EFFECTS OF SOCIAL DESIRABILITY ON PATIENT COMPLIANCE AND REPORTING OF NONCOMPLIANCE

by

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I. INTRODUCTION

The validity of using patient self-report to assess compliance rates has been questioned as far back as Hippocrates (1923). Despite the criticisms of the self-report method of assessing patient compliance, some researchers still use the self-report method, because it is one of the most practical methods available to study noncompliance (Morisky, 1986; Stewart, 1987) However, there is little research on why patients may exaggerate when reporting their compliance rates with medication regimens. Researchers have tended to either use the self-report method to assess compliance and take the chance that the method is invalid or switch to an alternative method to assess patient compliance.

DiMattio and DiNicola (1982) point out that we must seek to understand patients' reporting of compliance just as fully as we seek to understand compliance behavior itself. Past studies have attempted to explain compliance in terms of personality traits of patients such as the internal versus external locus of control (Marston, 1970). Therefore, perhaps there are certain kinds of people who are more likely to exaggerate their compliance rates with medication regimens than others.

Social desirability scales are often used by survey researchers to look at response bias (Rossi et. al., 1983). One of the instruments most widely used

to study response styles is the Marlowe-Crowne Social Desirability Scale (Crowne and Marlowe, 1964). Crowne and Marlowe (1964) defined social desirability as the need for social approval and they hypothesized that individuals vary in the degree that they possess this need.

Snyder's self-monitoring scale (1987) is another way to look at social desirability, that is, in terms of behavior. His main hypothesis is that individuals differ in the extent to which they monitor (observe and control) their expressive behavior. He sees his scale as being different from the scales that measure the need for social approval, because even though individuals may have a high need for social approval, they may lack the necessary self-presentational skills and abilities needed to gain such approval.

No one has examined how patients respond to social desirability scales and whether social desirability affects patient compliance or their willingness to report noncompliance. Patients may be different in their willingness and ability to report noncompliance.

The primary objectives of this study are: 1) to develop a new social desirability scale that can be used in medical settings that is brief, reliable, and valid; 2) to examine the effects of social desirability on patient compliance and the reporting of noncompliance. It is hypothesized that social desirability will be positively related to compliance and negatively

related to the reporting of noncompliance.

II. LITERATURE REVIEW

Problem of Noncompliance

Patient compliance with medications is the extent to which a person's behavior coincides with medical advice (Haynes, 1979). Patient noncompliance with medication regimens is important to study for several reasons. Noncompliance can result in exacerbation of signs, symptoms, and progress of the disease, and also in increased use of medical and institutional facilities (Burrell and Levy, 1985). Twenty-three percent of nursing home admissions result primarily from the inability of patients to manage medications at home (Strandberg, 1984). Patient noncompliance is a public health problem (Eraker, 1984).

Methods of Assessing Patient Compliance

There are several ways to measure patient adherence to medication regimens: interview, self-report, self-monitoring, pill counts of unused tablets, tallies of refills of medications, behavioral measures, clinical rating, marked-sign techniques (inactive or false markers embedded in treatment package), biochemical indicators, record of broken appointments, clinical outcome improvement or stability in medical condition or symptoms, and the

Medication Event Monitoring System (Meichenbaum and Turk, 1987; Aprex, 1989).

Perhaps the most controversial method of measuring noncompliance with medication regimens is self-report by patients. The validity of this method has been questioned by researchers (Gordis, 1979; Enlund, 1981) who have compared self-report to other more objective measures of compliance such as pill counts, prescription records, or the Medication Event Monitoring System. Park and Lipman (1964) found that pill counts and patient reports were in agreement only 58% of the time; most patients exaggerated their rates of compliance with their medication regimens. Enlund (1981) found that interviews were relatively accurate in identifying the number and types of drugs that patients were on, but not for detecting patient compliance with dosage regimens.

However, other researchers have argued in favor of using self-report as a measure of noncompliance because it is one of the most practical methods available (Morisky, 1986; Stewart, 1987). Morisky (1986) tested the concurrent and predictive validity of a four-item self-reported measure of compliance by comparing the patients' self-reports to their blood pressure measurements. His results show that the scale demonstrates concurrent validity (point biserial correlation = 0.43, $p<0.01$), meaning that individuals

who score high on the scale have better blood pressure control.

Stewart (1987) compared interview and unannounced pill count methods of compliance and found that the overall accuracy of the interview was 75%, the sensitivity was 80%, and the positive predictive value was 69%. Sensitivity is the ability of the interview to detect noncompliers, positive predictive value is the ability of the interview to detect the true noncompliers, and accuracy is the ability of the interview to detect true compliers and true noncompliers. Her findings contrast those of other studies (Park and Lipman, 1964; Gordis, 1969; Sackett, 1978; Gilbert et al., 1980; Inui, 1981, *see Table 1*), which show a generally similar overall accuracy, a considerably lower sensitivity, and, except for Gilbert et al. (1980) a higher positive predictive value.

Stewart (1987) suggests that part of the differences in predictive value, accuracy, and sensitivity between her study and the other studies could be due to different patient mixes and different kinds of medical care. The key question that Stewart (1987) raises is what is the most important attribute of a measure when assessing its validity: sensitivity, positive predictive value, or accuracy? She points out that a clinician who is looking for cases of noncompliance will be most interested in the sensitivity of subjective assessment, whereas a researcher would be interested in both sensitivity and

specificity (i.e., accuracy).

Eraker (1984) pointed out that the accuracy of self-report could be increased by informing patients that physiological or pharmacological measures would be used in addition to self-report to assess compliance with medication regimens. The same could also hold true if patients are told they have a special Medication Event Monitoring System (MEMS) container that counts the number of times they open it. The advantages and disadvantages of the MEMS container will be discussed later.

As mentioned above, several researchers tend to compare patients' self-reports with more objective measures of compliance such as pill counts. However, recently the validity of pill counts have been questioned. Pullar et al., 1989 attempted to assess patient compliance using both a pharmacologic indicator (low-dose phenobarbital) and a return tablet count. They found that the pill counts grossly overestimated patient compliance. Seventy-four percent of their patients had good compliance (between 90%-110%) according to the tablet count, but 32% of these individuals had plasma phenobarbital levels that were less than 90% of the lowest value found in normal volunteers, which suggested poorer compliance than what was shown by the pill counts.

Rudd, et al., (1989) assessed compliance by performing pill counts on 121

ambulatory hypertensive subjects. They dispensed 150% of the needed medicine to allow postponement of clinic visits and to check for patients who were discarding tablets or "pill dumping". They found a distinct group of outliers, whose compliance rates exceeded 100%, while they expected to find compliance rates that were below 100% since all patients were taking between four and eight tablets a day in four intervals.

However, in both of these studies the pill counts were conducted in the clinic. Patients were instructed to bring the remainder of their medications back to the clinic with them. This could make patients suspicious that their medications might be counted and could promote "pill dumping". However, if an unannounced pill count was conducted at a home interview, patients would be less likely to suspect that their pills would be counted and therefore less prone to "pill dump". Therefore, the above researchers' critiques of pill counts may be applicable only to those conducted at return clinic visits, not those conducted at home interviews that are unannounced.

The newest tool used for assessing patient medication compliance is the Medication Event Monitoring System (MEMS) which are 30-dram pill bottles fitted with a microprocessor (Aprex, 1990). Each bottle opening and closing is recorded as a presumptive dose. Data are retrieved by connecting the bottle to a microcomputer communication port. Collected data are sent to

the Aprex Corporation by diskette for analysis using proprietary software. Information is provided as listings of the date and time of individual bottle openings and closings, the duration of the opening, and the hours since the previous dose (Aprex, 1989; Cramer et. al., 1989). One of the potential disadvantages to the MEMS container is that patients might take out more than one dose at a time at each opening of the bottle or regularly open the container and discard the medication to maintain the impression that compliance has occurred.

Factors Affecting Patient Compliance

Researchers have examined the relationship between compliance and hundreds of variables (Haynes, 1979; Meichenbaum and Turk, 1987). Variables that researchers have recently found to be related to compliance include number of medications (Cramer, 1989), fear of side effects, whether or not the prescription is from a general practitioner, the number of times per day the patient takes the medication (Spagnoli, 1989), and the physician-patient relationship (Svarstad, 1985; Inui, 1985). Patients on more scheduled medications, who took medications more times per day, who were afraid of side effects, and who received their prescription from a general practitioner were all less compliant with their medication regimens.

Spagnoli et al., 1989 found that patients were taking 81.5% of the medications the way their physicians had recommended. Cramer et al., 1989 assessed compliance for their epilepsy patients using the Medication Event Monitoring System (MEMS) which counts the number of times and the time of day the patient opens his/her medication container. They found an average overall compliance rate of 76% for their subjects, but compliance varied greatly depending on the number of times per day the subjects were supposed to take the medication: 87% of the once daily, 81% of the twice daily, 77% of the three times a day, and 39% of the four times a day dosages were taken as prescribed. Eisen et al., 1987 found that mean compliance for their hypertensive patients was 84%, which can be compared to mean compliance rates between 50% and 80% found in most hypertensive populations under treatment (Sackett 1979).

