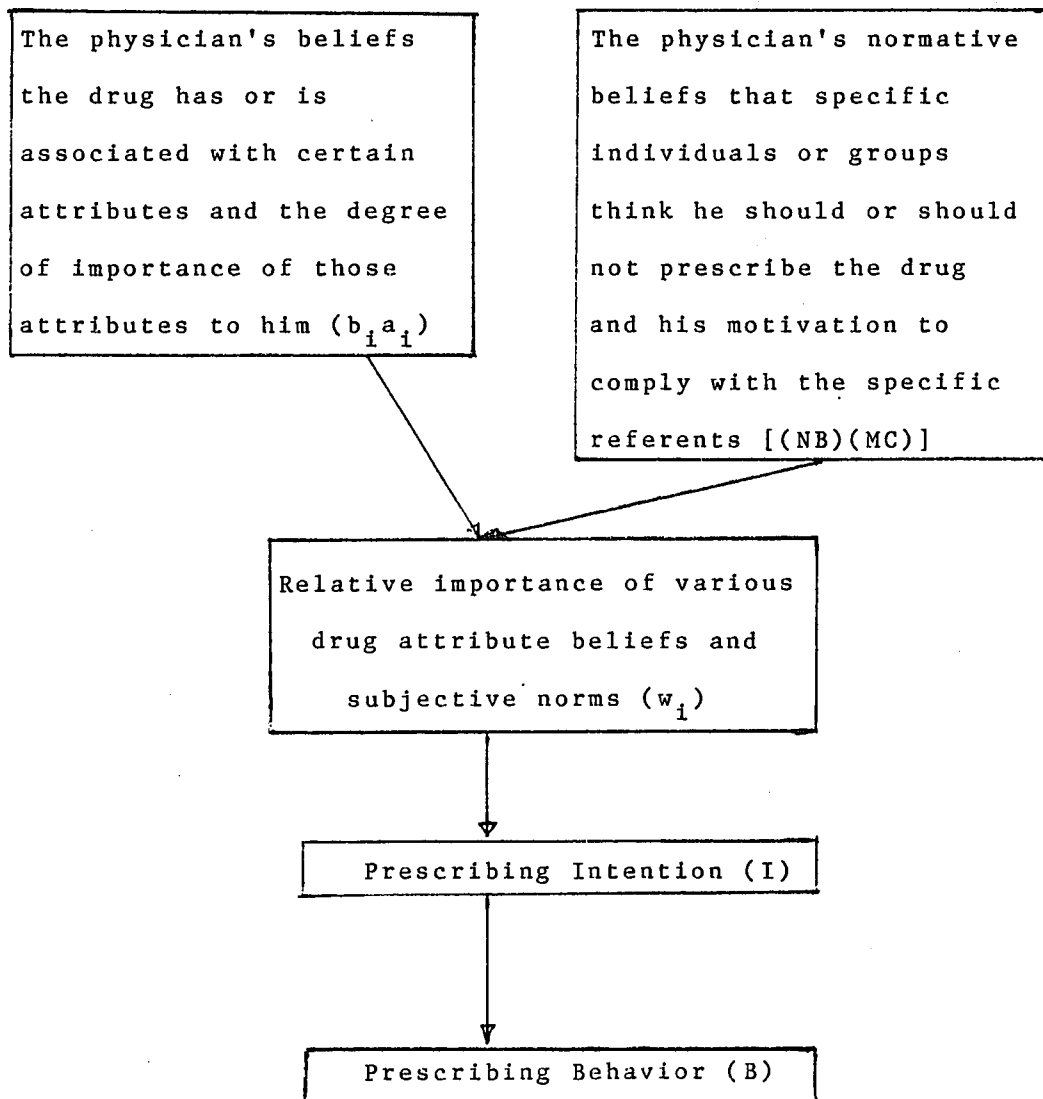


Figure 1. Schematic representation of the Fishbein Behavioral Intention Model as it applies to this study.

$$B = I = (b_1 a_1)w_1 + (b_2 a_2)w_2 + \dots + (b_n a_n)w_n + [(NB)(MC)]w_{n+1}$$

In the equation: B = a prescribing behavior of a physician with respect to a particular drug.

I = a physician's intention to prescribe a particular drug to a patient in a specific situation.

b_i = a physician's subjective probability that a particular drug has or is associated with the i^{th} attribute in question.

a_i = the importance of that attribute to a physician.

w_i = empirically derived standardized regression coefficient.

n = the number of drug attributes in the study.

NB = a normative belief that colleagues think he should or should not prescribe the drug to the patient.

MC = the motivation to comply with colleagues.

The aggregate version of the Fishbein Behavioral Intention model is symbolically represented as:

$$B = I = (A)w_1 + (SN)w_2$$

where A = a physician's attitude toward prescribing a drug to a patient in a specific situation.

SN = a physician's subjective norm with respect to prescribing a drug to a patient in a specific situation.

Each of the attitude and the subjective norm components in the aggregate model is affected by the antecedent variables. The attitude (A) is a function of a physician's belief regarding drug attributes that are associated with a particular drug and the degree of importance of the attributes. Thus,

$$A = \sum_{i=1}^n b_i a_i$$

The subjective norm is a function of a physician's subjective probability that colleagues think he should or should not prescribe the drug to a patient and his motivation to comply with colleagues. Thus,

$$SN = [(NB)(MC)]$$

Therefore, the equation for the aggregate model becomes:

$$B = I = \left(\sum_{i=1}^n b_i a_i \right) w_1 + [(NB)(MC)] w_2$$

Comparing the aggregate and disaggregate version of the Fishbein Behavioral Intention Model, the disaggregate model which considers each drug attribute separately has an

advantage of allowing the researcher to calculate the standardized regression weights of each independent variable, thus determining the relative importance of each drug attribute and subjective norm in explaining physician prescribing intentions and prescribing behaviors (Sheth, 1974; Raju, Bhagutand and Sheth, 1975; Harrell and Bennett, 1974; Wilkie and Pessemier, 1973; Fisher and Pathak, 1980).

Additionally, in this study, the evaluative component of the original Fishbein Behavior Intention Model has been substituted by a measure of importance. As Cohen (1972) stated that:

The advantage of this procedure is that if every one has the same direction of preference along the dimension (e.g., more is better - as in the case of cavity prevention for toothpaste), we are not simply asking how important the dimension is, but rather how important the attainment of a valued state is..., and under the assumption of common direction of preference, the greater the importance, the greater the value.

Therefore, the substitution of importance measurement for the evaluative component of the Fishbein behavior Intention Model was considered appropriate for this study, because physicians were assumed to possess homogeneity in the evaluation of the goodness or badness across all salient drug attributes. For example, higher efficacy is universally preferred to less efficacy, and less side effects are preferred to more side effects.

Research Objectives

The objectives in this research were as follows:

1. Determine the relative importance of various drug attributes in explaining prescribing intentions among HMO and FFS physicians.
2. Compare HMO and FFS physicians regarding the relative importance of various drug attributes when making prescribing decisions.
3. Compare HMO and FFS physicians with respect to each of the seven drug attribute beliefs and the motivation to comply with colleagues.
4. Test the ability of Fishbein Behavioral Intention Model in explaining prescribing intentions among HMO and FFS physicians.
5. Determine if the subjective norms [(NB)(MC)] contribute significantly to the explanation of prescribing intentions across HMO and FFS physicians.
6. Compare HMO and FFS physicians with respect to the mean scores of subjective norms toward prescribing intentions.

Research Hypotheses

The following null hypotheses were tested in this study:

HI: There is no difference in the means of prescribing

intention scores for each drug between HMO and FFS physicians.

HII: There is no agreement in the rank order of mean importance scores of seven drug attributes between HMO and FFS physicians.

HIII: There is no difference in the mean scores of motivation to comply with colleagues, and the mean importance scores of each drug attribute between HMO and FFS physicians.

HIV: There is no difference in the mean scores of subjective norms for each drug between HMO and FFS physicians.

HV: There is no difference in the mean scores of drug attribute beliefs for each drug between HMO and FFS physicians.

HVI: There is no significant relationship between a disaggregate form of each drug attribute belief weighted by the value importance of that attribute ($b_i a_i$) plus subjective norm [(NB)(MC)] and a physician's intention (I) to prescribe a particular drug across HMO and FFS physicians.

HVII: The squared multiple correlation coefficient for the regression of prescribing intention on a disaggregate form of each of seven drug attribute beliefs weighted by the degree of importance of the attribute is the same as the squared multiple

correlation without the inclusion of subjective norm.

HVIII: There is an equality between sets of regression coefficients in two linear regressions of prescribing intention on a disaggregate form of each drug attribute belief weighted by the value importance of that attribute plus subjective norms between HMO and FFS physicians.

HIX: There is no significant relationship between a physician's prescribing intention (I) and the linear combination of attitude and subjective norm for each of the four beta-blockers across HMO and FFS physicians.

HX: The squared multiple correlation coefficient for the regression of prescribing intention on attitude with the inclusion of subjective norm is the same as the squared multiple correlation coefficients without the inclusion of subjective norm.

HXI: There is an equality between sets of regression coefficients in two linear regressions of prescribing intention on a linear combination of attitude and subjective norm between HMO and FFS physicians.

In addition, the following exploratory questions were examined:

EI: What is the relative importance of various drug attributes in determining prescribing intention of a particular drug in each group of HMO and FFS physicians.

EII: What is a set of drug attributes that significantly differentiate prescribing intentions between HMO and FFS physicians.

Definitions

1. Drug attribute: A characteristic, quality, consequence, or outcome possessed by (or associated with) a drug.
2. Behavior: An observable act of the subject used to infer beliefs, attitudes, or intentions.
3. Belief: A subject's subjective probability that an object has or is associated with the attribute in question.
4. Behavior intention: A subject's subjective probability that he will perform the behavior in question.
5. Normative beliefs: A subject's beliefs that particular individuals or groups think he should or should not perform the behavior in question.
6. Motivation to comply: A subject's general tendency to act as what a specific individual or groups think he should.

7. Subjective norm: A subject's perception of the normative pressure place upon him to perform or not to perform the behavior.
8. Evaluative belief: A product of a subject's subjective probability that a drug has or is associated with the drug attribute in question and the degree of importance of the attribute.

CHAPTER 2

REVIEW OF THE LITERATURE

This chapter presents a review of the literature regarding drug prescribing and variables affecting drug prescribing. Factors influencing drug prescribing that are discussed here include: education, drug advertising and source of drug information, colleagues, pharmacists, patient's characteristics, physician's characteristics and drug attributes. In addition, the Fishbein Behavioral Intention Model and its application in the fields of social psychology, marketing and health care will be covered. Finally, other models of the drug prescribing process will be discussed.

Factors Influencing Drug Prescribing

Education: Education helps provide physicians with therapeutic knowledge and ability to practice medicine during their professional career. However, medical schools differ in terms of their educational programs and medical training. Joyce, Last and Weatherall (1968) studied prescribing rates of 93 general practitioners in England and reported that "higher educational qualification" was related to a lower rate of prescribing of all kinds of drugs. Stolley et al (1972) conducted a study regarding

quality of prescribing among primary care physicians in private practice and found that rational prescribers tended to have more post-graduate education, but fewer years of medical experience. In addition, Garner (1971) reported that physicians who graduated from different medical schools had different prescribing rates.

However, contradictory results have been reported by Lee, Draper and Weatherall (1965) who found that physicians who graduated from different medical schools were not significantly different in their drug prescribing. The Ministry of Health in the United Kingdom (1964) also reported that graduates of different medical schools have the same prescribing habits.

As a conclusion, the effect of medical school on physician prescribing behavior has not been well established due to the inconsistent findings reported in the literature. Nevertheless, there is some support that higher educational qualifications of physicians are related to higher quality of drug prescribing.

Drug Advertising and Source of Drug Information: It has been estimated that more than one billion dollars are spent annually by drug firms on drug advertising and disseminating drug information to physicians (Silverman and Lee, 1974; Jacoby and Small, 1975). This level of expenditure in advertising suggests that advertising has

some effect on drug prescribing. Most drug advertising and promotion are in the form of journal advertising, direct mail and drug company representatives. These advertisements have been referred to by some authors in the literature as "commercial sources of influence" on drug prescribing (Avorn, Chen and Hartley, 1982; Herman and Christopher, 1976).

Smith, in his review of the effect of journal advertising on drug prescribing, reported that there was unsubstantiated evidence that drug firms, through journal advertising, influenced physicians to prescribe drugs inappropriately. Journal advertisement might influence drug prescribing in combination with other factors; thus, making it difficult to study the effect of drug advertising separately.

However, a study comparing scientific and commercial sources of influence on prescribing by physicians was conducted by Avorn, Chen and Hartley (1982) in the Boston area. The researchers examined the prescribing behavior of physicians with respect to two groups of drugs: cerebral vasodilators and propoxyphene derivatives. These two drug groups have been promoted heavily by drug firms as very effective drugs. Nonetheless, these messages appeared to be different from the messages published in the scientific literature, in which their effectiveness was presented as questionable or unsuperior to other drugs. The results of

the study were interesting. Over half of the interviewed physicians perceived journal advertising (68%) and detailmen (54%) to be "minimally important" in influencing their prescribing when compared with scientific sources such as professional journal and published clinical studies. However, the attitudes of the physicians toward the two groups of drugs were inconsistent with the information presented in scientific sources. Approximately half of the physicians who perceived that they were not influenced by advertising also believed that these two drugs were very effective, as advertised by drug firms.

These findings indicate that physicians were influenced by "commercial sources of influence" despite their unawareness of those influences. Commercial sources of drug information may be biased in terms of the messages they present (Avorn, Chen and Hartley, 1982). Stolley et al (1972) reported that the better prescribers are those physicians who depend more on scientific sources for drug information than on drug advertising.

