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COMPLIANCE, MEMORY LOSS, AND DEPRESSION
IN THE ELDERLY

By

Barbara J. Clark

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

Department of Psychology

1991

ABSTRACT

COMPLIANCE, MEMORY LOSS, AND DEPRESSION IN THE ELDERLY

By

Barbara J. Clark

The intent of this study was to identify potential risk factors for unintentional noncompliance with prescribed medication regimens in an elderly population. Variables hypothesized to affect ability to comply included cognitive impairment, depressed feelings, complexity of dosing regimen, and age of participant. In addition, two other variables, reliance on memory aids and intent to comply with medication instructions, were included in the final analysis.

The 40 elderly participants who completed the study resided independently in the community and took their prescribed medications without help. The participants provided demographic information and a medical history.

Assessment instruments included the Beck Depression Inventory, the Geriatric Depression Scale, the Mini Mental State Examination, and the Senile Dementia of the Alzheimer Type (SDAT) battery. Compliance percentage and complexity were determined by pill counts.

Results using Chi Square analysis suggest there is a relationship between memory loss, intent to comply, and actual compliance. A possible relationship between depression and compliance is discussed.

ACKNOWLEDGMENTS

I would like to thank Dr. Norman Abeles, my thesis chairman, for his guidance, support, and encouragement. I would also like to thank Dr. Robert Caldwell and Dr. Raymond Frankmann for their guidance and consideration.

I would like to thank my husband, Lee, for his professional and personal contribution to this study. I would not have completed this without his help.

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INTRODUCTION

Elderly persons represent 12% of the population in the United States, yet they consume over 30% of all drugs prescribed (Landry, Smyer, Tubman, Lago, Roberts, & Simonson, 1989). By the year 2000, they will represent 17% of the population and will account for over 50% of prescription drug use. Elderly Americans living independently in the community receive at least 20 prescriptions each year (Beller & Evans, 1987). It is not surprising that the elderly's expenditure on drugs is disproportionately greater than that of the general population (Swift, 1988). It is also more likely for an elderly individual to have a chronic disease requiring treatment with drugs (German, Klein, McPhee, & Smith, 1982). The simultaneous treatment of several diseases increases the risk of adverse drug reactions, and drugs have been estimated to be directly related to 20-33% of all hospital admissions of those over 85. It is clear that drug toxicity is more severe and frequent in the elderly and that they are more sensitive to adverse side effects and drug interactions than are younger adults who consume the same drugs.

Both normal aging and the disease processes of chronic illness make older adults more susceptible to adverse reactions to prescription medicines. As an individual ages,

their body composition changes, resulting in alterations of the distribution, metabolism, and renal excretion of drugs (Kazis & Friedman, 1988). The elderly are more vulnerable physiologically, psychologically, and anatomically to the adverse effects of drugs, and the potential for serious harm is significantly greater.

One goal of a responsive health care system should be to assist the elderly in maintaining functional status. The majority of elderly patients live at home, so it appears that attempts to preserve their independence can be a considerable benefit, both in terms of quality of life to the individual and cost to the community (Currie, Moore, Friedman, & Warshaw, 1981). Understanding the factors which permit or threaten the maintenance of the elderly in their homes is helpful in keeping them there. One of these factors is the ability to take medication as prescribed. Meichenbaum and Turk (1987) view compliance as "the extent to which patients are obedient and follow instructions, proscriptions, and prescriptions of health care providers" (p. 20).

Noncompliance with prescribed medication can take two forms--intentional and unintentional. Intentional noncompliers choose not to follow instructions on how to take medication, while unintentional noncompliers try to follow instructions but are unable to for some reason.

According to some studies, up to 45% of the elderly do not take their medications as prescribed (Folkman, Bernstein, & Lazarus, 1987; Gabriel, Gagnon, & Bryan, 1977; Martin &

Mead, 1986; Morgan, Nowson, Murphy, & Snowden, 1986; Morrow, Von Leirer, & Sheikh, 1988). Furthermore, rates of noncompliance increase with the number of medications taken and the number of times a single medication is taken (Morrow et al., 1988). Statistics such as these underscore the need to study factors affecting noncompliance in the elderly since surveys show that 85% of patients over the age of 75 are responsible for taking their own medication (Wanderless & Davie, 1977).