The literature on the doctor-patient relationship is most relevant to looking at how the patient's desire for approval from physicians and pharmacists relates to patient compliance. Inui (1985) found that after a physician-patient interaction, the patient's change in concern, satisfaction, and memory of the visit all affected compliance with the physician's advice. Svarstad (1985) found that compliance is a function of patient knowledge and acceptance, which in turn were determined by the physician's influence and

teaching styles.

The physician's influence style is important in motivating the patient to comply with the medication regimen. Kelman (1958) feels that there are three processes of attitude change resulting from social influence: compliance, identification, and internalization. Compliance occurs when a person accepts the influence because he/she hopes to achieve a favorable reaction from another person or group, not because he/she believes the content. Identification occurs when a person accepts an influence because he/she wants to establish or maintain a satisfying self-defining relationship to another person or group. Internalization occurs when an individual accepts influence because the ideas and actions of which it is composed are intrinsically rewarding. All three of these processes can be related to patient compliance with medication regimens. The processes of compliance and identification can both be related to the patient's desire for approval from his/her physician or pharmacist. Therefore, the literature on social desirability may be important when looking at the effect of practitioner-patient relationships on patient compliance with medication regimens.

Factors Affecting Reporting of Noncompliance

A number of researchers have found that patients do not disclose all of

their questions or difficulties to their physicians. Beisecker (1990) found that situational variables (i.e., presence of a companion, first versus repeat visit, length of interaction) explain information-seeking behavior better than patient attitudes and sociodemographic characteristics. Korsch (1968) found that 65% of expectations held by a patient were not mentioned to the doctor nor were 67% of the patient's main worries. Waitzkin (1984) found that women asked more questions of doctors and engaged in more verbal behavior within the encounters. Despite these studies examining the lack of patient disclosure to physicians, few studies document the reasons why patients do not accurately report their difficulties to physicians. One possible explanation for this lack of patient disclosure is that patients desire the physician's approval.

There are several other reasons why a patient may not accurately report his or her level of noncompliance. Stewart (1987), who compared interview data and an unanounced pill count, found that older patients and patients who were more highly educated were more accurate in their reporting of noncompliance. Age can influence a patient's reporting of noncompliance because in different time periods individuals may have learned different patient roles. As Parsons (1951, 1958) pointed out, patients are expected to be cooperative and submissive, while physicians are expected to be dominant

and in control. However, Friedson (1970) suggests that Parsons' analysis focuses on what should happen in a patient-physician interaction instead of what actually happens. Friedson (1970) argues that not all patients accept the authority of the physician as absolute. Some believe that patients are now more likely to question their physicians than in the past, in part because patients now feel they have a right to medical information (Haug, 1981). These age differences in reporting of noncompliance might actually be related to cohort differences (i.e., patients have varying expectations for interaction with a health care provider because they were socialized differently at different points in time).

The number of medications the patient is on and the number of times per day a patient has to take his/her medications could also influence reporting of noncompliance. The more medications a patient is on, the less likely he/she might be to remember the number of doses missed in the past week. Also, the more times per day a patient takes his/her medications, the less likely he/she might be to remember the number of times that doses that were missed.

Another factor that could influence a patient's willingness to discuss noncompliance is the physician's style of communication. Svarstad (1978) classified physicians into two categories based her observation of physician-

patient communication in an outpatient clinic. The autocratic physicians ignored patient complaints and ignored or responded punitively to patients' admissions of noncompliance. In contrast, the nonautocratic physicians acknowledged patient concerns and attempted to manage noncompliance in a nonpunitive manner. As expected, patients who saw autocratic physicians were less likely to admit their noncompliance in an apparent effort to avoid disapproval. Some of the patients who intentionally do not comply with their medication regimens may overestimate their levels of compliance with medication regimens to gain their physician's or pharmacist's approval. Therefore, the literature on social desirability may be useful when looking at factors that influence a patient's reporting of noncompliance with medication regimens.

Social Desirability

Social desirability scales are often used by survey researchers to look at response bias. One of the instruments most widely used to study response bias is the Marlowe-Crowne Social Desirability Scale (Crowne and Marlowe, 1964). Crowne and Marlowe (1964) defined social desirability as the need for social approval and they hypothesized that individuals vary in the degree that they possess this need. Although Crowne and Marlowe's research moved

from a response bias to a personality trait interpretation of this scale, other researchers have used the Marlowe-Crowne scores as statistical correction factors, to estimate the true relationships between variables affected by this type of response bias (Rossi, et al., 1983). Sudman and Bradburn (1974) criticize Marlowe and Crowne's definition of social desirability because they feel the "relative threat" of a situation should be part of the definition of social desirability.

Stocking (1978) tested two different interpretations of the need for social approval variable as measured by the Marlowe-Crowne scale. One interpretation is that the need for social approval is a response bias variable that distorts the relations between variables. The other interpretation is that the need for social approval reflects real differences in the beliefs and self-image of respondents and that it should be treated as part of the true variance. Stocking suggests that individuals who score high on the scale tend to see the world in terms of absolutes, have rigid standards for their behavior, and therefore are more likely to behave in socially desirable ways no matter what the situation. Stocking concludes that her data support the latter interpretation, because the data indicate differences between individuals on a wide range of activities, not just those with normative constraints. She concludes that researchers should treat scores on the

Marlow-Crowne scale as real differences between individuals rather than as an indication of response bias.

Snyder's self-monitoring scale (1987) is a different way to look at social desirability in terms of behavior. His main hypothesis is that individuals differ in the extent to which they monitor (observe and control) their expressive behavior. He sees his scale as being different from the scales that measure the need for social approval, because even though individuals may have a high need for social approval, they may lack the necessary self-presentational skills and abilities needed to gain such approval.

Snyder's scale (1987) measures five main components of self-monitoring: **1)** concern with social appropriateness of one's self-presentation, **2)** attention to social comparison information, **3)** ability to control and modify one's self-presentational and expressive behavior, **4)** the use of the ability in particular situations, and **5)** the extent to which one's expressive behavior and self-presentation are molded to fit particular situations.

However, the available social desirability scales have several problems if one wants to apply them to medical settings. First, the scales are too general. The only situation Snyder refers to in his self-monitoring scale is a party or social gathering (*Appendix A, Item 2*), which makes the scale difficult to use in health care research. Both providers and patients are likely to

question the relevance or importance of such general questionnaires. Secondly, the researcher does not know the frame of reference the respondent is using when answering some of the questions (Converse and Presser, 1989). For example, when individuals answer the question on the Marlowe-Crowne scale, "*I can remember playing sick to get out of something*" one does not know how important the situation was the respondent got out of when playing sick. "Playing sick" can have different meanings to different individuals. One would have difficulty making meaningful correlations between these scales and compliance with medical regimens or reporting of noncompliance. Finally, the available social desirability scales are too long to be filled out easily by patients in clinical settings.

Therefore, the primary objectives of this study are: 1) to develop a new social desirability scale which can be used in medical settings that is brief, reliable, and valid, and 2) to examine the effects of social desirability on patient compliance and the reporting of noncompliance. The following hypotheses are proposed:

H1 - Patients who score high on the social desirability scale will be more compliant with medication regimens than patients who score low on the social desirability scale;

H2 - Noncompliant patients who score high on the social desirability scale will exaggerate their levels of compliance with medication regimens more than noncompliant patients who score low on the social desirability scale.

Both of these hypotheses are derived from Stocking's (1978) idea that social desirability is related to objective behavior rather than being a response bias variable that distorts the relations between variables. I am considering both compliance and reporting of compliance to be objective behaviors.

III. METHODOLOGY

The proposed scale was pretested on a group of pharmacy students. The final scale was given to a group of patients from three Health Maintenance Organization (HMO) clinics who were enrolled in a research study looking at their compliance with medication regimens. In this section, a review of the research methodology is discussed in greater detail.

Sample

Patients enrolled in the compliance research study were sampled from three pharmacies of a Health Maintenance Organization (HMO) in the Midwest. The HMO was chosen as the enrollment site, because all patients

enrolled in the HMO had to have their prescriptions filled at the three HMO pharmacies. This allowed the researchers to have easy access to complete medical and prescription records.

To be eligible for the study, patients had to be: **1)** taking enalapril or captopril (blood pressure medications), **2)** taking at least three scheduled medications, and **3)** not using any special medication container such as a Mediset. If patients met the above criteria, the study was briefly introduced to them by a HMO pharmacy employee. If the patient seemed interested in participating and a pharmacist had time to talk to the patient, the pharmacist explained the project in more detail and asked the patient if he/she wanted to participate.

If the patient agreed, he or she was then randomly assigned to receive a traditional medication cap or a Medication Event Monitoring System (MEMS) cap. The patient was asked to sign one of two consent forms, depending on whether the patient was to receive a special medication cap or not (*Appendix B, Items 1a and 1b*). The MEMS cap was placed on the patient's enalapril or captopril container. Patients were instructed to use only the medication in the container with the MEMS cap and to place any enalapril or captopril tablets left at home in the container with the MEMS cap. All patients were asked how many tablets they had left at home. All patients

were told that a research assistant would be calling them soon to set up a home interview in about a month and they were given a card with the research assistant's name and telephone number.

If the patient seemed interested in the study, but the pharmacist was too busy to talk to the patient, the patients was asked if the research assistant could contact them to explain the study in more detail. The research assistant would then call the patient, explain the study in more detail to them, and ask the patient if he/she wanted to participate. If the patient agreed to participate, the research assistant would randomly assign the patient either to receive a MEMS cap or not.