Source of drug information also affects the adoption of new drugs. Miller (1973, 1974) divided the drug adoption process into five stages as: awareness, interest, evaluation, trial, and adoption. Each stage of the adoption process was reported to be associated with different potential sources of drug information. In the awareness stage, drug company representatives appeared to be the most

important source of drug information; while, in the interest stage, detailmen, journal advertising, journal articles, colleagues, and the Physicians' Desk Reference were the main sources of drug information. In the evaluation stage, colleagues were the most important source of drug information. In the trial stage, the Physicians' Desk Reference was the most important source of information on drug dosage, contraindication, frequency of drug administration, etc.

Colleagues: Coleman, Katz and Menzel (1966) reported that physicians turned to their colleagues for advice and drug information when there were perceived risks related to drug use. They also tended to follow their peers' advice more in the treatment of chronic disease than in the treatment of acute disease (Coleman, Katz and Menzel, 1959).

Five types of physicians interconnections were identified by Coleman et al (1966) as: common hospital appointments, shared offices, advice networks, discussion networks and friendship networks. These professional networks were found to affect the way physicians adopt new drugs. Physicians with more social interaction, who were more integrated into the professional network, and who practiced as a group tended to adopt new drugs earlier than physicians who worked independently in solo practice.

Christensen and Wertheimer (1979) studied the adoption of new drugs by conducting interviews with 29 physicians in a health maintenance organization (HMO). It was found that physicians used literature-based sources for general drug information and colleagues for information on new drugs. However, the findings from this study were, in one way, inconsistent with the results reported earlier by Coleman et al (1966). This study found that physicians who were highly integrated into social and professional networks did not adopt new drugs earlier than their peers, and therefore, the researchers concluded that the extent to which colleagues influenced the adoption of new drugs was dependent upon the type of practice setting, type of new drug, type of physicians' specialty, and time period of study.

Pharmacists: Earlier studies on drug prescribing had reported that pharmacists had very little effect on prescribing behavior of physicians (Gaffin and Associates, 1958; Caplow and Raymond, 1954; Hawkins, 1959; Winick, 1961). Nevertheless, recent studies have reported an increasing importance of pharmacists in influencing physicians' decisions about drug use. For example, a study conducted by Alexander et al (1983) in a Veterans Administration medical center evaluated an educational program on pharmacology initiated by clinical pharmacists.

This program included weekly lectures to medical students, psychiatric residents and staff psychiatrists on the clinical use of psychotropic drugs. After twelve weeks of the program, it was found that the uses of psychotropic drugs by physicians were more appropriate and closer to the recommendations cited in the literature when compared with the period before the study.

Patient's Characteristics: When a patient consults with a physician about his illness, he usually brings with him the expectation that something can be done to improve his condition (Hagan, 1984). According to Muller (1972),

Prescribing is theoretically at least, a means of terminating the interview in a fashion that satisfies both doctor and patient...it both summarizes and carries forward the relationship, it is an expression of concern and it deals with interest of both parties in a manner perceived as equitable.

Although a prescription drug is an important means to treat patients, it is not the only option available for physicians. Stimson (1975) reported that the physicians perceived 80% of the patients expected a prescription drug, whereas only 50% of patients expected drugs to be prescribed to them. These perceptions may encourage physicians to prescribe the drugs instead of recommending other forms of therapy.

In addition to patient expectations, patient income, sex and age may also affect physician prescribing behaviors.

Coleman et al (1966) reported that physicians with a relatively high proportion of higher income patients prescribe more recent and more expensive drugs than physicians with a relatively high proportion of lower income patients. Hartzema and Christensen (1983) studied the prescribing patterns of 80 family practitioners in a large HMO and found that patient panel size and age composition accounted for 45.7% of the variation in the prescribing rate. They also reported that female patients preferred to see female physicians and older physicians tended to have more older patients than did younger physicians. Therefore, this helps explain why older physicians had higher prescribing rates. Older patients generally have more chronic diseases and require more drugs than younger patients.

In addition, the seriousness of disease and patient condition is another variable affecting physician prescribing behaviors. Miller (1974) reported that physicians usually depend more on professional sources of drug information when treating patients with difficult conditions in which drug efficacy is not clearly known. Menzel and Katz (1955-56) found that colleagues were a more important source of drug information when treating chronic conditions than treating acute conditions. Bauer and Wortzel (1966) reported that as the severity of the disease increased, the use of professional sources of drug

information increased over the use of commercial sources of drug information.

Physician's Characteristics: Stolley et al (1972) in the study of the relationship between physician characteristics and the quality of prescribing reported that the better prescribers tended to be younger with less medical experience. They maintained larger, hurried practices with more ancillary personnel. They also tended to consult more with their colleagues and placed a higher value on their profession. They informed patients more about drugs and treatments. The more appropriate prescribers were more satisfied with their formal medical training and more critical of pharmaceutical industry advertising. They relied more on journal articles for drug information, sought more data on contraindications, and were more dissatisfied with existing sources of drug information.

Hayer (1982) also reported similar findings; namely, that younger physicians prescribed drugs more rationally than older physicians. Peterson et al (1956) found that the relationship between good performance in medical school and good performance in medical practice diminished among physicians over 35 years old.

With respect to physician specialty, Garner (1971), through prescription analysis, found that specialists were more likely to determine the specific course of a disease

and prescribed drugs more specific to the disease than general practitioners.

Knapp and Oeltjen (1972) reported that physician specialty and the severity of disease were related to the relative weighting of benefits and risks given to hypothetical drugs used in the treatment of hypertension. For milder cases of hypertension, internal medicine physicians weighed benefits of a drug more heavily than the risks of the drug, while the general practitioners were more concerned with the risks than benefits. For more severe cases of hypertension, the relationship was reversed. Internal medicine physicians weighed the risks of a drug more heavily than the benefits, while the general practitioners were more concerned with the benefits than the risks.

Finally, in the study of prescribing behavior of 124 general practitioners conducted by Melville (1980), the researcher reported a relationship between physician prescribing behavior and job-satisfaction. It was found that the prescribing of drugs which were likely to cause adverse reactions or which are considered inappropriate by medical consensus was associated with low job-satisfaction among physicians. Physicians with low job-satisfaction were also more likely to allow ancillary personnel to write prescriptions for potent and harmful drugs.

Drug attributes: Miller (1974), in his review of physician prescribing habits, noted that drug attributes influenced the prescribing of new drugs as well as established drugs. Drug attributes that were hypothesized to affect the adoption of a new drug included: cost, consistency of therapeutic response, risks associated with prescribing the drug, complexity of drug's effect, available dosage forms, communicability of a new drug, the degree to which a new drug is superior to existing drugs, the reputation of drug manufacturer, the social reward associated with a drug, and the reaction of colleagues. Drug attributes that were hypothesized to influence the prescribing of established drugs included: initial cost and continuing cost of a drug, the social reward associated with a drug, consistency of therapeutic response, length of drug's name and the reputation of drug manufacturer (Miller, 1973, 1974).

Caplow and Raymond's study (1954) supports Miller's notion. They found that "superior therapeutic effect" accounted for 56 percent of drug adoptions, drug side effects accounted for 15 percent, and ease of administration accounted for 14 percent of new drug adoptions. Bauer (1961) also found that there was a significant relationship between preference for a drug company and preference for a given drug.

Several studies have identified drug cost as a relatively unimportant drug attribute in influencing physicians. Lowery, Lowy and Warner (1972), in a survey of 220 physicians, found that many physicians had a limited knowledge of drug costs. Zelnio and Gagnon (1979), in a literature review of the impact of drug cost information on physician prescribing patterns, stated that physicians did not incorporate drug cost into the prescribing decision to the extent necessary for cost savings.

Lilja (1976) studied the relative importance of three drug attributes: efficacy, side effects and cost of the drug. He found that drug efficacy was the most important drug attribute influencing prescribing. Side effects and cost were ranked second or third in importance, depending upon the type of drugs being prescribed.

Zelnio (1982), in a study of the relative importance of eight drug attributes, using a paired comparisons technique, reported that the most important drug attributes were drug efficacy, side effects, and contraindications. The lesser important drug attributes were those of dosage form availability, drug cost, source of drug information, frequency of administration and manufacturer's reputation. He also stated that these drug attributes represented the most important factors affecting physician prescribing behavior identified to date. However, this study had some limitations. The researcher did not study a specific drug

class under a specific patient condition. Therefore, the findings might not be generalizable to all classes of drugs across all types of patients.

Fishbein Behavioral Intention Model

The Fishbein Behavioral Intention Model, based on a modification of Dulany's theory of Propositional Control (Dulany, 1961, 1968), assumes that "most behavior of interest ... is under volitional control and that in a given situation, a person holds or forms a specific belief that influences his subsequent behavior" (Ajzen and Fishbein, 1973). According to the theory, behavioral intention acts as an intermediate variable between the criterion variable (overt behavior) and the two predictor variables: a personal or an attitudinal factor and a social or normative factor (Fishbein and Ajzen, 1975). The model, mainly used to predict behavioral intention, is operationalized in the form of a regression equation and is symbolically represented as follows:

$$B = I = (A)w_1 + (SN)w_2$$

where "B" is the overt behavior; "I" is the intention to perform the behavior in question; "A" is the attitude toward performing the behavior; "SN" is the subjective norm with respect to performing the behavior; "w₁" and "w₂" are empirically derived standardized regression coefficients.

Each of the two predictor variables in the model is also affected by antecedent variables. The attitudinal variable (A), is a function of a subject's belief regarding the outcomes of performing the behavior and the subject's evaluation of those outcomes. Therefore,

$$A = \sum_{i=1}^n b_i a_i$$

where "b" is the belief that performing the behavior leads to outcome i; "a" is the subject's evaluation of outcome i; "n" is the number of beliefs regarding performing that behavior; "i" is the outcomes associated with that behavior.

The normative variable (SN), is a function of a subject's beliefs that specific individuals or groups think he should or should not perform the behavior in question and the subject's motivation to comply with those expectation. The subjective norm is symbolically represented as:

$$SN = \sum_{i=1}^n NB_i MC_i$$

where "NB" is the normative belief that specific individuals or reference groups think he should or should not perform the behavior; "MC" is the motivation to comply with reference group i; "n" is the number of reference groups or specific individuals. Therefore, the central equation of Fishbein Behavioral Intention Model becomes:

$$B = I = \left(\sum_{i=1}^n b_i a_i \right) w_1 + \left(\sum_{i=1}^n NB_i MC_i \right) w_2$$

Fishbein's model normally requires that certain assumptions are met. As pointed out by Fishbein, Ajzen, Landy, and Anderson (1970), "it must be emphasized, however, that these near perfect correlations between behavioral intent and behavior are only obtained, and are only expected, when one considers an individual's intention to perform a specific act in a specific situation." In addition, the time interval between the measurement of behavioral intention (BI) and the observation of behavior (B) should be small in order to obtain high correlation between B and BI (Ajzen and Fishbein, 1972).

The Fishbein Behavior Intention Model usually utilizes a summative approach to determine each of the attitude and the subjective norm components. Then, by regression analysis, the standardized regression coefficients for each of the two components are calculated. The beta weights thus obtained are used to determine the relative importance of the attitudes and subjective norms in determining the individual behavior.

However, several researchers have reported the use of a disaggregate version of the model in which the effect of individual variables toward the behavioral intention is determined separately. It was found that the disaggregate model is theoretically and empirically superior to the

summative model because of its improvement in the diagnostic and explanatory power toward the behavior intention. It also provided better understanding regarding the relative importance of various attribute beliefs and specific referent groups to the prediction of behavior and behavior intention (Engel, Blackwell, and Kollat, 1978; Tunçalp and Sheth, 1975; Sheth, 1970, 1974; Raju, Bhagut and Sheth, 1975; Harrell and Bennett, 1974; Fisher and Pathak, 1980).

The Fishbein Behavior Intention Model has shown to be useful and received substantial empirical support from various fields in social psychology, marketing, and health care.

Social Psychology: The earlier studies that investigated the behavior intention model were mostly in social psychological settings (Fishbein, 1966; Ajzen and Fishbein, 1969, 1970, 1972; Fishbein et al, 1970; Ajzen, 1971; Hornik, 1970; De Vries and Ajzen, 1971; A.R. Carlson, 1968; Mc Ardle, 1972; Darroch, 1971; Glassman, 1971; Jaccard and Davidson, 1972). These studies attempted to predict various behavioral intentions based on the attitudes and the normative component of the model. In general it was found that the multiple correlation between the attitudes, the subjective norms and behavioral intentions were highly significant.

Ajzen and Fishbein (1970) and Ajzen (1971) used an experimental setting called a Prisoner's Dilemma Game. This game involves two subjects, each of whom make choices between two strategies that represent cooperation and competition. The measures of attitudes and subjective norms were found to correlate highly with the behavior intention. The multiple correlations ranged from 0.818 ($p < 0.01$) (Ajzen, 1971) to 0.888 ($p < 0.01$) (Ajzen and Fishbein, 1970).

In another setting, Carlson (1968) measured 30 behavioral intentions regarding an African Negro. It was reported that the multiple correlations of the attitudes, subjective norms and behavioral intentions were statistically significant, with an average mean of 0.913 ($p < 0.01$). Ajzen and Fishbein (1969) measured the intention of college students to engage in eight different behaviors on a Friday night. The multiple correlations obtained from the study were also statistically significant, with a mean of 0.766 ($p < 0.01$).

In addition, DeVries and Ajzen (1971) tested the ability of the model in predicting various cheating behaviors among college students. The multiple correlations of the attitudes, subjective norms and behavioral intentions ranged from 0.51 to 0.71 (all significant at $p < 0.01$). The correlations between behaviors and behavioral intentions were also statistically significant ($p < 0.01$).

Davidson and Jaccard (1975) used the model to predict the intention of married women with respect to family planning. The multiple correlations of the two components and behavioral intentions were also significant, ranging from 0.71 to 0.81 ($p < 0.01$).

Researchers also applied the Fishbein Behavioral Intention Model to the prediction of the subject's intention to drink alcohol. It was found that the attitudes and subjective norms contributed significantly to the prediction of both intentions to drink (average $R = 0.753$) and self-reported drinking behavior (average $R = 0.42$) (Schlegal, Cranford, and Sanborn, 1977; McCarty, Morrison and Mills, 1983).