Thus, it appears that the successful application of ambulatory programs for the control of disease demands that the health care provider be able to detect those elderly individuals who will be noncompliant. Furthermore, it has been documented that physicians overestimate the degree of compliance among their patients and that their ability to predict whether or not a patient will comply with the medication regimen is no better than chance (Beck, 1985). It is well documented that patients generally overstate the extent of their compliance (Weibert & Dee, 1980). Over 25 years ago Schwartz, Wang, Zietz, and Goss (1962) recognized the need to identify reliable risk factors for noncompliance so that the health care provider might be able to detect the potentially unreliable patient before treatment was begun. More recently, Pace (1989) has reported that the incorporation of functional assessment into the routine ambulatory care of the elderly is supported in the literature. Assessment of the impact of aging on an elderly

individual's ability to function independently in the community is critical in providing appropriate health care. Since it appears that the majority of ambulatory elderly patients with chronic illness do not follow their prescribed treatment and that the physician is often the last to know that the patient is not complying, it is imperative to identify factors that influence noncompliant behavior.

In research on unintentional noncompliance, Wong and Norman (1987) state that poor compliance may be attributed to cognitive impairments associated with aging. Between 5-20% of persons over 65 suffer from dementia, a deterioration of intellectual capacity that includes serious declines in areas of cognition, memory, language, visual-spatial skills, and personality (Benson, 1982; Larson, Reifler, Featherstone, & English, 1984). Meyer and Schuna (1989) say that demented patients may have decreased ability to understand, remember, and follow through with the directions that would enable them to take their medications as prescribed. Since a large proportion of patients discharged from a general hospital are elderly and a substantial number are likely to exhibit impairment, this population would appear to be at high risk for cognitive failure to comply (Johnston, Clarke, Mundy, Cromarty, & Ridout, 1986). Thus, it appears that dementia as well as age-associated cognitive decline would affect the ability to comprehend and remember text, a vital component in the task of following dosage instructions. Elderly individuals are most susceptible to making mistakes because

they have significantly more complicated medications schedules, and the more drugs they take, the greater the likelihood of adverse drug reactions which may further impair cognitive abilities. Morrell, Park, and Poon (1989) reported that elderly persons are unable to process information as well as younger adults whenever the amount of information presented is increased. In addition, gradual reductions in cognitive abilities may be adversely affected by diseases that elderly persons seek health care for (Morrow et al., 1989).

Disease is not the only factor that effects cognitive abilities; mood has been implicated in many studies. It is apparent that depression in particular is common among the elderly, with prevalence rates ranging from 10-20% (Haggerty, Golden, Evans, & Janowsky, 1988). As the intensity of the depression increases, cognitive processes are disrupted, and less can be learned and remembered (Weingartner, Cohen, Murphy, Martello, & Gerdt, 1981). Furthermore, both dementia and depression can coexist in the elderly, and there is a trend for those with moderate to severe depression to manifest more cognitive dysfunction (Cavanaugh & Wettstein, 1983). A depressed emotional state could be a cause of noncompliance in that the drug reminds the elderly individual they are sick, so they consequently "forget" to take the medication (Weibert & Dee, 1980). Therefore, although there is a paucity of research on the subject of unintentional noncompliance, it seems possible that the existence of

depression in the elderly could adversely effect their ability to comply with complicated dosing schedules.

No conclusive data have emerged that identify the factors that affect unintentional noncompliance in the elderly, but it is important to do so since the effects of inappropriate drug use would be more severe among the elderly as compared to the general population. Few researchers address cognitive function in the elderly and relate it specifically to drug compliance; even fewer studies relate depression specifically to drug compliance. Concern about the misuse of drugs among the elderly centers on the deleterious effects on day-to-day functioning of mistakes in dosing. The effects of hyper and/or hypo compliance can be seen physiologically by identifying somatic health symptoms and dysfunctions in the central nervous system, as well as psychologically in the way the elderly cope with everyday stresses (Folkman et al., 1987). Spagnoli et al. (1989) state that factors which influence compliance must be researched since errors in drug taking have potentially more serious effects in the elderly. The two factors mentioned here, the effects of dementia and/or depression on unintentional noncompliance in combination with increasing age, should be significant and most severe when the elderly try to understand and remember complex medication schedules.

While it is important to identify risk factors that would identify elderly who are unintentional noncompliers, the elderly who are intentional noncompliers should be

mentioned. Elderly patients choose to discontinue drug therapy for many reasons, some of them being the failure to recognize the seriousness of their condition, the belief that once their symptoms disappear they are cured, the erroneous conclusion that the medication is not working as it should, the cost of the medication, and the deleterious side effects of the medication (Falvo, 1985; Weibert & Dee, 1980). It is not uncommon for elderly individuals to comply with one prescribed medication but to choose not to take their other prescribed drugs (Richardson, 1986). Richardson (1986) cites one study indicating that 73% of noncompliance is intentional with the most common reason for not complying being the belief that the drug was not needed in the dosage prescribed. Evidence seems to suggest that intentional noncompliance is prevalent among the elderly.