If the patient was to receive a MEMS cap next time they had their enalapril or captopril refilled, the patient was sent a letter explaining the study in more detail (*Appendix B, Item 2a*), a consent form (*Appendix B, Item 1a*), and a return envelope. Once the consent form was received in the mail, the pharmacists at each pharmacy site were instructed to give the patient a special medication cap next time they had their enalapril or captopril refilled. When the patients picked up their MEMS caps, the pharmacist asked them how many tablets they had left at home. The pharmacists would tell the research assistant when the patient picked up their prescription with the MEMS cap, so the research assistant could call the patient and set up a

home interview in about a month.

If the patient was not to receive a MEMS cap next time they had their prescription refilled, the research assistant would: **1)** ask the patient how many enalapril or captopril tablets they had left at home, **2)** set a home interview in about a month, and **3)** send the patient a cover letter (*Appendix B, Item 2b*) and consent form (*Appendix B, Item 1b*).

Data Collection

All home interviews were set up to occur at least 25 days after nonMEMS patients were enrolled in the study or at least 25 days after the MEMS patients had received their special medication caps. Patients were called one or two days before the interview as a reminder. The research assistant began the home interview by asking patients to fill out a Brief Medication Questionnaire (BMQ) (*Appendix C, Item 1*). The Brief Medication Questionnaire was designed with several objectives in mind. First, the researchers wanted a questionnaire that was relatively brief and easy to administer by practitioners involved in the monitoring and management of patient compliance. Second, the researchers wanted a questionnaire that would yield better information about the patient's perceived difficulties and concerns regarding his/her medication regimen. Finally, the researchers

wanted a tool that would yield accurate information about patient compliance and the different types of medication errors that patients can make when trying to follow medication advice.

The patients either filled out the BMQ themselves or the research assistant asked the patient the questions. The research assistant then conducted a short, follow-up interview (*Appendix C, Item 2*) to clarify the patient's reported difficulties and compliance and to gather demographic information. The research assistant then conducted an unannounced pill count of the patient's enalapril or captopril prescription. If the patient had a MEMS cap, the research assistant used a lap top computer to transfer the information from the MEMS cap to computer disk.

Shortly after their home interviews, the patients were contacted and asked if they would mind filling out a brief eighteen item mail questionnaire about their relationships with their doctors and pharmacists. Those patients with the MEMS caps were also asked if they would mind using the MEMS cap for four (4) more months. If the patients agreed to participate in the continuation study, they were sent a cover letter (*Appendix D, Items 1a or 1b*), a consent form (*Appendix D, Items 2a or 2b*), and a mail questionnaire (*Appendix D, Item 3*). If patients did not return the mail questionnaire within two weeks, they were sent a follow-up letter (*Appendix D, Item 4*). If patients

did not respond to the follow-up letter, they were called to see if they had received a mail questionnaire.

After the home interview, data on the patient's currently prescribed medications were obtained from the patient's medical and pharmacy records. The research assistant recorded data from the pharmacy and medical records for up to six months before the patient interview. The different sources of information (patient self-report, pill count, MEMS data, medical record, and pharmacy record) were then compared to determine the patient's compliance with physician instructions.

Rate of Participation

Of the 48 patients eligible for the study, four (8.3%) refused to participate. One of the refusers was too busy, one reported being too depressed to participate, one felt the study was an invasion of privacy, and one had had a negative experience in a previous research study. Nonparticipants ranged in age from 44 to 67. Two of the patients were on enalapril and two were on captopril. Each of the nonparticipants was on three scheduled medications.

All of the 43 mail questionnaires were returned for a response rate of 100%. Thirty-five of the 43 (81.3%) were returned after the first mailing of

the questionnaire. Five more questionnaires were returned after a second mailing and three more were returned after a follow-up telephone call.

Measurement of Social Desirability

Development of the Scale - The proposed social desirability scale measures a patient's social desirability with respect to a patient's interaction with his/her physician and the patient's interaction with his/her pharmacist. These two health care professionals were chosen for the scale because they are the ones most involved with patient medication use. Social desirability was defined as being a property of a situation and as having three main components: **1)** the need to gain social approval from the health care professional with whom one is interacting, **2)** the perceived threat of the health care professional with whom one is interacting, and **3)** the ability to modify one's behavior to gain this other person's approval.

Three items for each part of the definition of social desirability were included in the scale that related to physician-patient interaction and three items for each part of the definition of social desirability were included in the scale that related to pharmacist-patient interaction (*Table 2*). The items for pharmacists were virtually the same as items for physicians. The only difference was whether the question was worded in a positive or negative

fashion. Overall the scale was balanced, nine positively-worded questions and nine negatively-worded statements. The researchers started with a pool of 18 items with an intent to drop the least reliable items and develop a scale containing 10-15 items.

The proposed scale has the response categories of strongly agree/agree/disagree/strongly disagree rather than the response categories of true/false which are found on Snyder's self-monitoring scale and the Marlowe-Crowne social desirability scale. The reason for this change is that social desirability is now being measured as being on a continuum rather being than a class variable, because social desirability is now being conceptualized as being a property of a situation rather than a trait.

A middle category is not given as an option in the proposed scale, because noncommittal answers were not desired (Converse and Presser, 1989). Those who do not feel intensely about an item are more likely to be affected by changes in form of the question. However, to avoid losing information about the direction in which some people lean on an issue, no middle category was offered.

Assessing the Reliability of the Proposed Scale - The reliability of the scale was analyzed in three stages. First, the reliability of the 18-item scale was tested with the help of 111 first-year pharmacy students who completed a

survey instrument that contained: **1)** Snyder's self-monitoring scale, **2)** questions about the last time they had seen a physician and pharmacist and whether they usually go to the same physician and pharmacist each time, **3)** the proposed scale, and **4)** a demographics section (*Appendix A*). The survey instrument took an average of 10 minutes to complete. The reliability of the social desirability scale that was given to the pharmacy students was calculated using Cronbach's alpha. First, the reliability was analyzed using all pharmacy students, regardless of when the last time they saw a physician or pharmacist was. Next, the reliability was analyzed using those students who had seen a physician and pharmacist within the past three months. The reliability was tested this way, because the researchers sought to develop a scale that could be used by patients who were in ongoing relationships with their pharmacists and physicians. For those patients who had missing data for certain items of the scale, the mean of the other items similar to the missing item was calculated and used for the missing value (Rossi, et al., 1983). Four of the 18 items were deleted using the item-total statistics.

This revised 14-item social desirability scale was sent to the 43 patients enrolled in the compliance study. In the third and final stage, the reliability of this social desirability scale was recalculated using the patient sample. Four additional items were dropped due to poor reliability (*Table 4*). The

final 10-item scale was used in later analyses of patient reporting and compliance.

Assessing the Validity of the Proposed Scale - The next analysis involved using the data from the first-year pharmacy students who had been given the proposed social desirability scale as well as Snyder's self-monitoring scale. The reliability of Snyder's self-monitoring scale was calculated using 192 Stanford University undergraduates. The scale had a Kuder-Richardson 20 reliability coefficient of 0.70 and a test-retest reliability of 0.83 ($df=51$, $p<.001$, one month interval). Snyder (1974) also conducted a cross-validation on an independent sample of 146 University of Minnesota undergraduates yielded a Kuder-Richardson 20 reliability coefficient of 0.63. To assess the validity of his scale, Snyder (1974) used peer ratings. According to peers, individuals who were high self-monitors were good at learning what is socially acceptable in new situations, they have good self-control of emotional expression, and they use their abilities to effectively create the impression they want.

To compare the new social desirability scale with Snyder's, the following variables were created DESIRE (patient's social desirability score) and MONITOR (self-monitoring score based on Snyder's scale). We then examined the relationship between the 10-item social desirability scale and

Snyder's self-monitoring scale for all students.

Measurement of Compliance and Reporting of Noncompliance

First I wanted to see how well the social desirability scores correlated with actual patient compliance. We used compliance data for the full month, because it was felt that a longer time period would more accurately reflect a person's usual compliance behavior. For those individuals who had had the MEMS cap, their actual percent compliance rate (COMPLIANCE-MEMS) for the past month was based on how many times they had opened the container to take a dose. For those individuals who did not have the MEMS cap, their actual compliance rate (COMPLIANCE-nonMEMS) was based on a pill count done after a month's time period.

Next I wanted to see how well the social desirability scores correlated with patient reporting of noncompliance . Therefore, a new variable REPORTING-DISCREPANCY was created for individuals who had been less then 93% compliant with their medication regimen a week before the home interview. We only looked at the reporting behavior of those individuals who were less than 93% compliant, because if an individual was 93% compliant or greater then he/she either had been fully compliant or had missed only one dose of a medication taken two or three times a day in the

past week. We felt that these individuals might really believe that they were fully compliant due to memory effects. REPORTING-DISCREPANCY was defined as the percentage of prescribed doses reported to have been taken by the patient minus the percentage of prescribed doses actually taken in the past week. The patient's reported compliance for the past week was based on their response to question 8 of the Brief Medication Questionnaire (*Appendix C, Item 1*).