Furthermore, several researchers also reported the use of multiple regression analysis to calculate the standardized regression weights of each of the attitude and subjective norm components. These standardized regression coefficients are used to determine the relative importance of the attitude and subjective norm toward prediction of individual behavior intention. According to Ajzen and Fishbein (1973, 1975), the standardized regression weights of each of the two components vary with individual differences between subjects, different behaviors, situations and populations.

The evidence for individual differences in the regression weights of the two components was reported by

Fishbein (1966). In the study of undergraduates' intentions to engage in premarital sexual intercourse, it was found that attitudes and subjective norms correlated significantly with behavioral intentions across both male and female subjects. For female subjects, the standardized regression coefficients of the attitudinal component and the subjective norm component were 0.757 ($p < 0.01$) and 0.232 ($p < 0.01$) respectively. However, for male subjects, the regression weight of the attitudinal component was -0.148 (nonsignificant) and the regression weight of the subjective norm component was 0.947 ($p < 0.01$). Therefore, it was concluded that for female subjects, the attitudinal considerations of premarital sexual behavior were more important than the subjective norm considerations, while for male subjects, the subjective norm considerations were the important factors in determining the behavioral intentions.

Furthermore, Spencer and Budd (1984) studied sex differences in alcohol consumption among college students. It was reported that men's intentions to drink alcohol were based mostly on the subjective norm considerations, while for women, the attitudinal components were the major influences on their intentions.

Carlson (1968) found evidence for differences in the standardized regression coefficients of the two components due to the various behavior under the study. The measures of 30 behavioral intentions of female subjects with respect

to a Negro stimulus person were obtained under five different situations as: formal social acceptance, informal social acceptance, marital acceptance, cooperation, and subordination-superordination. It was found that the more a given behavior involved marital acceptance, the greater was the importance of subjective norm considerations, and the more a given behavior involved formal social acceptance, the greater was the importance of attitudinal considerations.

The situational factors have also been found to affect the regression weights of the attitudinal and subjective norm components. Ajzen and Fishbein (1970), and Ajzen (1971), using a Prisoner's Dilemma Game, found that under the cooperative situation, the subjective norm considerations were more important than the attitudinal considerations. However, under the competitive situation, the attitudinal considerations were more important than the subjective norm considerations in determining the behavior intentions.

Fishbein, Ajzen, Landy and Anderson (1970) also studied the behavior in a group work task situation. It was found that under the interpersonal communication condition, the beta weight of the normative component was larger than the attitudinal component, whereas, under the forced compliance condition, the attitudinal component was more important than the normative component.

Finally, the population under study also influences the relative importance of the attitudinal and the normative component in explaining individual behavior. Newman and Martin (1982) measured attitudes and social norms of 279 high school students in New Zealand with respect to cigarette smoking and compared the results with the U.S. adolescents. It was reported that the multiple correlations of attitudes, social norms and behavioral intentions were statistically significant ($p < 0.01$) for both the U.S. and New Zealand samples. However, for the New Zealand sample, the standardized regression weights were significant for both attitude and social norm ($p < 0.01$), for the U.S. sample, only the regression weight for attitude was found to be statistically significant ($p < 0.01$). The researchers concluded that the subjective norms component were more important in determining intentions to smoke cigarettes among the New Zealand sample than among the U.S. sample.

Marketing: The Fishbein Behavioral Intention Model has been used to predict and explain individual behavior in marketing settings as well as in social psychological settings. Several researchers have tested the model's predictive validity over a wide range of consumer intentions and behaviors. Bonfield (1974) tested it with respect to non-carbonated food drink purchases and found that the model

significantly explained 48% of the variance in consumer behavioral intentions. Wilson, Mathews, and Harvey (1975) tested it with respect to toothpaste purchases and reported that the model yielded statistically significant multiple correlations across all six brands of toothpaste under the study with an average R of 0.672 ($p < 0.001$). Ryan (1978) also tested the model with respect to toothpaste purchases. The results indicated a statistically significant relationship between the attitude plus subjective norm and behavior intention to purchase a brand of toothpaste.

Moreover, Lutz (1977) tested the explanatory power of the model with respect to laundry detergent purchases. The findings strongly supported the conceptual framework based on the Fishbein Behavioral Intention Model. Ryan and Bonfield (1980) also tested the model's external and pragmatic validity with respect to loan applications at a credit union. The correlation between behavioral intention and behavior was found to be significant ($r = 0.33$, $p < 0.001$). The results thus supported the use of behavioral intention as an intermediating variable for determining overt behavior. Furthermore, it was found that the attitudes influenced behavioral intention with regard to loan applications more than did the subjective norms.

Wilson, Mathews and Monoky (1972) also examined the relative importance of attitudes and subjective norms toward the prediction of behavioral intentions. Using the two

Prisoner's Dilemma Game in a buyer-seller situation, the researchers reported the results that were consistent with the findings reported in social psychological field. Under the cooperative condition, the normative component exerted more influences on behavioral intentions than did the attitudinal component, while, under the competitive condition, the attitudinal component was more important in determining behavioral intentions.

In addition, marketing researchers have also tested the ability of a disaggregate version of Fishbein's model in explaining consumer intentions and behaviors. The disaggregate model was found to provide more diagnostic power in examining the attitude formation, attitudinal change, and the relative importance of various independent variables to the prediction of behavioral intentions (Sheth, 1974; Raju, Bhagut and Sheth, 1975; Ryan, 1978; Shimp and Kavas, 1984; Gensch, 1985).

Sheth (1970) tested the disaggregate model with respect to breakfast cereal purchases. The multiple correlations obtained ranged from 0.31 (nonsignificant) to 0.62 (significant at $p < 0.01$). Raju, Bhagut and Sheth (1975) compared the ability of Fishbein's aggregate model, the disaggregate model, and Rosenberg's aggregate attitude model, to predict consumer intentions with respect to automobile purchases. It was found that the disaggregate model yielded the highest multiple correlation among the

three models. The multiple correlation of the disaggregate model was 0.73 ($p < 0.001$), of the aggregate model was 0.47 ($p < 0.001$), and of Rosenberg's model was 0.39 ($p < 0.001$).

Shimp and Kavas (1984) tested the Fishbein model with respect to consumer coupon usage. It was found that the aggregate form of attitudinal component explained only 2% of attitudinal variance while the disaggregate form explained 59% of the attitudinal variance. These studies thus provided empirical support for the model in explaining individual behavioral intentions and behaviors.

Health Care: In addition to the model's usefulness in social psychology and marketing, the model has also been widely applied to predict and explain various behaviors in many health care settings. Harrell and Bennett (1974) used the model to predict physician drug choice for five oral antidiabetic drugs. The multiple correlations were found to be statistically significant across all brand drugs ($p < 0.001$). The results thus supported the conceptual framework that the intention to prescribe a drug is a function of beliefs regarding the attributes associated with a drug, the evaluation of those attributes, and the subjective norms. In addition, the researchers also compared the disaggregate version of the model with the aggregate form in the ability to predict physician drug choice. The disaggregate form was found to yield higher multiple correlations than the

aggregate form. The multiple correlations of the disaggregate form ranged from 0.432 to 0.632 ($p < 0.001$), while the multiple correlations obtained from the aggregate form ranged from 0.409 to 0.539 ($p < 0.01$). The researchers also stated that the disaggregate model was more useful in predicting and explaining physician prescribing behavior because it provides information regarding the contribution of each drug attribute and subjective norm toward physician's brand preferences and prescribing intention.

Epstein, Read and Winickoff (1984) also used the Fishbein model to study physician prescribing behavior for anti-inflammatory drugs in Veterans Administration Clinics. The researchers measured physicians' beliefs regarding three drug attributes: drug efficacy, side effects and cost of different brands of non-steroidal anti-inflammatory drugs and aspirin compounds, and the relative importance of six drug attributes : drug efficacy, side effects, likelihood of compliance, placebo effects, cost and the patient's perception of the physician. It was found that the physicians' beliefs were not significantly related to prescribing behavior. Nevertheless, the researchers were reluctant to conclude that there was not a relationship between the two variables as the sample size of physicians was small and only three drug attribute beliefs: efficacy, side effects, and cost, were determined. However, the evaluations of physicians regarding the importance of cost

and placebo effects were significantly correlated with physician prescribing behavior ($p < 0.05$).

Oliver and Berger (1978) compared the predictive ability of Fishbein's model, the Health Belief Model and Wortzel's Drive Reduction model with respect to the subject's intention to receive swine flu vaccination. It was found that Fishbein Behavioral Intention Model performed better than did the Health Belief Model or Wortzel's Drive Reduction model. However, all three models yielded statistically significant multiple correlations of 0.73, 0.52, and 0.44, respectively (all significant at $p < 0.01$).

Ahlering (1979) tested the model with respect to the subject's intention to donate blood. The multiple correlations of the attitudes, the subjective norms and behavioral intentions were statistically significant with a mean of 0.37 ($p < 0.005$). The behavior intention was also found to correlate significantly with behavior ($p < 0.001$). Furthermore, Saltzer (1979) applied the model to predict the intention and behavior regarding weight control. The attitude and subjective norm were found to be significantly correlated with behavioral intention and behavior with multiple correlations of 0.38 ($p < 0.01$) and 0.31 ($p < 0.05$) respectively.

Edmondson (1981) applied the aggregate and disaggregate form of Fishbein's Behavioral Intentions Model to predict and explain medication-taking behavior in the

elderly. It was reported that both aggregate and disaggregate models yielded statistically significant squared multiple correlation coefficients from 0.160 to 0.284, respectively ($p < 0.001$). The correlation between intention and reported compliance behavior was also significant ($r = 0.765$, $p < 0.001$). For the aggregate form, only the attitudinal component contributed significantly toward behavioral intentions. For the disaggregate form, more information was obtained; the physician, drug efficacy, and side effects were found to be the important determinants toward medication-taking intentions. The researcher concluded that although both forms of the model were useful in the study of medication compliance, the disaggregate form was superior to the aggregate form in predicting and explaining the medication-taking intentions.

Budd, Bleiker, and Spencer (1983) applied Fishbein's model to differentiate between the "non-users", "experimenters", "occasional users" and "regular users" of marijuana in a student population. It was demonstrated by the study that Fishbein's model provided the useful approach to the understanding of beliefs, attitudes and social norms differences among the four types of drug-user status.

In a hospital pharmacy setting, Fisher and Pathak (1980) utilized the Fishbein Behavioral Intention Model as a conceptual framework to explain physician's intention to use pharmacists as drug information consultants. The researchers

not only tested the ability of the aggregate and disaggregate forms, but also investigated the effect of adding situational variables in the prediction of physicians' intentions. The multiple correlations of the disaggregate form was 0.43 ($p < 0.1$), of the aggregate form was 0.56 ($p < 0.01$), and of the aggregate form with situational variables was 0.74 ($p < 0.01$). It was then concluded by the researchers that although the disaggregate version had not improved the explanatory power of the model, it provided better diagnostic power regarding the relative importance of the individual beliefs, attitudes and normative beliefs to the explanation of physicians' use of pharmacists as drug information consultants.

In conclusion, these studies from social psychology, marketing, and health care provided the evidence to support a conceptual framework based on Fishbein Behavioral Intention Model. The individual's subjective beliefs regarding consequences of performing the behavior, the evaluation of those consequences, and the subjective norms are significantly related to behavior intention. Moreover, the standardized regression coefficient of each independent variable, obtained by multiple regression analysis, can be used to determine the relative importance of various independent variables in predicting and explaining behavior intention and behavior.

Other Models of Drug Prescribing

In addition to the Fishbein Behavior Intention Model, several researchers have proposed other models that attempt to explain the decision making process that lead a physician to prescribe a particular drug or having chosen to prescribe one drug over another. One model of drug prescribing, suggested by Hemminki (1975). The major variables in the model that influencing prescribing decisions are: (1) the pressure from research and drug firms, (2) the demands and expectations of patients, pressure groups and society, and (3) control and regulations from government, health authorities and insurance systems. Research and drug firms are indicated in the model as closely related variables which mutually affect the demands from pressure groups and society. These three variables: research, drug firms, and the demands from pressure groups and society, directly influence drug prescribing of physicians through education, scientific journals and advertising. The extent of this influence varies with the physician's personal characteristics, working situations and his therapeutic opportunities. Colleagues are considered as another important source of influence who are also affected by each of the above variables. Additional variables that exert influences on physician's drug prescribing include: patient's personal characteristics, patient's demands and

expectations, federal, state and local control groups, professional norms and other situational factors in the practicing environment. Despite the useful conceptual framework provided by the model, this model ignores the cognitive component of prescribing decision process.

A model for the adoption of new drugs has been proposed by Miller (1974). This model was adapted from the model for the adoption of innovations developed by Rogers and Shoemaker (1971). The model consists of three major parts: (1) antecedents (2) process (3) results. The antecedents are "those factors present in the situation prior to the introduction of an innovation" (Rogers, 1962). Antecedents include the individual physician's identity and perception of the situation, each of which affects the drug adoption process.

The adoption process in the second part involves five stages as: awareness, interest, evaluation, trial and adoption. In the first stage, a physician becomes aware of a new drug mostly through detailmen and journal advertising. If interested in the new drug, more drug information is sought from journal articles, drug company advertisements, the Physician's Desk References (PDR) and colleagues. In the evaluation stage, the physician decides to consider using the new drug. He begins to evaluate the new drug and seeks information from his colleagues, journal articles and medical meetings.

After the evaluation stage, if the physician decides to try a new drug on a patient, he will obtain data on drug dosage, available dosage form and drug contraindication mostly from the PDR, journal advertising, drug company literature and samples of new drug. The results of the trial stage will then lead him to either adopt or reject the new drug.