Finally, while there are many articles dealing with the problem of noncompliance, health care providers have neglected to integrate the management of the problem into their clinical practices. Improved function is an appropriate therapeutic goal for the elderly, especially if they are chronically ill. For busy, office-based health care professionals, "that goal is more easily realized if some means are available to regularly assess the functional abilities of elderly patients at risk" (Pace, 1989, p. 29). Distinguishing the causes of noncompliance, both unintentional and intentional, should be an important avenue for research. This study focuses specifically on identifying

possible causes of unintentional noncompliance.

The ability to screen for loss of functions on a routine basis represents a potential first step in identifying overlooked problems that demand attention, such as dementia and/or depression (Pace, 1989). If it is found that dementia and depression are factors that effect medication-taking behavior in the elderly, it will be useful for health care providers to have access to standardized, structured assessment instruments and questionnaires that will enable them to identify patients at risk for unintentional noncompliance so they can take preventive measures.

Therefore, it is the intent of this study to identify factors that affect unintentional noncompliance in the elderly and in turn to provide health care professionals with standardized assessment instruments and questionnaires which will reliably identify those elderly at risk.

Accordingly, the present study was set up to test six specific hypotheses:

1. There will be a statistically significant correlation between memory loss and compliance. Specifically, the community-dwelling elderly with more memory problems will be significantly less compliant than those with less memory problems.
2. There will be a statistically significant correlation between depression and compliance. Specifically, the community-dwelling elderly who are more depressed will be significantly less compliant than those who are not

depressed.

3. There will be a statistically significant correlation between the presence of dementia as well as depression and the ability to comply. Specifically, the community-dwelling elderly who are both demented and depressed will be significantly less compliant than those who are only depressed, only demented, or not depressed or demented.

4. There will be a statistically significant correlation between the complexity of the dosing regimen and compliance. Specifically, the community-dwelling elderly who have more complex regimens will be significantly less compliant than those who have less complex regimens.

5. There will be a statistically significant correlation between the age of participant and compliance. Specifically, as age of participant increases, ability to comply with dosing regimens will decrease.

6. These four variables--memory loss, depression, complexity of dosing schedule, and age--will fit a multiple regression model of compliance for the community-dwelling elderly population.

REVIEW OF THE LITERATURE

Memory Loss in the Elderly

Dementia is one of the major health problems in the elderly. Ciocon and Potter (1988) report that 50% of individuals over 60 complain of memory problems, with dementia the most common cause of memory impairment in the elderly. Stern and Bernick (1987) state that "dementia is a syndrome of diffuse disturbance of cognitive functions in an alert patient of sufficient severity to interfere with social or occupational performance; a defect in memory is always present" (p. 44). Although it is accepted that as individuals age there are declines in intellectual processing and memory, it is hard to distinguish age-associated declines from a dementing process (Morrow et al., 1988; Stern & Bernick, 1987). Early dementia is a disorder that primarily affects the elderly and is characterized by a wide range of symptoms such as failing attention and memory, errors of judgment, irritability, personality changes, and poor orientation (Haggerty et al., 1988; Meyer & Schuna, 1989; National Institute on Aging Task Force, 1980). The prevalence rate of dementia has been estimated to be between 5-20% for individuals over 65 years of age (Larson et al., 1989; Lazarus, Newton, Cohler, Lesser, & Schweon, 1987; McCartney & Palmateer, 1985; McIntyre & Frank, 1987; Small & Jarvik, 1982). Furthermore, dementia of the Alzheimer Type is the most common cause of dementia in the elderly

population (Larson et al., 1986; Bayer, Pathy, & Twining, 1987). The elderly individual with memory problems forgets names, overlooks appointments, fails to recall the day's events, leaves tasks unfinished, and becomes ignorant of the date, time of day, or season of the year (Roth, 1976).

Memory problems may be concealed by elderly persons who have high initial intelligence, but as these problems magnify, the individual is unable to recall past events as well.

Mild degrees of intellectual impairment are relatively common in the older adult population, and these individuals may be at risk for further dementing processes, or these may be age-associated (late-life forgetting) memory impairments. The earliest change is usually identified as a selective impairment of memory for recent events. Roth (1976) states that an elderly individual with dementia is characterized as having progressive impairment of memory and orientation for time and place, a decline in intellectual grasp and comprehension, deterioration of the personality, and mood lability.