For those individuals who had the MEMS cap, their actual compliance rate for the past week was based on how many times they had opened the container to take a dose. Compliance data from the past week was used, because we had asked the patient to report his/her compliance for the past week rather than the past month. We felt that the patient's recall would be better for a week's time period rather than a month's time period. For those individuals who did not have the special MEMS cap, their percent compliance rate was based on a pill count done after a month's time period. The nonMEMS patients' month compliance rate was assumed to be equal to their week compliance rate, unless the patient admitted missing more doses in the past week than had been estimated by the pill count. We did not conduct a pill count after a week's time period, because we wanted the fact that they were be observed to be less salient.

Measurement of Other Variables

The measurement of selected other independent variables was straightforward. These variables include: patient age (in years), patient sex (male=0), patient educational level (in years), whether the patient has a MEMS (0=nonMEMS), number of scheduled medications patient is currently taking (count), and number of times per day patient takes the target medication (1=once per day, 2=twice a day , and 3=three times a day).

Statistical Analysis

First, we examined the Pearson correlation coefficients between REPORTING-DISCREPANCY (the percentage of prescribed doses reported to have been taken by the patient minus the percentage of prescribed doses actually taken in the past week), the patient's social desirability score, and other selected independent variables thought to influence patient reporting of noncompliance.

The actual percent compliance rates for MEMS and nonMEMS patients were also correlated with the patient's social desirability scores, because it was felt that those patients with high social desirability scores would want to please their physicians and pharmacists and therefore be more compliant to begin with. The percent compliance rates for MEMS and nonMEMS patients

were also correlated with the other selected independent variables that were thought to influence patient compliance.

Three regression models were estimated using linear regression techniques. Backward elimination procedures were used to obtain the best fitting model. In the first model, reporting of compliance was regressed on social desirability and the other independent variables. In the second model, percent compliance of the MEMS patients was regressed on social desirability and the other independent variables. In the third model, percent compliance of the nonMEMS patients was regressed on social desirability and the other independent variables. Separate regression models were estimated for the MEMS and nonMEMS patients when regressing percent compliance on the independent variables, because we felt we might see different results, since the the MEMS patients' actual compliance behavior might be affected by the fact that they knew the MEMS cap was recording each time they opened their medication container.

IV. RESULTS

Characteristics of the Sample

Of those enrolled in the study, 21 patients were on captopril and 22 patients were on enalapril. Twelve of the 22 patients on enalapril used the

MEMS cap. Eleven of the 21 on captopril used the MEMS cap. The number of times per day the patient was supposed to take the target medication ranged from 1 to 3 (mean=1.59). The number of scheduled medications the patient was on range from 2-8 (mean=3.5).

Twenty-six (60.5%) of the 43 patients in the sample were men and 17 were women. Forty-one (95.3%) of the patients were white and two were black. Patient age ranged from 30-74 years (mean=52.6 years). Seventeen (39.5%) of the patients were age 60 or over, whereas 26 of the patients were under age 60. Patient educational level ranged from 8-20 years (mean=13.8).

Social Desirability: Reliability, Validity, and Distribution of Scores

The reliability of the scale was first calculated for all students in the sample (alpha=.7433) (*Table 4*). Next, the reliability was calculated using only those students who had seen a physician and pharmacist in the past three months (alpha=.8569) (*Table 4*). Because we wanted a brief scale to be sent to the patients, four items were dropped using the item-to-total statistics. The reliability for the 14-item scale remained substantially the same (alpha=0.8450) (Table 4). Two of the items that were dropped referred to the patient's interaction with his/her pharmacist and the other two items that were dropped referred to the patient's interaction with his/her

physician.

This revised 14-item social desirability scale was sent to the 43 patients enrolled in the compliance study. The reliability of the scale was then recalculated for the patient sample. Adequate reliability (alpha=0.71) was obtained after deleting four of the 14 items (*Table 4*). The reliability of the final scale is quite good and comparable to Synder's Kuder-Richardson reliability of 0.70.

Once again, two of the items that were dropped in this step of the reliability analysis referred to the patient's interaction with his/her physician and the other two items that were dropped referred to the patient's interaction with his/her pharmacist. Five of the eight items dropped from the originally proposed 18 item scale refered to the patient's need to gain either his/her pharmacist or physician's approval.

As mentioned above, the pharmacy students were given both the newly constructed social desirability scale and Snyder's self-monitoring scale to assess the criterion validity of the new scale. We then examined the correlation between Snyder's self-monitoring scale and the final ten item social desirability scale. The two scales were uncorrelated, (Pearson r=0.057;p=.278).

Student social desirability scores on the 14-item scale ranged from 20 - 41,

with a mean of 33.7. Patient social desirability scores on the 14-item scale ranged from 16 - 38, with a mean of 31.09. Patient social desirability scores on the 10-item scale ranged from 10 - 27, with a mean of 20.47.

Patient Compliance

One of the main purposes of this study was to investigate how actual patient compliance correlated with patients' social desirability scores. The compliance data for a month's time period was used. The MEMS data were used to measure of compliance for the MEMS patients, whereas pill count data were used for the nonMEMS patients. There were 21 MEMS patients and 19 nonMEMS patients.

Compliance of the nonMEMS patients ranged from 48%-105% with a mean of 89.1% (Table 5). Compliance of the MEMS patients ranged from 0%-109% with a mean of 86.4% (Table 5). Those patients who were greater than 100% compliant took more doses of their medication than their physician had prescribed. The compliance rate of both groups is quite high. The high compliance rates might be due to the fact that we only followed the patients for a month, that the majority of the sample was on once a day or twice a day dosing, or that the patients knew they were being observed as part of a study.

Tables 6 and 7 show the relationship between patient compliance and the selected independent variables for MEMS and nonMEMS patients, respectively. The independent variables included social desirability, patient age, sex, level of education, number of times per day patient takes target medication, and number of scheduled medications patient is on. As shown in *Table 6*, compliance of MEMS patients was found to correlate significantly with social desirability scores ($r=.607$, $p<.01$) and number of scheduled medications ($r=-.376$, $p<.05$). As shown in *Table 7*, compliance of nonMEMS patients did not correlate significantly with desirability scores or any other variables.

Table 6 shows the correlations between social desirability and patient educational level ($r=.332$, $p<.1$) and sex ($r=-.319$, $p<.1$) for MEMS patients. Males and more highly educated patients were more likely to have lower social desirability scores. However, as shown in *Table 7*, social desirability was not correlated with patient educational level or sex for the nonMEMS patients. Patient age correlated with social desirability for the nonMEMS patients ($r=-.409$, $p<.05$). Older nonMEMS patients were more likely to have lower social desirability scores.

The final regression equation that attempted to explain the compliance of MEMS patients did contain social desirability as an independent variable. In

fact, social desirability was the most significant variable (beta=.619, p=.0013) in explaining compliance behavior of the MEMS patients (*Table 8*). The higher a patient's score on the social desirability scale, the more compliant he or she was with the medication regimen. The other significant variable in explaining the compliance of the MEMS patients was SCHEDRX (the number of scheduled medication the patient was on) (beta=-.395, p=.0258). The more scheduled medications a patient was on, the less compliant he or she was. The final regression equation using desirability and number of scheduled medications to explain compliance of the MEMS patients was highly significant (F=9.94, p=.0012). The two variables explained 52.4% of the variance in percent compliance rates. Consistent with the bivariate results, none of the independent variables correlated significantly with the compliance of the nonMEMS patients (results not shown). Possible explanations of this rather interesting result are discussed below.

Patient Reporting of Noncompliance

Another purpose of this study was to examine the reporting behavior of noncompliant patients. We were able to obtain objective compliance data for the past week for 40 of the 43 patients (93%) who agreed to participate in the study.[1] Of these 40 patients, 20 patients (50%) took less than 93% of

their prescribed doses during the week prior to the interview. These 20 patients were defined as being "noncompliant" in the following analysis.

Table 9 presents the descriptive statistics and correlation matrix for the selected independent variables and patient reporting of noncompliance (REPORTING-DISCREPANCY). The selected independent variables included patient age, sex, number of scheduled medications, number of times per day the target medication was taken, and whether the patient had a MEMS container or not. Consistent with past research, the noncompliant patients tended to overreport their level of compliance. The difference between the patient's reported and actual compliance ranged from 0%-52% with a mean discrepancy of 17.7%.

Reporting of noncompliance was found to be associated with patient age ($r=-.31$, $p<0.1$) and the number of times per day the patient took the medication ($r=.47$, $p<0.05$) (*Table 9*). Younger patients and patients on multiple dose regimens were less likely to report their noncompliance. Social desirability scores were not correlated significantly with reporting of noncompliance ($p>.10$).

Patient reporting of noncompliance was correlated, although not significantly, with whether or not a patient had a MEMS ($r=-.287$, $p=.13$). MEMS patients were better at reporting noncompliance than nonMEMS

patients, possibly because they felt their compliance behavior was visible to the research assistant.

All of the regressions were estimated using ordinary least squares linear regression techniques. Backward elimination techniques were used to eliminate nonsignificant terms ($p>.10$). The final regression equation statistically explaining patients' reporting of noncompliance did not contain social desirability. The variables that did explain reporting behavior were age and number of times per day the patient was supposed to take his or her target medication (*Table 10*). Times per day was the most significant variable in explaining patient reporting behavior (beta=-.335, $p=.025$). The more times per day a patient took his or her medication, the less accurate was the patient's reporting of noncompliance. Also, the younger a patient was, the less likely he or she was to report noncompliance correctly. The final regression equation which included times per day and age was significant ($F=4.24$, $p=.032$). The two variables explained 33.3% of the variance in reporting of noncompliance.