Another model of drug prescribing is the cognitive decision-making model studied by Knapp and Oltjen (1972). This model, based on Rettig's modification of Rotter's social learning theory (Rotter, 1954; Rettig, 1963, 1964), stated that physician's drug choice is a function of four variables: (1) physician's expectancy of patient benefit if the drug were prescribed (2) the magnitude of those beneficial effects (3) the expectancy that drug side effect will occur (4) the magnitude of the side effect. In the study, the researchers ascertained the relative weights given to the four factors by physicians when making drug choices for varying severities of hypothetical case of essential hypertension patients. The results from this study suggested that severity of disease and the physician's specialty were related to the relative weights of the four factors given to hypothetical drugs. For a milder case of hypertension, internal medicine physicians weighed benefits of a drug more heavily than risks. General practitioners,

however, were more concerned with risks of drug than benefits. For more severe case of hypertension, the relationship was reversed. Other background variables such as physician status, age, site of practice, and prescribing rate were not significantly related to the physician's perceptions of benefits-to-risks ratio of drug.

Lilja (1976) proposed a model of the physician's drug choice process. According to Lilja (1976), physicians select most brand name drugs or established drugs through habitual process and adopt a new drug through nonhabitual choice process. Three drug attributes: drug efficacy, side effect and drug cost were included in the study and assumed to be the most important variables affecting the physician's disposition toward drugs. In his study, 180 Swedish physicians were asked about their overall attitude for each of 10 mentioned antidiabetic drugs used to treat diabetes mellitus, and each of 10 mentioned antibiotic drugs used to treat pneumonia. Then, they were asked about their judgement regarding curing effect, side effect and cost of each drug. Using multiple regression analysis, it was found that curing effect was the most important decision criterion for both types of drugs. Side effect was the second most important criterion in choosing antidiabetic drugs, while drug cost was the second in importance when choosing antibiotic drugs. In addition, there were no significant

relationships between a physician's background variables and the prescribing decision.

The most recent cognitive model of drug prescribing was proposed and tested by Segal and Hepler (1982,1985). This model is based on Vroom's valence and force models (Vroom, 1964). According to this model, a physician's drug choice is a function of (1) a physician's beliefs or subjective probability that certain outcomes will occur from various drug choices, and (2) the values of those outcomes to the physician. The researchers first tested this model using a hypothetical case of mild hypertension patient (Segal and Hepler, 1982). Six drug-related outcomes were identified by interviewing 12 physicians including psychiatrists, internists and family practitioners. These six outcomes identified were: control of disease, patient compliance, side effect, cost to a patient, patient's satisfaction with treatment and colleagues' criticism. Then, another fifty family practice residents were asked about their beliefs regarding the probability that each of the drug outcomes will occur from various drug choices and the values of each outcome to them. After knowing physician's beliefs and outcome values, the drug-choice model was used to predict physician's choice of drug treatments. It was found that the drug-choice model correctly predicted 72% of prescribing decisions, which was significantly more than would be expected at random ($p < 0.01$).

Furthermore, Segal and Hepler (1985) also tested this model using actual cases of hypertension and maturity-onset diabetes mellitus patients. The results from this study were consistent with the earlier study. The drug-choice model correctly predicted prescribing intention in 81% of hypertension cases and in 87% of the diabetes cases. The model also correctly predicted actual prescribing in 76% of hypertension cases and in 70% of the diabetes cases, which were significantly more than would be expected at random ($p < 0.01$). The researchers, then concluded from this evidence that the cognitive theory of prescribing model is a useful model for predicting physician's drug choice regardless of their medical specialty or site of practice setting.

CHAPTER 3

METHODOLOGY

A mail survey was used to obtain data and information from physicians. Data were collected concerning the prescribing intention of four beta-blocker drugs, subjective beliefs of attributes associated with a drug, the value importance of drug attributes, normative beliefs, and motivation to comply with colleagues. The data were used to test the hypotheses and exploratory questions stated in the introductory chapter.

Selection of Subjects

HMOs can be classified into two types: the group/staff model (prepaid group practices, PGPs) and individual practice associations (IPAs) (Luft, 1980). The staff model involves physicians that are employed directly by the HMO on a salary or capitation basis. The group model involves an independent medical group practice that contracts with the HMO. In contrast, individual practice associations consist of physicians in private practices who bill the HMO on a fee-for-service basis. The HMO's in the study included only the group/staff model, excluding IPAs, so as not to confound the practice settings under investigation.

The HMO and FFS Physicians who were included in the study were family practitioners, internists, and cardiologists, in the Phoenix and Tucson Metropolitan Areas. Other physician specialties were excluded because they treat hypertensive patients less frequently.

The sample size of each group of HMO and FFS physicians was first determined by using the formula cited by Cohen (1977). Testing the significance of squared multiple correlation coefficient, the sample size is a function of the noncentrality parameter (L), the effect size index (f^2), and the number of independent variables (u). L is determined according to the desired power of the test and the probability of making a type I error, and is also equal to f^2v , where v is the degrees of freedom of the denominator of the F-ratio. The effect size index is equal to $R^2 / 1 - R^2$. According to study in the behavioral sciences, the desired power of the test usually is 0.80, the probability of type I error is 0.05, therefore L is equal to 15. The expected squared multiple correlation coefficient was estimated from a previous study as 0.26 (Harrell and Bennett, 1974). By substituting all of the values in the equation, the sample size was found to be 52 for each group of physicians.

Since approximately 149 physicians from the major HMOs in the Phoenix and Tucson Metropolitan Areas were family practitioners, internists, and cardiologists, the entire

population of 149 subjects was included in the study so as to compensate for any nonrespondents in the sample. The names of subjects were obtained from the HMO physician directories. A random sample of 150 FFS physicians was drawn from the physician list in the telephone directory, classified by type of specialty, in which the names of family practitioners, internists, and cardiologists were obtained, excluding the name of HMO physicians and other types of physician specialty.

INSTRUMENT

The survey instrument was a four-page questionnaire developed for the purpose of the study (Appendix A). The questionnaire began with a hypothetical case of 50-year-old male patient. The patient was described having uncontrolled hypertension even though he was taking hydrochlorothiazide. The respondents were asked to estimate the probability of adding each of four beta-blocker drugs to hydrochlorothiazide when treating the described patient. The subjective probability of adding each beta-blocker drug was considered as the dependent variable (prescribing intention, I). It was measured on a 7-rating bipolar semantic differential scale with the responses scaled from "extremely improbable" to "extremely probable" as suggested by Fishbein and others (Fishbein and Ajzen, 1975; Harrell and Bennett, 1974).

Essential hypertension was chosen as the disease for the case because of its prevalence and its amenability to drug therapy. It has been well recognized that drugs can effectively reduce high blood pressure and decrease the incidence of complications such as heart disease, renal disease, and cerebrovascular stroke, hence, reducing the morbidity and mortality rate (U.S. Dept of health, education and welfare public health service, National institutes of health, 1979). Moreover, the cause of essential hypertension is unknown and there is no clear-cut therapy, thus allowing a substantial judgement among physicians with respect to choosing a particular drug to be prescribed.

Beta-blocker drugs were chosen for the study because they are widely recommended as a step-2 antihypertensive therapy when blood pressure is inadequately controlled by hydrochlorothiazide alone (Herfindal ET, Hirschman JL, 1984; Conti CR, 1984). Beta-blocker drugs are also one of the most commonly prescribed classes of drugs. The four beta-blocker drugs included in the study were: propranolol, metoprolol, atenolol, and nadolol. They are all among the top 50 products in number of prescriptions in the United States with propranolol, atenolol, metoprolol, and nadolol ranked as third, thirteenth, seventeenth, and forty second, respectively (Pharmacy Times, 1986).

The next section of the questionnaire sought to ascertain the subjective norm, which is a product of physician normative beliefs (NB) and motivation to comply (MC). The normative belief was assessed by asking the respondents to give the subjective probability that most of their colleagues would recommend each of the four beta-blocker drugs on a 7-rating bipolar semantic differential scale from "extremely improbable" to "extremely probable". The motivation to comply was measured by asking the respondent the likelihood that he would prescribe what his colleagues recommended on 7-rating scales from "extremely unlikely" to "extremely likely".

A third section asked the respondents to indicate the degree of importance of 7 drug attributes when choosing to add a beta-blocker drug to hydrochlorothiazide. These attributes were: high efficacy of drug, low side effects, low cost, high patient compliance, convenient dosage schedule, credible drug manufacturer, and reliable sources of drug information to justify the prescribing decision. These data were used as an independent variable (the value importance, a) and were measured on a 7-rating unipolar scales from "of less importance" to "of more importance". The labelings were chosen as they allow the respondents to use a greater proportion of the scale than "unimportant-important" labelings (Bennett and Scott, 1971; Mazis, Ahtola

and Klippel, 1975). All 7 drug attributes included in the study were identified through a review of the literature as important drug attributes associated with prescribing (Caplow and Raymond, 1954; Miller, 1973, 1974; Lilja, 1976, Zelnio, 1982, Segal and Hepler 1982, 1985).

Next, the questionnaire consisted of a section ascertaining subjective beliefs (b) regarding the seven attributes associated with each of the four beta-blocker drugs. Each respondent was asked to estimate the probability that each drug possessed or was associated with the various attributes, using a scale of: 1 = extremely improbable, 2 = quite improbable, 3 = slightly improbable, 4 = neutral, 5 = slightly probable, 6 = quite probable, 7 = extremely probable.

Validity

The face validity of the survey instrument was determined by eliciting the opinions from several clinical pharmacists regarding the appropriateness of the case study and drugs included in the study.

Reliability

A test of the reliability of the instrument used in the study was not performed due to the single-item scale measurement of each dependent and independent variable. However, there is substantial evidence in previous research supporting acceptable reliability for the scales used in

Fishbein Behavioral Intention Model (Ryan and Bonfield, 1980; Wilson, Mathews, Harvey, 1975).

Data Collection

The initial mailing, which included the questionnaire, a cover letter and postage prepaid envelope were mailed to 299 subjects on April 4, 1986. A reminder/thank you postcard was sent as follow-up twelve days after the initial mailing. A reminder letter and a replacement questionnaire was sent to each of nonrespondents eight days following the postcard. Two weeks later, a final reminder postcard was sent. Data collection was ended on May 30, 1986.

Scoring Procedure

When all questionnaires were received from the respondents, the responses were scored. All bipolar items such as prescribing intention (I), normative beliefs (NB), drug attribute belief (b) were scored -3 to +3 (Fishbein and Ajzen, 1975). The degree of importance of each drug attribute (a) which used a unipolar scale was scored +1 to +7. The motivation to comply with colleagues (MC) was also viewed as unipolar and was scored +1 to +7 (Lutz, 1976; Fishbein, 1976). The score of each drug attribute belief weighted by the value importance (ba) and the score of

subjective norm which is a product of normative belief and motivation to comply [(NB)(MC)] ranged from -21 to +21.

Data Analysis

The data were analysed by several statistical methods using the SYSTAT statistical package on a Digital Rainbow Computer.

A series of two-tailed t-tests was used to examine differences in prescribing intention (I) and the subjective norm [(NB)(MC)] between HMO and FFS physicians.

A Kendall's coefficient test was used to determine the agreement in the rank order of mean scores of importance of the seven drug attributes between two groups of physicians.

A multivariate analysis of variance was used to examine the differences between HMO and FFS physicians concerning motivation to comply with colleagues (MC), the importance of each of the seven attributes (a), and drug attribute belief (b).

A multiple regression analysis was used to calculate multiple correlation coefficients (R), squared multiple correlation (R^2), standardized regression coefficient (w) from the linear relationship between the dependent variable and the set of independent variables. The F-test was used to test for the significance of squared multiple correlation (R^2) and the inclusion of the subjective norm in the model. The F-test was also used to test for the equality of sets of

regression coefficients in two linear regressions of prescribing intention on a disaggregate form of each drug attribute belief weighted by the importance of the attributes plus the subjective norm for HMO and FFS physicians (Chow, 1960). The standardized regression coefficients (w) obtained from the multiple regression were used to determine the relative importance of each independent variable toward explaining prescribing intentions in each group of HMO and FFS physicians

Methodological Assumptions

1. The scales used to measure the dependent and independent variables are equal interval scales.
2. The scores for dependent and independent variables are normally distributed among HMO and FFS physicians with equal variances.
3. Prescribing intention scores (I) have equal variances across all level of the independent variables.
4. The relationship between prescribing intention and a set of independent variables is linear.

Limitations

1. This study only measured physician prescribing intention. The actual prescribing behavior may not be inferred.
2. This study was correlational in nature, causal linkages between variables may not be assumed.

3. This study was conducted with HMO and FFS physicians in the Phoenix and Tucson Metropolitan Areas. The results may not be generalized to other type of health care settings or the physician population as a whole.

CHAPTER 4

RESULTS

Of the 146 surveys delivered to HMO physicians, 73 (50%) were returned. Of the 149 surveys delivered to FFS physicians, 49 (32.9%) were returned. A total of four surveys were returned to sender. In addition, six responses were not used in the analysis due to the following circumstances: one subject refused to complete the survey, two surveys were returned blank, and three surveys were returned after the close date of May 30, 1986. (Table 1).

The remaining 116 returned questionnaires were analyzed, representing a usable response rate of 46.6 % for HMO physicians and 32.2% for FFS physicians. The net response rate for HMO physicians was found to be statistically different at a 0.05 level of significance from that of the FFS physicians (chi-square = 6.59,df = 1). In addition, chi-square analyses were performed to compare the respondents and the samples with respect to medical specialty and geographic area. This was done for both HMO and FFS physicians. No significant differences were found between respondents and their samples. (Tables 2 and 3).

Table 1. Analysis of Survey Response for HMO and FFS Physicians

Response Analysis	HMO	FFS
Total surveys mailed	149	150
"Return to sender"	- 3	- 1
Total sample	146	149
Total surveys returned	73	49
<u>Unusable Returned</u>		
Refused to complete any survey	1	0
Surveys returned blank	1	1
Surveys returned after close date	3	0
Total unusable returns	-5	-1
Total usable returned	68	48
Gross response rate	73/146 = 50%	49/149 = 32.9%
Net response rate	68/146 = 46.6%	48/149 = 32.2%

Table 2. Distribution of Respondents and Sample by Type of Specialty and Geographic Areas for HMO Physicians

Category	Number of Physicians in the sample	Number of Respondents
Type of Specialty		
Family Practice	76	47
Internal Medicine	61	24
Cardiology	9	2
Total	146	73
Geographic Areas		
Phoenix	91	45
Tucson	55	28
Total	146	73

Type of Specialty:chi-square= 4.906,df = 2;
nonsignificant at .05 level

Geographic Area:chi-square= 0.108,df = 1;
nonsignificant at .05 level

Table 3. Distribution of Respondents and Sample by Type of Specialty and Geographic Areas for FFS Physicians

Category	Number of Physicians in the Sample	Number of Respondents
Type of Specialty		
Family Practice	57	22
Internal Medicine	67	21
Cardiology	<u>25</u>	<u>6</u>
Total	149	49
Geographic Areas		
Phoenix	117	39
Tucson	<u>32</u>	<u>10</u>
Total	149	49

Type of Specialty:chi-square= 2.23,df = 2;
nonsignificant at 0.05 level

Geographic Areas:chi-square = 0.03,df = 1;
nonsignificant at 0.05 level

Descriptive Data of Study Variables

The prescribing intention, normative beliefs, and drug attribute beliefs of the four beta-blockers for HMO and FFS physicians are presented in Table 4 - 7. The tables provide the mean, standard deviation and frequency distribution of positive, zero and negative scores for each variable as obtained from the survey.

For prescribing intention, positive scores indicate that physicians were likely to prescribe the drug to the patient described in the questionnaire. Conversely, negative scores indicate an unlikelihood of prescribing the drug to the patient. Zero scores were obtained if physicians were neither likely nor unlikely to prescribe the drug.

Normative belief and drug attribute belief scores were obtained in the same manner as those of the intention. For example, if physicians believed that the drug possessed or was associated with the drug attribute in question, the positive scores were obtained. In contrast, if physicians believed the drug was unlikely to possess the drug attribute, negative scores were obtained. Zero scores indicate that physicians believed the drug was neither likely nor unlikely to possess or was associated with the drug attribute in question.

Table 4 indicates that for Drug A, among both HMO and FFS physicians, most of the belief scores regarding high efficacy, low cost, credible manufacturer, and reliable source of drug information were positive, while the scores for prescribing intention and low side effect were mainly negative. The scores of normative beliefs, high patient compliance, and convenient dosage schedule were almost equally distributed between positive, zero and negative.

Table 5 shows the results of Drug B for HMO and FFS physicians. Beliefs concerning high efficacy, low side effect, high patient compliance, convenient dosage schedule, credible manufacturer, and reliable source of drug information had a larger number of positive scores, while the scores on prescribing intention, normative beliefs and the belief regarding low cost were more evenly distributed.

Table 6 and 7 show the results of Drug C and D for both HMO and FFS physicians. For Drug C, most of the variables were positive with the exception of beliefs regarding low cost which were mainly negative. For Drug D, most of the variables were also positive except for prescribing intention and low cost which were largely negative.

In summary, most of HMO and FFS physicians believed that all four beta-blockers were likely to possess or were associated with high efficacy, credible manufacturer, and reliable source of drug information. However, the beliefs

Table 4. Mean, Standard Deviation, and Distribution of Intention and Beliefs Scores for Drug A among HMO and FFS Physicians

Type	n	Mean	Standard Deviation	Frequencies		
				+	0	-
----- Prescribing Intention -----						
HMO	68	-0.574	1.911	20	13	35
FFS	46	-0.196	2.104	12	14	20
----- Normative Beliefs -----						
HMO	63	0.048	1.475	27	15	21
FFS	40	0.475	1.469	18	12	10
----- High Efficacy -----						
HMO	66	2.000	1.052	60	4	2
FFS	48	1.937	1.099	43	4	1
----- Low Side Effect -----						
HMO	66	-0.621	1.537	18	9	39
FFS	48	-2.292	1.487	16	13	19
----- Low Cost -----						
HMO	64	1.359	1.505	49	9	6
FFS	48	0.708	1.584	29	9	10
----- High Patient Compliance -----						
HMO	66	-0.242	1.359	22	18	26
FFS	48	0.396	1.440	23	13	12
----- Convenient Dosage Schedule -----						
HMO	66	-0.318	1.405	22	14	30
FFS	48	0.396	1.723	24	8	16
----- Credible Manufacturer -----						
HMO	66	1.439	1.394	44	19	3
FFS	48	1.958	1.304	38	9	1
----- Reliable Source of Drug Information -----						
HMO	66	1.712	1.433	50	12	4
FFS	48	2.063	1.119	42	5	1

Table 5. Mean, Standard Deviation, and Distribution of Intention and Beliefs Scores for Drug B among HMO and FFS Physicians

Type	n	Mean	Standard Deviation	Frequencies		
				+	0	-
----- Prescribing Intention -----						
HMO	68	0.015	1.550	26	15	27
FFS	46	0.457	1.917	25	10	11
----- Normative Beliefs -----						
HMO	64	0.406	1.294	25	23	16
FFS	41	0.634	1.428	23	12	6
----- High Efficacy -----						
HMO	65	1.969	0.901	60	5	0
FFS	47	1.979	1.053	44	2	1
----- Low Side Effect -----						
HMO	65	0.831	1.193	40	16	9
FFS	47	0.830	1.185	31	10	6
----- Low Cost -----						
HMO	63	-0.016	1.264	20	22	21
FFS	47	-0.255	1.406	14	15	18
----- High Patient Compliance -----						
HMO	64	1.172	0.918	52	8	4
FFS	47	1.489	1.019	39	7	1
----- Convenient Dosage Schedule -----						
HMO	65	1.477	0.886	58	5	2
FFS	47	1.587	1.066	41	4	2
----- Credible Manufacturer -----						
HMO	64	1.538	1.300	44	17	3
FFS	47	2.000	1.268	38	8	1
----- Reliable Source of Drug Information -----						
HMO	65	1.600	1.356	49	14	2
FFS	45	1.979	1.132	39	5	1

Table 6. Mean, Standard Deviation, and Distribution of Intention and Beliefs Scores for Drug C among HMO and FFS physicians

Type	n	Mean	Standard Deviation	Frequencies		
				+	0	-
Prescribing Intention						
HMO	68	1.838	1.580	58	3	7
FFS	48	1.708	1.611	40	4	4
Normative Beliefs						
HMO	64	1.297	1.305	52	9	3
FFS	42	1.357	1.265	31	11	0
High Efficacy						
HMO	66	2.227	0.780	64	2	0
FFS	47	2.043	0.999	44	2	1
Low Side Effect						
HMO	66	1.682	1.084	60	1	5
FFS	47	1.106	1.339	34	6	7
Low Cost						
HMO	64	-0.391	1.410	15	17	32
FFS	47	-0.872	1.377	9	12	26
High Patient Compliance						
HMO	66	2.167	0.870	64	1	1
FFS	47	2.064	0.895	44	3	0
Convenient Dosage Schedule						
HMO	65	2.431	0.637	64	0	1
FFS	47	2.362	0.792	46	1	0
Credible Manufacturer						
HMO	66	1.697	1.324	50	14	2
FFS	47	2.000	1.268	38	8	1
Reliable Source of Drug Information						
HMO	66	1.682	1.315	52	12	2
FFS	47	2.043	1.141	41	5	1

Table 7. Mean, Standard Deviation, and Distribution of Intention and Beliefs Scores for Drug D among HMO and FFS physicians

Type	n	Mean	Standard Deviation	Frequencies		
				+	0	-
Prescribing Intention						
HMO	68	-0.456	1.848	20	11	37
FFS	46	-0.674	2.045	13	7	26
Normative Beliefs						
HMO	64	0.078	1.587	24	18	22
FFS	40	0.075	1.670	14	11	15
High Efficacy						
HMO	65	1.846	1.034	60	3	2
FFS	47	1.787	1.062	43	3	1
Low Side Effect						
HMO	65	0.615	1.319	37	18	10
FFS	47	0.191	1.610	22	10	15
Low Cost						
HMO	62	-0.371	1.258	12	22	28
FFS	47	-0.787	1.382	8	15	24
High Patient Compliance						
HMO	65	1.554	1.212	53	8	4
FFS	47	1.489	1.249	36	7	4
Convenient Dosage Schedule						
HMO	64	1.875	0.968	59	4	1
FFS	47	1.936	1.258	40	5	2
Credible Manufacturer						
HMO	65	1.631	1.193	48	16	1
FFS	47	1.979	1.260	38	8	1
Reliable Source of Drug Information						
HMO	65	1.569	1.369	49	13	3
FFS	47	1.936	1.169	40	6	1

concerning side effect, cost, patient compliance, dosage schedule and normative beliefs seemed to vary with each beta-blocker. Most of HMO and FFS physicians believed that Drug A was likely to possess low cost but unlikely to possess low side effect. On the other hand, Drug B, C, and D were believed to be associated with low side effect, high patient compliance and convenient dosage schedule but were unlikely to be associated with low cost.

Hypotheses Testing

The survey instrument was designed to collect data that would facilitate the testing of the research hypotheses stated in Chapter 1. All null hypotheses were evaluated at a 0.05 significance level.

Hypothesis I. There is no difference in the means of prescribing intention scores of each beta-blocker between HMO and FFS physicians.

Results of a series of two-tailed t-test are shown in Table 8. No significant differences were found between the HMO and FFS physicians concerning their prescribing intention for any of the four beta-blockers. Thus, the null hypothesis was not rejected.

Hypothesis II. There is no agreement in the rank order of mean importance scores of seven drug attributes between HMO and FFS physicians.

Table 8. The Mean Prescribing Intention Scores between HMO and FFS Physicians

	HMO			FFS			t	p-value
	n	Mean	S.D.	n	Mean	S.D.		
Drug A	68	-0.574	1.911	46	-0.196	2.104	0.994	0.322
Drug B	68	0.015	1.550	46	0.457	1.917	1.356	0.178
Drug C	68	1.838	1.580	48	1.708	1.611	0.433	0.666
Drug D	68	-0.456	1.848	46	-0.674	2.045	0.592	0.555

-3 = Extremely Improbable

0 = Neutral

3 = Extremely Probable

To test the hypothesis, Kendall's coefficient of concordance was calculated between the rankings of importance scores among HMO and FFS physicians. The result is shown in Table 9. The coefficient of concordance between the two rankings was found to be statistically significant at 0.05 level ($W = 0.982$, $p < 0.05$). Therefore, the null hypothesis was rejected, indicating the agreement between the two sets of rankings of mean importance scores between HMO and FFS physicians.

Hypothesis III. There is no difference in the mean scores of motivation to comply with colleagues, and the mean importance scores of drug attributes between HMO and FFS physicians.

The results of the multivariate analysis of variance (MANOVA) for the difference in the two centroid group means are shown in Table 10. Wilk's lambda and F-statistics were not statistically significant at 0.05 level. Thus, the null hypothesis was not rejected, indicating that there were no significant differences between HMO and FFS physicians in terms of motivation to comply and the importance of drug attributes.

Hypothesis IV. There is no difference in the mean scores of subjective norms of each beta-blocker between HMO and FFS physicians.

The results of a series of two-tailed t-tests are shown in Table 11. None of the t-ratios were statistically

Table 9. Rank of the Mean Scores of Importance of Seven Drug Attributes between HMO and FFS Physicians

	HMO				FFS			
	n	Mean	S.D.	Rank	n	Mean	S.D.	Rank
High Efficacy	67	6.239	0.971	2	48	6.250	1.062	2
Low Side Effects	68	6.00	1.209	4	48	6.083	1.318	4
Low Cost	67	4.866	1.325	6	48	4.396	1.685	7
High Patient Compliance	68	6.279	0.861	1	48	6.354	0.978	1
Convenient Dosage Schedule	68	6.074	0.997	3	48	6.208	1.091	3
Credible Manufacturer	65	4.477	1.888	7	48	4.729	1.807	6
Reliable Source of Drug Information	66	5.091	1.671	5	48	5.417	1.609	5

Kendall's Coefficient of Concordance = 0.98;
significant at 0.05 level

1 = Of Less Importance

7 = Of More Importance

Table 10. Mean Scores of Motivation to Comply and Importance of Drug Attributes between HMO and FFS Physicians

Variables	HMO			FFS		
	n	Mean	S.D	n	Mean	S.D
Motivation to comply ^a	67	4.552	1.105	45	4.311	1.411
Degree of Importance of: ^b						
High Efficacy	67	6.239	0.971	48	6.250	1.062
Low Side Effect	68	6.00	1.209	48	6.083	1.318
Low Cost	67	4.866	1.325	48	4.396	1.685
High Patient Compliance	68	6.279	0.861	48	6.354	0.978
Convenient Dosage Schedule	68	6.074	0.997	48	6.208	1.091
Credible Manufacturer	65	4.477	1.888	48	4.729	1.807
Reliable Source of Drug Information	66	5.091	1.671	48	5.417	1.609

a -3 = Extremely Improbable
 0 = Neutral
 3 = Extremely Probable

b 1 = Of Less Importance
 7 = Of More Importance

Manova

Wilk's Lambda = 0.937
 F-Statistic = 0.839, df = 8, 100;
 nonsignificant at 0.05 level

Table 11. The Mean Scores of Subjective Norms between HMO and FFS Physicians

	.HMO			FFS			t	p-value
	n	Mean	S.D	n	Mean	S.D		
Drug A	62	0.645	7.186	38	2.947	7.812	1.504	0.136
Drug B	63	1.984	6.057	39	4.205	6.118	1.793	0.076
Drug C	63	6.270	5.925	40	6.975	5.789	0.594	0.554
Drug D	63	0.683	7.716	38	0.684	8.540	0.001	>0.999

Subjective Norm = A Product of Normative Beliefs (NB) and Motivation to Comply with Colleagues (MC).
The Subjective Norm has a score ranged from -21 to +21.

significant at 0.05 level, indicating that there were no significant differences in the mean scores of the subjective norms between HMO and FFS physicians.