V. DISCUSSION

Patient compliance and desirability were significantly correlated for the MEMS patients. Why wasn't the compliance of the nonMEMS group

explained by the same factors that explained the compliance of the MEMS group, though? Part of the problem is that desirability correlated strongly with whether or not a patient had a MEMS container ($r=-.308$, $p<.001$). Since patients were randomly assigned to receive a MEMS cap or not, it appears that getting a MEMS cap influenced individuals' social desirability scores in a negative direction or this could simply be a random result. Patients with a MEMS cap reported a lower need for physician and pharmacist approval, less fear of health care professionals, and a lower likelihood of changing their behavior to gain a health care professional's approval. Part of this could be due to the fact that the social desirability scale was sent after the home interview, and therefore the MEMS patients knew that their actual compliance behavior was known by the research assistant. They therefore had nothing to lose by responding honestly to our questionnaire. They also could have viewed the questionnaire as a "test". However, the behavior of the nonMEMS patients was not as explicitly known to the research assistant, so they therefore could benefit by responding to our scale in a "socially desirable" fashion. Perhaps a better design would be to send the social desirability scale to the patients before the home interview. Contrary to the hypothesis, patient compliance was not correlated with the number of times per day the patient took his/her target medication. Most of

the patients in our sample were on once a day or twice a day dosing, which could explain why times per day did not correlate with compliance.

Contrary to the hypothesis, reporting of compliance was not related to social desirability, as measured in this study. There are several potential explanations for this lack of association. First, patients reported their compliance behavior to a researcher who was not associated with the patient's clinic, whereas the social desirability items asked them to think about their clinic physician and pharmacist. Different results might be obtained if we were able to examine patient reports to their physicians or pharmacists. Second, the effects of social desirability on reporting may depend on the patient's awareness of his/her true rate of noncompliance, the type of noncompliance, or severity of noncompliance. For example, patients who have difficulty remembering their medication may be unaware of the exact number of doses missed in the past week. Therefore, they are not able to report their behavior accurately even if their desire for social approval was low. It is possible that social desirability affects the reporting of intentional noncompliance, but has no effect on unintentional compliance due to forgetting or lack of understanding. Unfortunately, the sample size was too small to examine intentional versus unintentional noncompliance. Finally, reporting of noncompliance may not be an objective behavior like compliance

behavior itself. Therefore, our findings might support those of Stocking (1978), who found that social desirability reflects real differences between individuals rather than an indication of response bias. Social desirability influences actual patient compliance behavior rather than the reporting of patient compliance.

The finding that the number of times per day the patient was supposed to take his/her medication correlated with reporting behavior suggests that the more times per day a patient takes a medication, the harder it is for the patient to remember whether he took his or her medication or not. Our finding that older patients are more accurate at reporting noncompliance supports the findings of Stewart (1987). Older patients might be more concerned about their health and therefore spend more time monitoring their compliance with medication regimens.

This research study has several limitations. The sample size is small and consists only of patients belonging to one HMO. These patients might have different patterns of compliance and reporting of noncompliance than non-HMO members or members of other HMOs. Another limitation of the study is that the social desirability scale was sent to the patients after the home interview rather than before the home interview. Also, the patient's desire for approval from physicians and pharmacists was correlated with the

patient's reporting of noncompliance to the research assistant. A better design would have examined the patient's actual reporting of noncompliance to the physician or pharmacist.

This new social desirability scale does offer an advantage over Marlowe and Crowne's (1964) social desirability scale and Snyder's (1987) self-monitoring scale because the items are situation specific. Converse and Presser (1989) point out that responses to general attitude items are poorer predictors of behavior than responses to specific attitude questions. The finding that the new social desirability scale did not correlate at all with Snyder's self-monitoring scale suggests that the two scales are measuring different concepts or dimensions of social desirability. Perhaps the desire for social approval from a health care professional is different than the desire for approval from people in general. Snyder's scale asks individuals to think of the situation of a party or social gathering, which would probably cause individuals to think of friends or acquaintances. Our new social desirability scale asks individuals to think of themselves in interactions with health care professionals. When the patient is responding to our new social desirability scale, he/she could be responding to his/her perception of his/her health care provider as well as his/her perceived need for that health care professional's approval.

Both the current patient-provider relationship and the patient's general desire for social approval could be influencing the patient's desire for professional approval, which is what our scale could actually be measuring. Other independent variables, such as social support networks and the patient's perception of their disease severity, might also be influencing the patient desire for professional approval. This study suggests that self-monitoring and social desirability might be properties of a situation rather than charcteristics of a person. Previous researchers (Snyder 1987; Crowne and Marlowe 1964) might have been too quick to consider social desirability and self-monitoring as traits of individuals without making their scales more situation specific. Future studies should examine whether individuals have a general need for social approval, as well as a need for professional approval that is affected by various situational factors. We also need further research to determine whether a patient's need for professional approval changes over time.

VI. CONCLUSION

The fact that the social desirability scale correlated strongly with the compliance of the MEMS patients, suggests a need for more research looking at the effects of social desirability on patient compliance with medication

regimens. Also, future studies should examine whether the need or desire for professional approval is the same as or different from an individual's general desire for social approval.

Although social desirability was not found to correlate strongly with reporting of noncompliance, this study demonstrates that researchers should be looking at possible situational and social factors that could be influencing an individual's willingness to report noncompliance. The fact that times per day correlated strongly with reporting behavior suggests that researchers need to examine more carefully the reasons why individuals may unintentionally and intentionally exaggerate their compliance rates. If greater a distinction could be made between unintentional and intentional reasons for errors in reporting noncompliance, perhaps social desirability would correlate more with reporting behavior. A larger sample size or a sample followed for a longer period of time than a month also might find more of a correlation between desirability and reporting of noncompliance.

VII. FOOTNOTES

[1] In this study, noncompliance was defined in terms of percentage of doses missed by patients. Therefore, the two individuals who had stopped the target medication were not included in the compliance analysis, because they had duration errors rather than dosing errors.

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IX. TABLES

*Table 1: Summary of Studies Comparing Patients' Reports of Compliance with an Objective Measure of Compliance**

	Percent Accuracy[a]	Percent Sensitivity[b]	Percent Positive Predictive Value[c]
Park and Lipman (1964)	59.8	25.0	88.2
Gordis (1969)	68.9	46.2	100.0
Sackett (1978)	78.1	53.0	90.0
Gilbert (1980)	70.4	19.1	50.0
Inui (1981)	67.6	55.3	88.3
Stewart (1987)	75.0	80.0	69.2

*** adapted from Stewart (1987)**

[a] Accuracy is the ability of the interview to detect true compliers and true noncompliers.

[b] Sensitivity is the ability of the interview to detect noncompliers.

[c] Positive predictive value is the ability of the interview to detect true noncompliers.

TABLE 2: Breakdown of the Scale into the Three Parts of the Proposed Definition of Social Desirability*

	Student Sample		Patient Sample	
	Mean	SD	Mean	SD
A. Patient's need to gain approval				
1. I want my doctor to think that I am a good patient.[b]	3.27	.53	3.09	.53
2. I do not care whether my doctor likes me or not.*	2.70	.79	3.09	.81
3. I think it is important for my physician to like me.[a]	3.00	.69	----	---
4. I think it is important for my pharmacist to like me.[b]	2.42	.64	2.44	.70
5. I want my pharmacist to think I am a good patient.[a]	2.46	.58	----	---
6. I do not care whether my pharmacist thinks I am a good patient or not.[b]*	2.62	.75	2.67	.84
B. Perceived threat				
1. I do not like to ask my doctor questions if he or she seems too busy.[b]	1.85	.68	2.09	.81
2. I never feel intimidated by my doctor.*	2.5	.71	1.91	.81
3. I'm afraid my doctor would get angry if I was not following his/her instructions.	2.35	.56	2.28	.63
4. I do not like to ask the pharmacist questions if he or she seems too busy.	2.31	.62	----	---
5. I'm afraid the pharmacist would get mad at me if I didn't take my medications the way I am supposed to.[a]	1.92	.63	2.09	.78
6. I never feel intimidated by my pharmacist.*	1.96	.77	1.81	.59
C. Ability of patient to modify behavior to gain approval				
1. I find it hard to tell my doctor if I haven't taken all of my medications.	2.31	.79	1.95	.62
2. I find it easy to ask my doctor questions if I do not understand something.[a]*	1.89	.52	----	---
3. I find it hard to talk to my doctor about problems I may be having with my medications.	1.81	.49	1.53	.63
4. I find it hard to ask my pharmacist questions if I do not understand something.	1.54	.51	1.81	.66
5. I find it easy to talk to my pharmacist about problems I may be having with my medications.*	1.92	.80	1.79	.64
6. I find it easy to tell my pharmacist if I haven't taken all of my medications.*	2.34	.56	2.19	.66

* Response scale: Strongly Disagree/Disagree/Agree/Strongly Agree

[a] Items dropped based on reliability analysis using student sample.