Hypothesis V. There is no difference in the mean scores of drug attribute beliefs for each of the four beta-blockers between HMO and FFS physicians.

Table 12 - 15 show the results of the multivariate analysis of variances for testing the differences in two centroid group means. Wilk's lambda and F-statistics were found to be not statistically significant at 0.05 level for any of the four drugs. Therefore, the null hypothesis was not rejected, indicating that there were no significant differences between HMO and FFS physicians regarding the mean scores of drug attribute beliefs.

Hypothesis VI. There is no significant relationship between a disaggregate form of each drug attribute belief weighted by the importance of that attribute ($b_i a_i$) plus the subjective norm [(NB)(MC)] and a physician's intention (I) to prescribe the drug across HMO and FFS physicians.

Table 16 summarizes the results of multiple regression of prescribing intention on seven evaluated drug attribute beliefs and subjective norm for each beta-blocker across HMO and FFS physicians. It was found that the squared multiple correlation coefficients (R^2) were statistically significant for each of the four drugs in the HMO and FFS physicians, accounting for the average of 41.4

Table 12. The Mean Scores of Drug Attribute Beliefs for Drug A between HMO and FFS Physicians

Belief that drug A is associated with	HMO			FFS		
	n	Mean	S.D	n	Mean	S.D
High Efficacy	66	2.000	1.052	48	1.937	1.099
Low Side Effect	66	-0.621	1.537	48	-2.292	1.487
Low Cost	64	1.359	1.505	48	0.708	1.584
High Patient Compliance	66	-0.242	1.359	48	0.396	1.440
Convenient Dosage Schedule	66	-0.318	1.405	48	0.396	1.723
Credible Manufacturer	66	1.439	1.394	48	1.958	1.304
Reliable Source of Drug Information	66	1.712	1.433	48	2.063	1.119

-3 = Extremely Improbable
 0 = Neutral
 3 = Extremely Probable

MANOVA

Wilk's Lambda = 0.882
 F-Statistic = 1.997, df = 7, 104;
 nonsignificant at 0.05 level

Table 13. The Mean Scores of Drug Attribute Beliefs for Drug B between HMO and FFS Physicians

Belief that drug B is associated with	HMO			FFS		
	n	Mean	S.D	n	Mean	S.D
High Efficacy	65	1.969	0.901	47	1.979	1.053
Low Side Effect	65	0.831	1.193	47	0.830	1.185
Low Cost	63	-0.016	1.264	47	-0.255	1.406
High Patient Compliance	64	1.172	0.918	47	1.489	1.019
Convenient Dosage Schedule	65	1.477	0.886	46	1.587	1.066
Credible Manufacturer	65	1.538	1.300	47	2.000	1.268
Reliable Source of Drug Information	65	1.600	1.356	47	1.979	1.132

-3 = Extremely Improbable

0 = Neutral

3 = Extremely Probable

MANOVA

Wilk's Lambda = 0.912

F-Statistic = 1.392, df= 7,101;

nonsignificant at 0.05 level

Table 14. The Mean Scores of Drug Attribute Beliefs for Drug C between HMO and FFS Physicians

Belief that drug C is associated with	HMO			FFS		
	n	Mean	S.D	n	Mean	S.D
High Efficacy	66	2.227	0.780	47	2.043	0.999
Low Side Effect	66	1.682	1.084	47	1.106	1.339
Low Cost	64	-0.391	1.410	47	-0.872	1.377
High Patient Compliance	66	2.167	0.870	47	2.064	0.895
Convenient Dosage Schedule	65	2.431	0.637	47	2.362	0.792
Credible Manufacturer	66	1.697	1.324	47	2.000	1.268
Reliable Source of Drug Information	66	1.682	1.315	47	2.043	1.141

-3 = Extremely Improbable

0 = Neutral

3 = Extremely Probable

MANOVA

Wilk's Lambda = 0.880

F-Statistic = 1.982, df=7,102;

nonsignificant at 0.05 level

Table 15. The Mean Scores of Drug Attribute Beliefs for Drug D between HMO and FFS Physicians

Belief that drug D is associated with	HMO			FFS		
	n	Mean	S.D	n	Mean	S.D
High Efficacy	65	1.846	1.034	47	1.787	1.062
Low Side Effect	65	0.615	1.319	47	0.191	1.610
Low Cost	62	-0.371	1.258	47	-0.787	1.382
High Patient Compliance	65	1.554	1.212	47	1.489	1.249
Convenient Dosage Schedule	64	1.875	0.968	47	1.936	1.258
Credible Manufacturer	65	1.631	1.193	47	1.979	1.260
Reliable Source of Drug Information	65	1.569	1.369	47	1.936	1.169

-3 = Extremely Improbable

0 = Neutral

3 = Extremely Probable

MANOVA

Wilk's Lambda = 0.933

F-Statistic = 1.018, df=7,100;

nonsignificant at 0.05 level

Table 16. Disaggregate Fishbein Behavior Intention Model
 Relation between Evaluative Drug Attribute Beliefs and
 Subjective Norms for HMO and FFS Physicians

	Multiple R	R ²	F-value	Degrees of freedom	p-value
HMO					
Drug A	0.718	0.515	6.640	8, 50	<0.001
Drug B	0.633	0.400	4.175	8, 50	0.001
Drug C	0.637	0.405	4.088	8, 48	0.001
Drug D	0.731	0.535	6.890	8, 48	<0.001
FFS					
Drug A	0.782	0.612	5.522	8, 28	<0.001
Drug B	0.818	0.668	6.805	8, 27	<0.001
Drug C	0.755	0.570	4.969	8, 30	0.001
Drug D	0.853	0.727	9.318	8, 28	<0.001

and 53.9 percent of the variance in prescribing intention for HMO and FFS physicians, respectively.

Hypothesis VII. The squared multiple correlation coefficient for the regression of prescribing intention on a disaggregate form of each of seven drug attribute beliefs weighted by the value importance of the attribute is the same as the squared multiple correlation coefficient without the inclusion of subjective norms.

The results of the F-test are shown in Table 17. The F-ratios were statistically significant at 0.05 level for each of the four beta-blockers in both HMO and FFS physicians. Therefore, the null hypothesis was rejected, indicating that the subjective norm contribute significantly to the explanation of prescribing intention and was important to be included in the model.

Hypothesis VIII. There is an equality between sets of regression coefficients in two linear regressions of prescribing intention on a disaggregate form of each drug attribute belief weighted by the importance of that drug attribute plus subjective norm between HMO and FFS physicians.

The Chow test (1960) was used to test for the equality between sets of coefficients in the two linear regressions. The results are shown in Table 18. The F-ratios were not statistically significant at 0.05 level for any of the four beta-blockers, indicating that the

Table 17. Comparison of the Disaggregated Fishbein Behavior Intention Model with and without the inclusion of Subjective Norms between HMO and FFS Physicians

	R ² with subjective norms	R ² without subjective norms	R ² difference	F	Degrees of freedom	p-value
HMO						
Drug A	0.515	0.269	0.245	25.301	1, 50	<0.001
Drug B	0.400	0.195	0.205	17.057	1, 50	<0.001
Drug C	0.405	0.225	0.179	14.516	1, 48	<0.001
Drug D	0.535	0.266	0.269	27.773	1, 48	<0.001
FFS						
Drug A	0.612	0.330	0.282	20.340	1, 28	<0.001
Drug B	0.668	0.540	0.128	10.433	1, 27	0.003
Drug C	0.570	0.193	0.377	26.317	1, 30	<0.001
Drug D	0.727	0.407	0.320	32.833	1, 28	<0.001

Table 18. Test of Equality of Sets of Regression Coefficients in two Linear Regressions of Intention on a Disaggregate Evaluative Drug Attribute Beliefs and Subjective Norms between HMO and FFS Physicians

	SSE (HMO+FFS)	SSE (HMO)	SSE (FFS)	F-value	Degree of freedom	p-value
Drug A	189.166	108.871	61.692	0.945	9, 78	>0.05
Drug B	137.965	87.486	35.328	1.683	9, 77	>0.05
Drug C	101.955	64.568	23.379	1.380	9, 78	>0.05
Drug D	148.323	92.263	45.668	0.636	9, 76	>0.05

relationship between prescribing intention and a disaggregate form of each drug attribute belief weighted by the importance scores plus subjective norm is the same for both HMO and FFS physicians.

Correlational Findings

Correlation matrices of dependent and independent variables in the disaggregate version of Fishbein Behavioral Intention model revealed some of the independent variables to be quite highly correlated (Tables 19-22). For example, it was found that for all four beta-blockers in both groups of physicians, the evaluative belief concerning high patient compliance was highly correlated with the evaluative belief concerning convenient dosage schedule (Pearson correlation coefficients ranged from 0.609 to 0.839). In the same manner, the evaluative belief concerning credible manufacturer was highly correlated with the evaluative belief concerning reliable source of drug information to justify prescribing decisions (Pearson correlation coefficients ranged from 0.632 to 0.777).

Due to the high multicollinearity of these independent variables in the disaggregate model, it was not possible to meaningfully assess the relative importance of each variable on the dependent variable based on the standardized regression coefficients. In the presence of multicollinearity, the estimated value of regression

Table 19. The Pearson Correlation Matrix for the Variables in the Disaggregate Model for HMO and FFS Physicians: Drug A.

	EFFC	SIDE	COST	COMP	DOSE	MNFR	INFO	NBMC
HMO								
Intention	0.258	0.427	0.100	0.419	0.398	0.009	-0.053	0.682
EFFC		0.255	0.199	0.175	0.214	0.234	0.355	0.177
SIDE			0.159	0.663	0.609	0.051	-0.005	0.477
COST				0.128	0.022	-0.237	-0.117	0.290
COMP					0.839	0.101	0.139	0.448
DOSE						0.185	0.189	0.431
MNFR							0.691	-0.056
INFO								-0.172
FFS								
Intention	0.065	0.342	-0.163	0.305	0.415	0.192	-0.144	0.673
EFFC		-0.078	0.173	0.163	0.229	0.119	0.222	0.254
SIDE			-0.216	0.431	0.458	0.039	-0.102	0.280
COST				0.041	0.066	-0.012	0.095	-0.293
COMP					0.751	0.069	-0.021	0.171
DOSE						0.066	-0.040	0.287
MNFR							0.648	0.197
INFO								0.090

EFFC = evaluative belief concerning high efficacy
 SIDE = evaluative belief concerning low side effect
 COST = evaluative belief concerning low cost
 COMP = evaluative belief concerning high patient compliance
 DOSE = evaluative belief concerning convenient dosage schedule
 MNFR = evaluative belief concerning credible manufacturer
 INFO = evaluative belief concerning reliable source of drug information
 NBMC = subjective norm

Table 20. The Pearson Correlation Matrix for the Variables in the Disaggregate model for HMO AND FFS Physicians: Drug B.

	EFFC	SIDE	COST	COMP	DOSE	MNFR	INFO	NBMC
HMO								
Intention	0.227	0.392	0.064	0.279	0.215	0.184	0.266	0.598
EFFC		0.390	0.168	0.264	0.246	0.180	0.335	0.243
SIDE			0.374	0.616	0.276	0.083	0.252	0.429
COST				0.255	0.006	-0.095	0.131	0.057
COMP					0.609	0.177	0.254	0.430
DOSE						0.406	0.466	0.302
MNFR							0.777	0.130
INFO								0.223

FFS								
Intention	0.510	0.422	0.198	0.535	0.567	0.463	0.331	0.611
EFFC		0.488	0.153	0.414	0.468	0.323	0.450	-0.007
SIDE			0.135	0.288	0.253	0.275	0.315	0.211
COST				0.226	0.282	0.111	0.311	0.112
COMP					0.787	0.211	0.307	0.125
DOSE						0.117	0.196	0.182
MNFR							0.632	0.051
INFO								-0.147

EFFC = evaluative belief concerning high efficacy
 SIDE = evaluative belief concerning low side effect
 COST = evaluative belief concerning low cost
 COMP = evaluative belief concerning high patient compliance
 DOSE = evaluative belief concerning convenient dosage schedule
 MNFR = evaluative belief concerning credible manufacturer
 INFO = evaluative belief concerning reliable source of drug information
 NBMC = subjective norm

Table 21. The Pearson Correlation Matrix for the Variables in the Disaggregated Model for HMO and FFS Physicians: Drug C.

	EFFC	SIDE	COST	COMP	DOSE	MNFR	INFO	NBMC
HMO								
Intention	0.205	0.184	0.179	0.297	0.431	0.282	0.300	0.449
EFFC		0.165	-0.010	0.368	0.435	0.265	0.411	0.214
SIDE			0.239	0.487	0.333	0.312	0.323	0.332
COST				0.275	0.102	0.060	0.051	-0.055
COMP					0.690	0.194	0.261	0.188
DOSE						0.415	0.393	0.206
MNFR							0.763	0.055
INFO								0.040
FFS								
Intention	0.159	0.286	0.142	0.406	0.332	0.102	0.140	0.584
EFFC		0.256	0.399	0.269	0.081	0.362	0.512	-0.086
SIDE			0.199	0.500	0.262	0.086	0.160	-0.110
COST				0.154	-0.070	0.148	0.415	-0.025
COMP					0.704	0.056	0.097	-0.008
DOSE						-0.011	0.085	0.255
MNFR							0.678	0.157
INFO								0.120

EFFC = evaluative belief concerning high efficacy
 SIDE = evaluative belief concerning low side effect
 COST = evaluative belief concerning low cost
 COMP = evaluative belief concerning high patient compliance
 DOSE = evaluative belief concerning convenient dosage schedule
 MNFR = evaluative belief concerning credible manufacturer
 INFO = evaluative belief concerning reliable source of drug information
 NBMC = subjective norm

Table 22. The Pearson Correlation Matrix for the Variables in the Disaggregated Model for HMO and FFS Physicians: Drug D.