[b] Items dropped based on reliability analysis using patient sample.

* Reverse coded items.

Table 3: List of Variables Used in Analysis

VARIABLE NAME/DESCRIPTION	CODING
EDUC - Number of years of schooling	Continuous
AGE - Age in years	Continuous
SEX - Sex	0=male 1=female
MEMS - Does patient have MEMS or not.	0=no 1=yes
TIMESDAY - Number of times per day patient takes target medication.	Continuous
SCHEDRX - Number of scheduled medications patient is on.	Continuous
TFRQERM1 - Percent of prescribed doses taken based on pill count (month assessment)	Continuous
TFRQERM2 - Percent of prescribed doses taken based on MEMS (month assessment).	Continuous
REPORTWR - The percentage of prescribed doses reported to have been taken by the patient minus the percentage of prescribed doses actually taken in the past week.	Continuous
DESIRE - Sum of 10 social desirability scale items.	Continuous

Table 4: Descriptive Statistics and Reliability of Social Desirability Scale

	Descriptive Statistics			Cronbach's
	Range	Mean	SD	alpha
A. TOTAL STUDENT SAMPLE (N=108)				
18-Item Scale	24-54	43.54	5.31	.74
B. STUDENTS WHO HAD BEEN TO A PHYSICIAN AND PHARMACIST WITHIN THE LAST 3 MONTHS (N=26)				
18-Item Scale	24-52	41.15	6.3	.86
14-Item Scale	20-41	31.89	5.1	.84
C. PATIENT SAMPLE (N=43)				
14-Item Scale	16-38	31.09	4.3	.56
10-Item Scale	10-27	20.47	3.6	.71

Table 5: Compliance Among MEMS (N=21) and nonMEMS (N=19) Patients

Level of compliance Percent (%)	MEMS Patients N (%)	NonMEMS Patients N (%)
0	1 (4.8)	0 (0)
1-50	0 (0)	1 (5.3)
51-75	2 (9.5)	2 (10.5)
76-80	2 (9.5)	1 (5.3)
81-90	5 (23.8)	4 (21.1)
91-99	5 (23.8)	3 (15.8)
100	5 (23.8)	7 (36.8)
101-110	1 (4.8)	1 (5.3)

Table 6: Descriptive Statistics and Zero Order Correlation Matrix for Selected Independent Variables and Patient Compliance for Month: MEMS Patients Only (N=21) [a]

VARIABLE	1.	2.	3.	4.	5.	6.	7.
1. COMPLIA[b]	1.00	.61**	-.14	.17	.07	.19	-.38*
2. DESIRE		1.00	.11	.33#	-.32#	-.02	.03
3. AGE			1.00	.05	-.24	-.06	.45*
4. SEX				1.00	-.04	.08	.07
5. EDUC					1.00	.31#	-.09
6. TIMESDAY						1.00	.05
7. SCHEDRX							1.00
MEAN	**86.4**	**19.6**	**54**	**0.19**	**13.4**	**1.49**	**3.33**
STD DEV	**22.5**	**3.93**	**12.2**	**0.40**	**2.29**	**0.50**	**1.15**

[a] **Table shows Pearson correlation coefficient for MEMS patients only.**

[b] **COMPLIA (COMPLIANCE-MEMS) equals percentage of prescribed doses taken according to MEMS data.**

 # p < .10, * p < .05, **p < .01

Table 7: Descriptive Statistics and Zero Order Correlation Matrix for Selected Independent Variables and Patient Compliance for Month: nonMEMS Patients Only (N=19) [a]

VARIABLE	1.	2.	3.	4.	5.	6.	7.
1. COMPLIA[b]	1.00	-.16	.29	-.08	.02	-.26	-.26
2. DESIRE		1.00	-.41*	.24	-.29	.11	-.36#
3. AGE			1.00	.01	-.04	.20	.22
4. SEX				1.00	-.35#	-.03	.14
5. EDUC					1.00	-.01	.39#
6. TIMESDAY						1.00	-.07
7. SCHEDRX							1.00
MEAN	**89.1**	**21.6**	**51.4**	**0.63**	**13.6**	**1.68**	**3.31**
STD DEV	**15.9**	**3.06**	**11.4**	**0.49**	**2.75**	**0.82**	**1.00**

[a] **Table shows Pearson Correlation Coefficient for NONMEMS patients only.**

[b] **COMPLIA (COMPLIANCE-nonMEMS) equals percentage of prescribed doses taken according to pill count data.**

 # p < .10, * p < .05, **p < .01

Table 8: *Fitted Regression Equation Predicting Patient Compliance: MEMS Patients Only (N=21)*

	b	(SE of b)	Beta	T
SCHEDRX	-7.73	3.18	-.395	-2.43*
DESIRE	3.56	.934	.619	3.80**
CONSTANT	42.32	21.21	-	1.99#

Multiple R	.724
R-square	.524
R-square (adj)	.472
F-ratio	9.94
Sig. F-ratio	.0012

 # p< .10, * p< .05, **p < .01 (one-tailed test)

Table 9: Descriptive Statistics and Zero Order Correlation Matrix for Selected Independent Variables and Patient Reporting of Noncompliance (N=20)[a]

VARIABLE	1.	2.	3.	4.	5.	6.	7.	8.
1. DISCREP[b]	1.00	.00	-.31#	.22	-.11	.47*	.00	-.29
2. DESIRE		1.00	-.39*	.21	-.54**	.07	-.40*	-.14
3. AGE			1.00	-.03	-.18	.05	.40*	.23
4. SEX				1.00	-.21	-.04	-.39*	-.29
5. EDUC					1.00	-.32#	.23	-.21
6. TIMESDAY						1.00	-.23	.01
7. SCHEDRX							1.00	.08
8. MEMS								1.00
MEAN	**17.7**	**20.95**	**51.3**	**0.4**	**14**	**1.57**	**3.3**	**0.55**
STD DEV	**11.3**	**3.21**	**13.4**	**0.5**	**2.94**	**0.59**	**0.92**	**0.51**

[a] **Table shows Pearson correlation coefficients for patients with compliance less than 93% only.**

[b] **DISCREP (REPORTING-DISCREPANCY) equals the percentage of prescribed doses reported to have been taken by the patient minus the percentage of prescribed doses actually taken in the past week**

 # $p < .10$, * $p < .05$, ** $p < .01$

Table 10: Final Regression Equation Predicting Patients' Reports of Noncompliance (REPORTWR) (N=20) [a]

	b	(SE of b)	Beta	T
TIMESDAY	9.30	3.79	.486	2.45*[b]
AGE	-.284	.168	-.336	-1.69#
CONSTANT	17.72	10.46	-	1.69#

Multiple R	.577
R-square	.333
R-square (adj)	.254
F-ratio	4.24
Sig. F-ratio	.032

[a] Table includes only patients with compliance less than 93%.
[b] One-tail test

 # p< .10 , * p< .05

APPENDIX A: Pretest packet given to pharmacy students

Page(s)

Item 1: Cover letter to pharmacy students

(letterhead)

Dear Fellow Pharmacy Students:

For those of you who do not know me, my name is Betsy Sleath. I'm a pharmacist who is a graduate student in social and behavioral pharmacy working with Bonnie Svarstad.

Currently, I am working on my Master's thesis and need your help. Could you please answer the following questions as honestly as possible? They should only take about ten minutes to fill out. There are two sections. The first section contains 18 items that social psychologists have used in previous studies of interpersonal relationships. The second section contains 18 questions that I have written about patient relationships with their doctors and pharmacists.

All of your answers will be kept confidential. However, if you would like an interpretation of your results, please put your name and address on the back of the last page of this packet. I will send you the results early next fall.

I really appreciate your help. Have a great summer!

Sincerely,

Betsy Sleath, R.Ph.
UW-Madison, School of Pharmacy

BLS:sah

Item 2: Snyder's Self-Monitoring Scale [a]

The statements listed below concern your personal reactions in a number of different situations. No two statements are exactly alike, so consider each statement carefully before answering. If a statement is true or mostly true as applied to you, circle the T. If a statement is false or not usually true as applied to you, please circle the F.

1. I find it hard to imitate the behavior of other people. ..... T F

2. At parties and social gatherings, I do not attempt to do or say things that others will like. ..... T F

3. I can only argue for ideas which I really believe. ..... T F

4. I can make impromptu speeches even on topics about which I have no information. ..... T F

5. I guess I put on a show to impress or entertain others. ..... T F

6. I would probably make a good actor. ..... T F

7. In a group of people I am rarely the center of attention. ..... T F

8. In different situations and with different people, I often act like very different people. ..... T F

9. I am not particularly good at making other people like me. ..... T F

10. I am not always the person I appear to be. ..... T F

11. I would not change my opinions (or the way I do things) in order to please someone or win their favor. ..... T F

12. I have considered being an entertainer. ..... T F

13. I have never been good at games like charades or improvisational acting. ..... T F

14. I have trouble changing my behavior to suit different people and different situations. ..... T F

15. At a party I let others keep the jokes and stories going. ..... T F

16. I feel a bit awkward in public and do not show up quite as well as I should. ..... T F

17. I can look anyone in the eye and tell a lie with a straight face (if for the right end). ..... T F

18. I may deceive people by being friendly when I really dislike them. ..... T F

[a] Items 1, 2, 6, 7, 9, 11, 13, 14, 15, and 16 were reverse coded.