	EFFC	SIDE	COST	COMP	DOSE	MNFR	INFO	NBMC
HMO								
Intention	0.180	0.252	0.088	0.172	0.389	0.236	0.285	0.686
EFFC		0.233	0.049	0.445	0.506	0.219	0.355	0.262
SIDE			0.283	0.399	0.261	0.230	0.245	0.206
COST				0.062	0.073	0.189	0.144	0.015
COMP					0.745	0.189	0.328	0.142
DOSE						0.342	0.359	0.361
MNFR							0.772	0.298
INFO								0.287
FFS								
Intention	0.083	0.443	-0.082	0.268	0.359	0.389	0.330	0.773
EFFC		-0.019	0.201	0.294	0.202	0.202	0.398	-0.021
SIDE			0.169	0.279	0.242	0.184	0.132	0.339
COST				0.101	-0.122	0.086	0.354	-0.141
COMP					0.839	0.293	0.355	0.316
DOSE						0.184	0.213	0.305
MNFR							0.652	0.377
INFO								0.186

EFFC = evaluative belief concerning high efficacy
 SIDE = evaluative belief concerning low side effect
 COST = evaluative belief concerning low cost
 COMP = evaluative belief concerning high patient compliance
 DOSE = evaluative belief concerning convenient dosage schedule
 MNFR = evaluative belief concerning credible manufacturer
 INFO = evaluative belief concerning reliable source of drug information
 NBMC = subjective norm

coefficients can be unstable and sensitive to a slight change in the data. In addition, the algebraic signs of the regression coefficients may not be consistent to prior expectation (Chatterjee and Price, 1977).

Therefore, the aggregate version of the Fishbein Behavioral Intention model that consists of two variables - attitude and subjective norm - was used in order to further test the hypotheses. In the aggregate version of the model, the seven evaluative drug attribute beliefs were summed into one variable that represented the attitudinal component in the model.

The correlation matrices of the variables in the aggregate model for all four drugs in both groups of physicians are shown in Table 23-24. The intercorrelation between independent variables was less than in the disaggregate version of the model (Pearson correlation coefficients between the two variables ranged from 0.073 to 0.402.)

Aggregate Version of Fishbein Behavioral Intention Model

Hypothesis IX There is no significant relationship between a physician's prescribing intention (I) and the linear combination of attitude and subjective norm across HMO and FFS physicians.

Table 25 shows the results of multiple regression of prescribing intention on attitude and subjective norm for

Table 23. The Pearson Correlation Matrix for the Variables
in the Aggregate Model for HMO Physicians

	Attitude	Subjective Norm
Drug A		
Intention	0.388	0.682
Attitude		0.400
Drug B		
Intention	0.371	0.598
Attitude		0.402
Drug C		
Intention	0.413	0.449
Attitude		0.205
Drug D		
Intention	0.358	0.686
Attitude		0.350

Table 24. The Pearson Correlation Matrix for the Variables in the Aggregate Model for FFS Physicians.

	Attitude	Subjective Norm
Drug A		
Intention	0.314	0.673
Attitude		0.274
Drug B		
Intention	0.665	0.611
Attitude		0.351
Drug C		
Intention	0.365	0.584
Attitude		0.073
Drug D		
Intention	0.444	0.773
Attitude		0.332

each group of HMO and FFS physicians. The squared multiple correlation coefficients (R^2) were found to be statistically significant for all four drugs in both group of physicians, accounting for the average of 46.4 and 64.4 percent of the variance in prescribing intention for HMO and FFS physicians, respectively. Thus, the null hypothesis is rejected.

Hypothesis X. The squared multiple correlation coefficient for the regression of prescribing intention on attitude with the inclusion of subjective norm is significantly higher than the squared multiple correlation coefficients without the inclusion of subjective norms.

To test the hypothesis, the F-test was used. The results are shown in Table 26. The F-ratios were statistically significant at 0.05 level for all four drugs in both groups of physicians. Thus, the null hypothesis was rejected, indicating that the subjective norm contributed significantly toward the explanation of prescribing intention and was important to be included in the model.

Hypothesis XI. There is an equality between sets of regression coefficients in two linear regressions of prescribing intention on a linear combination of attitude and subjective norm between HMO and FFS physicians.

The Chow test (1960) was used to test for the hypothesis. The results are shown in Table 27. The F-ratios were not statistically significant at 0.05 level for

Table 25. Aggregated Fishbein Behavior Intention Model
 Relation between Attitude and Subjective Norms for HMO
 and FFS Physicians

	Multiple R	R ²	F-value	Degrees of freedom	p-value
HMO					
Drug A	0.693	0.481	25.932	2, 56	<0.001
Drug B	0.615	0.378	17.038	2, 56	<0.001
Drug C	0.556	0.309	12.051	2, 54	<0.001
Drug D	0.698	0.487	25.031	2, 54	<0.001
FFS					
Drug A	0.686	0.471	15.133	2, 34	<0.001
Drug B	0.778	0.605	25.307	2, 33	<0.001
Drug C	0.668	0.446	14.470	2, 36	<0.001
Drug D	0.798	0.637	29.850	2, 34	<0.001

Table 26. Comparison of the Aggregated Fishbein Behavior Intention Model with and without the inclusion of Subjective Norms between HMO and FFS Physicians

	R ² with subjective norms	R ² without subjective norms	R ² difference	F	Degrees of freedom	p-value
----- HMO -----						
Drug A	0.481	0.151	0.330	35.641	1, 56	<0.001
Drug B	0.378	0.138	0.270	21.623	1, 56	<0.001
Drug C	0.309	0.170	0.139	10.824	1, 54	0.002
Drug D	0.487	0.129	0.358	37.699	1, 54	<0.001
----- FFS -----						
Drug A	0.471	0.098	0.373	23.912	1, 34	<0.001
Drug B	0.605	0.442	0.163	13.616	1, 33	0.001
Drug C	0.446	0.133	0.313	20.340	1, 36	<0.001
Drug D	0.637	0.197	0.440	41.216	1, 34	<0.001

any of the four beta-blockers. Thus, the null hypothesis was not rejected, indicating that the relative importance of attitude and subjective norm in influencing prescribing intention of each of the four beta-blockers was the same in both groups of physicians.

Exploratory Question I. What is the relative importance of attitude and subjective norm in determining prescribing intention of each of four beta-blockers in HMO and FFS physicians.

The relative importance of attitude and subjective norm in explaining the prescribing intention was assessed by examining the standardized regression coefficients shown in Table 28. The standardized beta-weights indicate that the subjective norm was more important than the attitude in explaining prescribing intention of all four beta-blockers in the HMO group and three out of four beta-blockers in the FFS group.

Exploratory Question II. What is a set of drug attributes that significantly differentiate prescribing intentions between HMO and FFS physicians.

From hypothesis III, VII and X, it was found that HMO and FFS physicians did not differ in the relative importance of drug attributes in explaining prescribing intention. The relationship between prescribing intention and a set of independent variables is the same for both groups of physicians. The drug attributes that are considered

Table 27. Test of Equality of Sets of Regression Coefficients in two linear Regressions of Intention on a Linear Combination of Attitude and Subjective Norms between HMO and FFS Physicians

	SSE (HMO+FFS)	SSE (HMO)	SSE (FFS)	F-value	Degrees of freedom	p-value
Drug A	201.067	116.576	84.132	0.054	3, 90	>0.05
Drug B	141.483	90.725	42.054	1.945	3, 89	>0.05
Drug C	105.672	75.059	30.134	0.137	3, 90	>0.05
Drug D	164.454	101.683	60.686	0.377	3, 88	>0.05

Table 28. Regression of Intention to Prescribe Four Beta-blocker on Attitude and Subjective Norms for HMO and FFS Physicians

Drug	Variable	HMO			FFS		
		Beta	F	p-value	Beta	F	p-value
A	Attitude	0.138	1.716	0.195	0.140	1.166	0.287
	Subjective norms	0.627	35.641	<0.001	0.634	23.91	<0.001
B	Attitude	0.156	1.849	0.180	0.514	19.36	<0.001
	Subjective norms	0.535	21.623	<0.001	0.431	13.616	0.001
C	Attitude	0.335	8.41	0.005	0.324	6.76	0.013
	Subjective norms	0.380	10.824	0.002	0.561	20.34	0.001
D	Attitude	0.135	1.664	0.201	0.210	3.68	0.063
	Subjective norms	0.639	37.699	<0.001	0.703	41.216	0.001

important for HMO physicians, are also important for FFS physicians.

Power Analysis

A power analysis was performed to determine the probability of not committing a type II error, that is the failure to reject the null hypothesis when in fact the null hypothesis is false. The power of a statistical test depends upon the significance level, the reliability of the sample results which is always dependent upon the sample size, and the "effect size", that is the degree to which the phenomenon exist (Cohen, 1977).

Therefore, the power can be determined by knowing the significance level, the sample size, and the "effect size". In this survey, the significance level was set at 0.05. The sample size (n) is equal to 56 which was calculated by the formula

$$n = \frac{2 n_A n_B}{n_A + n_B}$$

when n is a harmonic mean of two populations with unequal sample sizes, n_A represents the sample size of HMO physicians which is equal to 68, and n_B is the sample size of FFS physicians which is equal to 48.

The "effect size" was arbitrarily chosen as $d = 0.5$ since it represents the mean difference that is large enough

to be seen. Moreover, there was no previous research done in which the effect size can be determined.

By referring to the power table with a significance level of 0.05, sample size of 56 , and the effect size of 0.5 for the two-tailed t-test of the difference between two group means, the power was determined to be 74 percent. Thus, the power of the test appeared to be quite satisfactory.

CHAPTER 5

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

The study used a mail survey to determine if HMO and FFS physicians differed in their evaluation of four beta-blocker drugs to treat a specific hypertensive patient. More specifically, the study encompassed prescribing intentions, the importance of drug attributes, drug attribute beliefs, motivation to comply with colleagues, and subjective norms. The differences between the two groups of physicians regarding the relative importance of various drug attribute beliefs and subjective norms in explaining prescribing intentions were also examined. Finally the ability of Fishbein Behavioral Intention model in explaining prescribing intentions among HMO and FFS physicians was tested. The results from the study will be discussed and conclusions will be made in this chapter.

Discussion

Response rate

The response rate for HMO and FFS physicians was 50% and 32.9% respectively. These response rates were consistent with previous pharmacy research projects which have used physicians as the sampling frame. Purohit and Pathak (1979), in a literature review of articles published

in the Journal of the American Pharmaceutical Association, found that a response rate of less than 39% was achieved in eight of 11 studies that employed physicians as a sample. In addition, Fisher and Pathak (1980) reported a response rate of only 23 percent in the study of physicians' attitudes toward the use of pharmacists as drug information consultant. Considering the physician response rate in these studies, the response rates in this study were quite satisfactory.

Comparison of HMO and FFS physicians

According to the results of hypothesis testing, the HMO and FFS physicians in this study did not differ with respect to (a) their prescribing intention of the four beta-blockers, (b) the importance of seven drug attributes, (c) the motivation to comply with colleagues, (d) the subjective norm, and (e) the beliefs associated with each of seven drug attributes. The seven drug attributes included in the study were: high efficacy, low side effect, low cost, high patient compliance, convenient dosage schedule, credible manufacturer, and reliable sources of drug information to justify prescribing decisions. The findings were found to be consistent across all four drugs in the study. This suggests that HMO and FFS physicians, despite the difference in practice settings, were not statistically different in their prescribing intention, and beliefs regarding the

various drug attributes associated with each of the four beta-blockers in the study.

There was also a high degree of agreement between HMO and FFS physicians regarding the ranking of mean importance scores of seven drug attributes as determined from the Kendall coefficient of Concordance ($W = 0.9821$, $p < 0.05$). The ranking of mean importance scores for both HMO and FFS physicians indicates that high patient compliance, high efficacy, convenient dosage schedule, and low side effect were the four most important drug attributes when choosing a beta-blocker. Reliable sources of drug information, credible manufacturer, and low cost were the three least important drug attributes. Low cost ranked sixth in importance among HMO and the least important among FFS physicians (See TABLE 9 in Chapter 4). The findings were similar to the results reported by Segal and Hepler (1982, 1985) that control of disease, patient compliance, and side effects were the most highly valued outcomes of drug use, while cost of drug was not a very important outcome. Lilja (1976), in the study of three drug attributes: efficacy, side effects, and cost, also found that drug efficacy was the most important drug attribute, while cost of drug ranked second in importance in choosing antibiotic drugs and ranked the least important in choosing antidiabetic drugs.

Thus, according to the study, an individual physician, regardless of the practice setting, views drug attributes that are related to patients such as patient compliance, efficacy, convenient dosage schedule, and side effect to be more important than those attributes related to the drug manufacturer or source of drug information. Cost of drug, similar to earlier findings, was found to be relatively unimportant in influencing prescribing intention. This represents an interesting finding because physicians, in a cost-conscious health care environment, might be expected to be more concerned with drug cost.

The Fishbein Behavioral Intention Model

The results of hypothesis testing provided supportive evidence regarding the ability of both aggregate and disaggregate versions of the Fishbein Behavioral Intention model to significantly explain prescribing intention.

The disaggregate model, as applied in the study, was found to provide higher explanatory power than the aggregate model in explaining prescribing intention. The amount of variance explained (R^2) increased from an average of 41.4 and 53.9 percent with the aggregate model to 46.4 and 64.4 percent with the disaggregate model for HMO and FFS physicians, respectively. This finding was also consistent with the results of earlier studies by Harrell and Bennett

(1974), Sheth (1970), Tuncalp and Sheth (1975), Raju, Bhagat, and Sheth (1975), and Edmondson (1981).

However, due to high multicollinearity between independent variables encountered in the disaggregate model (as discussed in the previous chapter), the aggregate model was chosen to explore the relative importance of attitude and subjective norm in influencing prescribing intention. Despite its lower explanatory power, the application of the aggregate model provided a better understanding of the relative importance of these two independent variables toward the dependent variable.

The relative importance of attitude and subjective norm, as assessed by the standardized regression coefficients, indicate that the subjective norm was more important than the attitude in influencing prescribing intention of beta-blocker drugs in the HMO and FFS physicians. For both the aggregate and disaggregate version of the model, the subjective norm was also found to contribute significantly to the explanation of prescribing intention in both groups of physicians.

These results seem to support the findings from the literature that colleagues do influence physicians' drug prescribing. Miller (1974), in the study of new drug adoption, stated that colleagues represented the most important source of drug information in the stage of new

drug evaluation. Coleman et al (1966) also reported that physicians who are integrated into professional networks, and who practice as a group tend to adopt new drug earlier than physicians who work independently in solo practice.

Nevertheless, these results were inconsistent with the findings reported by Harrell and Bennett (1974) that the subjective norm was unimportant in prediction and explanation of prescribing intention of oral antidiabetics. Possibly, the relative importance of the subjective norm in influencing prescribing intention might vary with type of drug class and disease condition under investigation. Coleman et al (1959) compared the use of certain classes of drugs in two specified conditions: respiratory infection and mild-to-moderate hypertension; these were classified as unambiguous and ambiguous clinical situations, respectively. It was found that the physicians were more similar in their treatment of hypertension than in their treatment of respiratory infection. Thus, the essential hypertension case applied in this study can be viewed as a more ambiguous clinical condition where there is less clear-cut treatment. The diabetes mellitus case in the earlier study, on the other hand, might represent more clear-cut therapy. This might help explain why the physicians in this study put more weight on their colleagues and subjective norm when making prescribing decision.

Another interesting finding is that both the aggregate and disaggregate model explained more variance in prescribing intention in the FFS group than in the HMO group. The explained variance for HMO physicians was 41.4 and 46.4 percent for the aggregate and disaggregate model. On the other hand, the explained variance for FFS physicians was 53.9 and 64.4 percent for the aggregate and disaggregate model, respectively. This might be due to the differences in the practice setting and in the organizational control of drug use.

Correlation of Variables

An examination of the correlation matrix of independent variables leads to an interesting finding (See Tables 18-25 in Chapter 4). The evaluative belief regarding credible manufacturer was found to be highly correlated with the evaluative belief regarding reliable source of drug information to justify prescribing decisions (Pearson correlation coefficient ranged from 0.632 to 0.677) across four beta-blockers in both HMO and FFS physicians. The correlation pattern suggests the important role of pharmaceutical manufacturers in acting as sources of drug information to physicians.

In addition, the evaluative belief concerning high patient compliance was highly correlated with the evaluative belief concerning convenient dosage schedule (Pearson

correlation coefficients ranged from 0.609 to 0.839). This suggests that the frequency of dosage administration was perceived to be related to patient compliance.

CONCLUSIONS

Regarding the use of four beta-blockers in the treatment of a specific case of hypertensive patient, HMO and FFS physicians were found not to be significantly different with respect to:

1. prescribing intention of four beta-blockers;
2. motivation to comply with colleagues;
3. the perceived relative importance of the following drug attributes when making prescribing decisions: high efficacy, low side effect, low cost, high patient compliance, convenient dosage schedule, credible manufacturer and reliable sources of drug information to justify prescribing decisions;
4. beliefs regarding each of seven drug attributes associated with each beta-blocker;
5. the subjective norm for each beta-blocker (the subjective norm is defined as a physician's belief regarding the probability that his colleagues would recommend prescribing each of the drug to the patient multiplied by his motivation to comply with his colleagues).

There was also a high degree of agreement between HMO and FFS physicians in the ranking of the importance of the

seven drug attributes when choosing a beta-blocker. Patient compliance, efficacy, dosage schedule, and side effects were the four most important drug attributes while sources of drug information, drug manufacturers, and drug cost were the three lesser important drug attributes.

In addition, the Fishbein Behavioral Intention model, as applied in the study, was found to be useful as a conceptual framework in the study of prescribing intention across HMO and FFS physicians. Both the aggregate and disaggregate version of the model significantly explained variance in prescribing intention. Using R^2 as the criterion, the aggregate version explained an average of 41.4 and 53.9 percent of the variance among HMO and FFS physicians, respectively. The disaggregate version explained 46.4 and 64.4 percent of variance among the same groups. The subjective norm was also found to contribute significantly to the explanation of prescribing intention of beta-blocker drugs for both group of physicians. Thus, the findings from the study support the theoretical framework that physician prescribing intention is a function of (1) the physician's beliefs that a drug has or is associated with certain attributes; (2) the degree of importance of those attributes; (3) the normative beliefs that colleagues would recommend the drug to be prescribed; and (4) the motivation to comply with colleagues.

Additionally, the study found that HMO and FFS physicians did not differ with respect to the relative importance of drug attributes and subjective norm toward prescribing intentions. Both groups of physicians were also found not to be significantly different concerning the relative importance of attitude and subjective norm in influencing the prescribing intention of beta-blocker drugs in the study.

RECOMMENDATIONS

This study supports the use of Fishbein Behavioral Intention model as a conceptual framework in explaining physician prescribing intention. The results are consistent with the earlier research that utilized the Fishbein model in the explanation of behavioral intention (Harrell and Bennett 1974; Edmondson 1981, Fisher and Pathak, 1980). However, the results from the study are subject to some limitations. This study only measured prescribing intention, therefore, the actual prescribing behavior may not be inferred. The HMO and FFS physicians that were found not to be different in their prescribing intention may be different in their actual prescribing behavior. Several variables that may intervene between intention and behavior included organizational control, peer review committees, formulary control, and source of drug information (Harrell and Bennett 1974, Vroom 1964). Therefore, further research

might be needed to study and compare actual prescribing behavior between these two groups of physicians.

Another recommendation from the research findings concerns the development of educational programs related to drug prescribing. Physicians, regardless of practice setting, were found to be consistent regarding prescribing intentions, attitude, and beliefs associated with a drug. Thus, an educational program that works well in one type of health care setting may be applied effectively in another type of health care setting. Educational programs that have been reported to significantly reduce inappropriate drug prescribing include printed materials on recommended prescribing alternatives along with face-to-face educational "detailing" by specially trained clinical pharmacists (Soumerai and Avorn 1986).

It was also found that the physicians in the study did not consider drug cost as an important drug attribute when making prescribing decision. Hence, in an attempt to promote proper and cost-effective drug therapy, the educational program designed to improve drug prescribing should not be based solely on sending out the information about drug cost. The information disseminated to physicians concerning drug cost should be accompanied by information regarding other more important factors such as patient compliance, drug efficacy and side effects, etc.

Additional recommendations are made concerning future research in the area of drug prescribing. First, this study utilized only small samples of the HMO and FFS physicians in specific geographic areas. Therefore, future research should be conducted to replicate the study using larger and more broadly based samples. Such research should also attempt to identify and incorporate into the model those drug attribute variables that are less correlated in nature. Thus, the relative importance of individual drug attributes in explaining prescribing intention can be better determined from the study.

Second, future research should also include more than one drug class and one treatment situation in the study. Hence, the results can be used to determine whether the relative importance of attitude and subjective norms in influencing prescribing intentions is consistent across all drug classes or all treatment situations. For example, it might be useful to compare the use of drugs in the treatment of chronic conditions such as hypertension with the use of drugs in the treatment of acute conditions such as infection.

Third, this study found subjective norms to be important in influencing physicians' prescribing intentions. Therefore, future research might further examine this component and might include more than one referent group in the subjective norm component of the Fishbein Behavioral

Intention Model. For example, clinical pharmacists and health care administrators are also important referent groups, as they become more and more involved in the drug utilization review and quality assurance programs in health care settings. Including these two groups in the model might also be useful in determining the influences of these groups on physicians' prescribing intentions.

Finally, it can be seen that Fishbein Behavioral Intention Model provided a useful framework in studying and explaining drug prescribing. The use of the model should assist health care administrators in understanding the cognitive process underlying drug prescribing, thus enabling health care programmers to develop effective and appropriate strategies to improve drug prescribing.

APPENDIX A

SURVEY INSTRUMENT AND CORRESPONDENCE



THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

COLLEGE OF PHARMACY
DEPARTMENT OF PHARMACY PRACTICE

• CLINICAL PHARMACY DIVISION
• ADMINISTRATIVE AND BEHAVIORAL
SCIENCE DIVISION

Dear Physician:

To fulfill the requirements for a Master of Science degree in hospital pharmacy administration, I am conducting a study of physician attitudes toward beta-adrenergic blocking drugs. The purpose is to learn how physicians distinguish between drug products that are therapeutically similar. The results from the study will be available to all physicians.

Your physician group is part of a carefully selected sample of physicians. Your response to the enclosed questionnaire is crucial to the success of this study. The information cannot be obtained from anyone else. So please take ten or fifteen minutes of your time to fill out this questionnaire. For the data to be significant, all questions must be completed.

All responses will be kept in the strictest confidence. The code number at the top of the survey is used to facilitate the follow-up procedures and, thus insure that you do not receive bothersome reminder letters. In addition, after the questionnaires have been received, the key linking yourself and the code number will be destroyed to further protect your anonymity.

Please return your completed questionnaire at your earliest convenience. A self-addressed stamped envelope has been provided.

I appreciate your time and consideration and look forward to receiving your comments and completed questionnaire. If you have any problems or would like to contact me, please call (602) 626-5730.

Sincerely yours,

Vijit Chinburapa

VIJIT CHINBURAPA
Master of Science Candidate

A 50 year-old male patient was being treated for essential hypertension. The diastolic blood pressure measured on three different occasions was between 110 and 115 mmHg. He was placed on a salt-restricted diet and received hydrochlorothiazide 50 mg twice daily. However, his blood pressure was still inadequately controlled. The diastolic blood pressure measured four weeks later was found to be between 100 and 105 mmHg.

The patient is 25-30 lbs overweight, smokes and has a sedentary life-style. He has a family history of hypertension. His mother died at age 65 of cerebrovascular stroke and his father died at age 60 of myocardial infarction. Nevertheless, he has no history of rheumatic fever, heart disease, chronic lung disease, diabetes mellitus and peripheral vascular disease. He also has normal heart rate, normal renal and normal hepatic function.

1. FOR EACH OF THE FOLLOWING QUESTIONS, PLEASE PROVIDE YOUR BEST ESTIMATE REGARDING THE PATIENT DESCRIBED AND CIRCLE THE NUMBER THAT BEST CORRESPONDS TO YOUR ESTIMATION. PLEASE ANSWER ALL ITEMS AND DO NOT CIRCLE MORE THAN ONE NUMBER ON A SINGLE SCALE.

1. For the patient described above, assume that you have decided to add a beta-blocker drug to hydrochlorothiazide. Please indicate the probability that you would prescribe each of the following drugs listed below.

	Extremely Improbable							Extremely Probable
INDERAL (Propranolol)	1	2	3	4	5	6	7	
LOPRESSOR (Metoprolol)	1	2	3	4	5	6	7	
TENORMIN (Atenolol)	1	2	3	4	5	6	7	
CORGARD (Nadolol)	1	2	3	4	5	6	7	

2. Assume that you have discussed the above patient with your colleagues. What is the probability that MOST of them would recommend each of the following drugs?

	Extremely Improbable							Extremely Probable
INDERAL (Propranolol)	1	2	3	4	5	6	7	
LOPRESSOR (Metoprolol)	1	2	3	4	5	6	7	
TENORMIN (Atenolol)	1	2	3	4	5	6	7	
CORGARD (Nadolol)	1	2	3	4	5	6	7	

3. In general, are you likely to prescribe what your colleagues recommend?

	Extremely Unlikely							Extremely Likely
	1	2	3	4	5	6	7	

4. Again, in reference to the above patient, please indicate the degree of importance of each drug attribute in choosing a beta-blocker drug.

	Of Less Importance				Of More Importance		
	1	2	3	4	5	6	7
High Efficacy of Drug.	1	2	3	4	5	6	7
Low Side Effect.	1	2	3	4	5	6	7
Low Cost of Drug.	1	2	3	4	5	6	7
High Patient Compliance.	1	2	3	4	5	6	7
Convenient Dosage Schedule.	1	2	3	4	5	6	7
Credible Drug Manufacturer.	1	2	3	4	5	6	7
Reliable Sources of Drug Information to Justify Prescribing Decision.	1	2	3	4	5	6	7

II. PLEASE COMPARE EACH DRUG AND ESTIMATE THE PROBABILITY THAT EACH DRUG WOULD POSSESS VARIOUS DRUG ATTRIBUTES LISTED BELOW. PLEASE FILL IN THE NUMBER THAT BEST CORRESPONDS TO YOUR ESTIMATION IN THE SPACE PROVIDED. PLEASE NOTICE THAT EACH DRUG IS TO BE EVALUATED ON ALL CHARACTERISTICS.

- 1 = Extremely Improbable
- 2 = Quite Improbable
- 3 = Slightly Improbable
- 4 = Neutral
- 5 = Slightly Probable
- 6 = Quite Probable
- 7 = Extremely Probable

	INDERAL (Propranolol)	LOPRESSOR (Metoprolol)	TENORMIN (Atenolol)	CORGARD (Nadolol)
High Efficacy of Drug.				
Low Side Effect.				
Low Cost of Drug.				
High Patient Compliance.				
Convenient Dosage Schedule.				
Credible Drug Manufacturer.				
Reliable Sources of Drug Information to Justify Prescribing Decision.				

Dear Physician:

Recently, a survey was mailed to you asking for your participation in an important study concerning physician attitudes toward beta-adrenergic blocking drugs.

If you have already returned the questionnaire, please consider this card a "Thank You" for your generous cooperation.

If you have not yet returned the completed form, would you please do so as soon as possible. Your participation is vital to the success of my study.

Sincerely,

VIJIT CHINBURAPA
Master of Science Candidate

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