Item 3: Proposed Social Desirability Scale [a]

A. When was the last time you saw a physician? _____

B. Do you usually go to the same doctor each time? **(Please circle)** YES NO

C. When was the last time you had a prescription filled? _____

D. Do you usually have your prescriptions filled at the same pharmacy each time? **(Please circle)** YES NO

The statements below concern your personal feelings about your doctor and pharmacist. No two statements are exactly alike, so consider each statement carefully before answering. Please circle whether you strongly agree (SA), agree (A), disagree (D), or strongly disagree (SD) with each statement that is listed below.

1. I want my doctor to think that I am a good patient. ..... **SA A D SD**
2. I do not like to ask my doctor questions if he or she seems too busy. .. **SA A D SD**
3. I think it is important for my pharmacist to like me. ..... **SA A D SD**
4. I do not care whether my pharmacist thinks I am a good patient or not. **SA A D SD**
5. I find it hard to tell my doctor if I haven't taken all of my medications. **SA A D SD**
6. I find it hard to ask my pharmacist questions if I do not understand something. ..... **SA A D SD**
7. I never feel intimidated by my doctor. ..... **SA A D SD**
8. I find it easy to talk to my pharmacist about problems I may be having with my medications. ..... **SA A D SD**
9. I do not care whether my doctor likes me or not. ..... **SA A D SD**
10. I do not like to ask the pharmacist questions if he or she seems too busy. ..... **SA A D SD**
11. I'm afraid my pharmacist would get mad at me if I didn't take my medications the way I am supposed to. ..... **SA A D SD**
12. I want my pharmacist to think that I am a good patient. ..... **SA A D SD**
13. I think it is important for my doctor to like me. ..... **SA A D SD**

14. I'm afraid my doctor would get angry if I was not following his instructions. ..... **SA A D SD**

15. I find it easy to ask my doctor questions if I do not understand something. ..... **SA A D SD**

16. I find it easy to tell my pharmacist if I haven't taken all of my medications. ..... **SA A D SD**

17. I never feel intimidated by my pharmacist. ..... **SA A D SD**

18. I find it hard to talk to my doctor about problems I may be having with my medications. ..... **SA A D SD**

[a] Items 4, 7, 8, 9, 15, 16 and 17 were reverse coded.

Demographics

1. How old are you? _____

2. Sex (**Circle one**): Male Female

3. Ethnic status (**Circle one**): Asian Black
   Hispanic White
   Native American Other:_____

4. What is your father's occupation? _____

5. What is your mother's occupation? _____

6. Do you already have a Bachelor's degree? **Yes** **No**

APPENDIX B: Materials sent to patients when enrolling in study

Page(s)

Item 1A: Consent form for MEMS Patients

I, _____, agree to participate in a research study
(PRINT NAME)

sponsored by the University of Wisconsin-Madison, School of Pharmacy. The general purpose of this study is to gain a better understanding of how people take their medications, how they feel about different medications and medication containers, and needs for drug information and assistance. The research study will involve the following activities:

A. Authorized personnel will review my medical and pharmacy records.

B. One-half of the patients who participate will be given a new type of medication container that will count the number of times it is opened.

C. A home interview will be held in about a month. The interview will include questions about my medication, possible need for information and assistance, and difficulty remembering. The interview will take about a half an hour.

D. My medication _____ will be filled in a special medication container. I am free to withdraw my consent and to stop participating at any time without influencing my subsequent care. I have the right to be provided with answers to my questions about this study and the measures which will be taken to protect my privacy and welfare.

All data will be kept confidential. When I enter the study I will be assigned a number. The key to patient names and numbers will be kept in a locked file. My name will not be attached to interview forms or information pulled from my medical records. A summary of this research study will be given to my pharmacy.

I have read the above and give my voluntary consent to these research activities.

_____ _____
Investigator Signature Date

_____ _____
Patient Signature Date

Item 1B: Consent form for nonMEMS Patients

I, _____, agree to participate in a research study
(PRINT NAME)

sponsored by the University of Wisconsin-Madison, School of Pharmacy. The general purpose of this study is to gain a better understanding of how people take their medications, how they feel about different medications and medication containers, and needs for drug information and assistance. The research study will involve the following activities:

A. Authorized personnel will review my medical and pharmacy records.

B. One-half of the patients who participate will be given a new type of medication container that will count the number of times it is opened.

C. A home interview will be held in about a month. The interview will include questions about my medication, possible need for information and assistance, and difficulty remembering. The interview will take about a half an hour.

I am free to withdraw my consent and to stop participating at any time without influencing my subsequent care. I have the right to be provided with answers to my questions about this study and the measures which will be taken to protect my privacy and welfare.

All data will be kept confidential. When I enter the study I will be assigned a number. The key to patient names and numbers will be kept in a locked file. My name will not be attached to interview forms or information pulled from my medical records. A summary of this research study will be given to my pharmacy.

I have read the above and give my voluntary consent to these research activities.

_____ _____
Investigator Signature Date

_____ _____
Patient Signature Date

Item 2A: Cover letter sent to MEMS patients

(letterhead)

Dear _____:

Thanks for agreeing to participate in our research study. I assure you that all information I collect will be kept confidential. Each person that has agreed to the study has been assigned an ID number. Therefore, all information I collect will be put under that number rather than under your name. Patient names and ID numbers will be kept in a locked file at the School of Pharmacy.

Could you please sign the enclosed consent form and return it to me as soon as possible? The next time you have your _____ (enalapril or captopril) refilled the pharmacist will put a special cap on the medication bottle. I will call you shortly after that to set up an interview about a month from when you received the special cap.

Please feel free to call me at 249-2749 if you have any questions.

Sincerely,

Betsy Sleath, RPh
UW-Madison
School of Pharmacy

Item 2B: Cover letter for nonMEMS Patients

(letterhead)

Dear _____:

Thanks for agreeing to participate in our research study. I assure you that all information I collect will be kept confidential. Each person that has agreed to the study has been assigned an ID number. Therefore, all information I collect will be put under that number rather than under your name. Patient names and ID numbers will be kept in a locked file at the School of Pharmacy.

Could you please sign the enclosed consent form and return it to me as soon as possible? I look forward to meeting you on _____ (date of interview) at _____ (time of interview).

Please feel free to call me at 249-2749 if you have any questions.

Sincerely,

Betsy Sleath, RPh
UW-Madison
School of Pharmacy

APPENDIX C: Brief Medication Questionnaire and Follow-up Interview

BRIEF MEDICATION QUESTIONNAIRE (BMQ)
(Confidential) **IDs**_____

1. Please list below all of the medications you took in the PAST WEEK. For each medication you list, please answer each of the questions in the box below.

Medication Name and Strength	How many days did you take it?	IN THE PAST WEEK: How many times per day did you take it?	How many pills did you take each time?	How many times did you miss taking a pill?	For what reason were you taking it?	How well does the medicine work for you? 1 = well 2 = okay 3 = not well
EXAMPLE:						
_____	_____	_____	_____	_____	_____	1 2 3
_____	_____	_____	_____	_____	_____	1 2 3
_____	_____	_____	_____	_____	_____	1 2 3
_____	_____	_____	_____	_____	_____	1 2 3
_____	_____	_____	_____	_____	_____	1 2 3
_____	_____	_____	_____	_____	_____	1 2 3
_____	_____	_____	_____	_____	_____	1 2 3

2. Below is a list of problems that people sometimes have with their medicines. Please check how hard it is for you to do each of the following:

	Very Hard	Somewhat Hard	Not Hard At all
Open or Close the medication bottle	_____	_____	_____
Read the Print on the bottle	_____	_____	_____
Remember to take all the pills	_____	_____	_____
Get your refills in time	_____	_____	_____
Take So Many Pills at the same time	_____	_____	_____

3. Do any of your medications bother you in any way? Circle one: YES NO

IF YES, please name the medication and check below how much it bothers you.

Name Of Medication	How much did it bother you? A Lot	Some	A Little	Never	In what way did it bother you?
EXAMPLE:					
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

4. Was it harder to remember to take your medication at certain times of the day? Circle one: YES NO

IF YES, circle what times were hardest. Morning Mid-day Early evening Bedtime

5. Was it harder to remember to take your medication on certain days? Circle one: YES NO

IF YES, circle what days were hardest. Mon. Tues. Wed. Thurs. Fri. Sat. Sun.

Now we'd like to ask you some questions just about your Captopril.

6. Did you take Captopril yesterday? Circle one: YES NO

If YES, please list below the times of day you took it (circle am or pm) and the number of Captopril pills you took each time.

Number of Captopril Pills	Time Taken	Circle am or pm
I took _____ Captopril pills at	_____	am/pm
I took _____ Captopril pills at	_____	am/pm
I took _____ Captopril pills at	_____	am/pm
I took _____ Captopril pills at	_____	am/pm

7. Was yesterday unusual? Circle one: YES NO

8. People sometimes find it hard to follow the doctor's instructions for a variety of reasons. Thinking just about Captopril, how many times this past week did you:

	0	1	2	3	4	5+
Forget to take a pill?	___	___	___	___	___	___
Add an extra pill?	___	___	___	___	___	___
Not take a pill on purpose?	___	___	___	___	___	___

9. Did your doctor recommend times that you should take Captopril? Circle one: YES NO

IF YES, circle the times that were recommended. Morning Mid-day Early evening Bedtime

10. Did your doctor recommend taking Captopril at the same time every day? Cirlce one: YES NO

IF YES, how many hours apart? _____ hours

11. How necessary do you feel it is to take Captopril for your health?

___Very Necessary ___Somewhat Necessary ___Not At All Necessary

12. Overall, how satisfied are you with Captopril?

___Very Satisfied ___Somewhat Satisfied ___Not At All Satisfied

13. Please check if you believe Captopril has caused any of the following:

____Metallic Taste ____Cough ____Dizziness

____Feeling Lightheaded ____Stomach Upset ____Rash

If you checked any of the above, have you ever cut the amount of Captopril to reduce these side effects?

Circle one: YES NO

14. What questions or concerns do you have that might be asked of your doctor or pharmacist?

Item 2: Follow-up Interview with Patient
Part One: Review of BMQ

1. If they did not list a prescribed medication in question one, ask the patient: "What about your _____?" Comments: _____
_____
_____

2. For question 3, ask the patient: "What did you do when the medication bothered you?" (Could probe with "Did you talk to your doctor or pharmacist?") Comments:_____
_____
_____

3. If the patient found it harder to remember his/her medication at certain times of day, ask: "Why was it harder to remember your medication at ___ ____?" Comments:_____
_____

4. If the patient found it harder to remember his/her medication on certain days, ask: "Why was it harder to remember your medication on _____ ____?" Comments:_____
_____

5. For question 7, if yesterday was unusual for the patient ask: "Why was yesterday unusual?" Comments:_____
_____

6. For question 8, if the patient forgot to take a pill, added an extra pill, or didn't take a pill on purpose ask: "Why did you _____?" Comments:_____

7. For question 9, if doctor recommended times, were they specific? Comments:_____

8. For question 10, ask: "Do you think it matters how many hours apart you take your captopril or enalapril?" Comments:_____
_____

9. For question 13, ask them: "Do you feel the captopril or enalapril has caused anything else?" Comments:_____
_____

Part Two: Other Medication Questions

1. Please describe how you remember to take your medications each day.

_____

_____

_____

_____

2. On a scale from 1 to 10, how much does taking medications intrude into your lifestyle? (give them an index card) 1 = Not at all 10 = A lot

_____

3. What do you feel would happen if you stopped taking your captopril or enalapril? _____

_____

4. Think of yesterday:

   A. What time did you wake up? _____
   B. What time did you go to bed? _____
   C. At what times did you eat your meals? _____
   D. What do you usually do on a typical day?_____

   _____

5. How long have you been on captopril or enalapril? _____

6. When did you first learn that you had _____? _____

_____

7. Were you on different medications for your hypertension before you were put on captopril or enalapril? YES NO

   If YES, what were they?_____

   _____

   If YES, how do you feel about taking captopril or enalapril compared to those other medications?_____

   _____

   _____

Part Three: Demographics

1. How many years of schooling have you completed? _____ Other comments:_____

2. Are you currently employed? (Probe for status) _____

   a. self-employed
   b. employed part-time
   c. employed full-time
   d. unemployed
   e. retired

3. (If employed) What is your occupation? _____

   (If unemployed) What do you usually do? _____

   (If retired) What was your occupation? _____

   Other comments:_____

4. How many people do you live with? _____
   (If one or more) Who are they? _____

5. How old are you? _____

6. Sex: _____

7. Race: _____

PILL COUNT: _____

APPENDIX D: Forms sent to patients for follow-up study

Item 1A: Cover letter sent to nonMEMS Patients

(letterhead)

Dear_____:

I enjoyed talking with you on the telephone. Thank you for agreeing to read through the attached consent form and brief questionnaire. If you agree to participate, would you please sign the consent form, fill out the questionnaire then return both to me as soon as possible. I would like to remind you at this time that all of your answers will be kept strictly confidential.

We greatly appreciate your assistance with this study. If you have any questions, please feel free to call me at 249-2749 (home) or 262-4723 (work).

Sincerely,

Betsy Sleath, RPh
UW-Madison
School of Pharmacy

Item 1B: Cover sent to MEMS Patients

(letterhead)

Dear_____:

I enjoyed talking with you on the telephone. Thank you for agreeing to read through the attached consent form and brief questionnaire. If you agree to participate, would you please sign the consent form, fill out the questionnaire then return both to me as soon as possible. I would like to remind you at this time that all of your answers will be kept strictly confidential.

When you begin using your new supply of _____ (enalapril or captopril) each month, please place the special medication cap on each new bottle. I will call you in four months to schedule and appointment so I can replace the special cap with a traditional type of cap.

We greatly appreciate your assistance with this study. If you have any questions, please feel free to call me at 249-2749 (home) or 262-4723 (work).

Sincerely,

Betsy Sleath, RPh
UW-Madison
School of Pharmacy

Item 2A: Consent form sent to nonMEMS Patients

I, _____, agree to participate in a continuation of the
PRINT NAME

research study being conducted by the University of Wisconsin-Madison, School of Pharmacy. The purpose of this continuation study is to gain a better understanding of how people take their medications over a longer period of time, and how people feel about their relationships with their physicians and pharmacists. This continuation study will involve the following activities:

a) Filling out a Brief Questionnaire about my relationships with my physician(s) and pharmacist(s).

I understand that this study is entirely voluntary and I may stop participating at any time without influencing my subsequent care. I have the right to have all my questions answered about this continuation study and the measure which will be taken to protect my privacy and welfare.

All data will be kept confidential. Only the researchers will see my Questionnaire and it will not be shown to my physician or pharmacist. The key to patient names and numbers will be kept in a locked file. My name will not be attached to the Questionnaire.

I have read the above and give my voluntary consent to these research activities.

_____
Investigator Signature/Date

_____
Patient Signature/Date

Item 2B: Consent form for MEMS Patients

I, _____, agree to participate in a continuation of
PRINT NAME

the research study being conducted by the University of Wisconsin-Madison, School of Pharmacy. The purpose of this continuation study is to gain a better understanding of how people take their medications over a longer period of time, and how people feel about their relationships with their physicians and pharmacists. This continuation study will involve the following activities:

a) Using the special medication cap on my _____ prescription for four more months, and

b) Filling out a brief questionnaire about my relationships with my physician(s) and pharmacist(s).

I understand that this study is entirely voluntary and I may stop participating at any time without influencing my subsequent care. I have the right to have all my questions answered about this continuation study and the measure which will be taken to protect my privacy and welfare.

All data will be kept confidential. Only the researchers will see my questionnaire and it will not be shown to my physician or pharmacist. The key to patient names and numbers will be kept in a locked file. My name will not be attached to the questionnaire.

I have read the above and give my voluntary consent to these research activities.

_____
Investigator Signature/Date

_____
Patient Signature/Date

Item 3: Social Desirability Scale

The statements below concern your personal feelings about your physician and pharmacist. No two statements are exactly alike, so consider each statement carefully before answering. Please circle whether you Strongly Agree (SA), Agree (A), Disagree (D), or Strongly Disagree (SD) with each statement listed below:

1. My physician always takes time to listen to my questions and concerns. .... SA A D SD
2. I do not like to ask my physician questions if he or she seems too busy. ..... SA A D SD
3. I think it is important for my pharmacist to like me. ..... SA A D SD
4. I do not care whether my pharmacist thinks I am a good patient or not. ..... SA A D SD
5. My physician always takes my point of view into account when making decisions about my medications. ..... SA A D SD
6. I find it hard to ask my pharmacist questions if I do not understand something. ..... SA A D SD
7. I never feel intimated by my physician. ..... SA A D SD
8. I find it easy to talk to my pharmacist about my problems I may have with my medication. ..... SA A D SD
9. I do not care whether my physician likes me or not. ..... SA A D SD
10. My pharmacist always takes the time to listen to my questions and concerns. ..... SA A D SD
11. I'm afraid my pharmacist would get mad at me if I didn't take my medications the way I am supposed to. ..... SA A D SD
12. I want my physician to think that I am a good patient. ..... SA A D SD
13. I find it hard to tell my physician if I haven't taken all of my medications. ..... SA A D SD
14. I'm afraid my physician would get angry if I was not following his/her instructions. ..... SA A D SD
15. My pharmacist never shows any interest in my point of view. ..... SA A D SD
16. I find it easy to tell my pharmacist if I haven't taken all my medications. ..... SA A D SD
17. I never feel intimated by my pharmacist. ..... SA A D SD
18. I find it hard to talk to my physician about problems I may be having with my medications. ..... SA A D SD

Item 4: Letter sent to Nonresponders

(letterhead)

Dear_____:

I am writing to confirm whether you received the mail questionnaire I sent you about two weeks ago. I have enclosed another copy of the consent form and questionnaire in case you did not receive one previously.

If you agree to participate, would you please sign the consent form, fill out the questionnaire then return both to me as soon as possible. I would like to remind you at this time that all of your answers will be kept strictly confidential.

We greatly appreciate your assistance with this study. If you have any questions, please feel free to call me at 249-2749 (home) or 262-4723 (work).

Sincerely,

Betsy Sleath, RPh
UW-Madison
School of Pharmacy