It is important to assess for dementia in the elderly population even though symptoms of forgetfulness and difficulties in understanding and coping with life stresses are often attributed to old age (Bayer et al., 1987). In fact, many physicians overlook such symptoms and fail to recognize a dementing process (Bayer et al., 1987; Pace, 1989).

Depression in the Elderly

Another major problem in the elderly population is the presence of depression. The incidence of depression increases as age increases (NIA Task Force, 1980). The prevalence of depression in the elderly population has been estimated to be between 10-15%, and the prevalence of depressive symptoms is disproportionately greater in the elderly (Blazer, Hughers, & George, 1987; Good, Vlachonikolis, Griffiths, & Griffiths, 1987; Griffiths, et al., 1987; Reifler, Larson, & Hanley, 1982). Reifler, Larson, Teri, and Poulsen (1986) reported that 24% of the elderly have significant depressive symptoms. Freedman, Bucci, and Elkowitz (1982) report that the highest rate of depressive symptoms is found in those over 65 who live in the community. Indeed, depression is the most common psychological complaint among the aged. Blazer et al. (1987) cite studies which found the prevalence rate of depression to be 21% in one cohort of older adults and pervasive depression to be 13% for persons over the age of 65. Henderson and Kay (1984) cite a study that found the prevalence rate of depression in individuals over the age of 65 to be 8.1%. This sample was only made of community-dwelling elderly. They also reviewed another study that randomly selected persons over the age of 65 living in the community and found prevalence rates of depression to be 13%.

Because of the increased likelihood of multiple psychological, social, physical, and cognitive losses, the

elderly are at a greater risk for developing depression than any other age group. Salzman and Shader (1979) point out that in the context of declining function, limited coping strategies, loss of interpersonal support, and stress such as disease, it is not surprising that late-life depression evolves. They go on to say that the loss of health, cognitive abilities, coping strategies, employment, and independence, work to lower an older adult's self-esteem and bring on a depressive episode.

Dementia and depression are related, but the overlap between the two represents a diagnostic challenge (Spar, 1982). Unfortunately, it is difficult in some instances to determine whether an elderly individual is clearly experiencing memory problems as a result of intellectual impairment and decline in cognitive functioning. At times, it may appear that an older adult suffers from dementia, when in fact a depressive state appears as dementia (Thompson, 1986). This condition is referred to as pseudodementia, and it is different from true dementia in that the underlying depression of pseudodementia is treatable. Roth (1976) states that 15% of elderly persons who are depressed exhibit cognitive impairment. Clinical research has shown that the memory problems of older adults with pseudodementia improve once the depression is effectively treated (Salzman & Shader, 1979). In a case of true dementia this would not happen. It should be noted that some authorities question the entire concept of pseudodementia (Salzman & Gutfreund, 1986).

Pseudodementia is described by Wells (1970) as the syndrome in which dementia is mimicked by depression. Although their performance on mental status examinations may point to organic brain disease, this is usually not the case; their affective states usually inhibit their performance making it appear that they are demented. Many researchers have identified the presentation of an elderly person with pseudodementia as follows: a) complaints and distress over declining cognitive abilities, b) history of recent, abrupt onset of symptoms that fluctuate over time, and c) appearance of depression at examination (Benson, 1982; Black & Hughes, 1987; Caine, 1981; Feinberg & Goodman, 1984; Fopma-Loy, 1986; Haggerty et al., 1988; Jorm, 1986; Reding, Haycox, & Blass, 1985; Small & Jarvik, 1982; Spar, 1982).

Memory Loss and Depression in the Elderly

Although it appears true that depression can be masked by findings suggestive of dementia, depression and dementia can also coexist in an elderly individual (Devanand & Nelson, 1985; Reding et al., 1985; Stein & Bernick, 1987). Reifler et al. (1982) state that the concept of pseudodementia did not seem helpful in dealing with the mixed presentation of coexistent dementing and depressive disorders. Griffiths et al. (1987) found that increasing dementia is associated with increasing depression and that depression and dementia were mutually exclusive diagnoses. Reding et al. (1985) suggested that a relatively severe impairment of intellectual functioning might suggest the presence of a coexistent

dementing disorder along with depression. Davis and Robins (1989) found the presence of concurrent psychiatric disorders in demented elderly subjects, one of which was depression. Lazarus et al. (1987) found that elderly patients diagnosed with dementia had a significantly higher frequency of depressive symptoms and suggested that there might be a high frequency of concomitant depressive symptoms in elderly patients diagnosed with dementia. Reifler et al. (1982) found that depressive and dementia were distinct disorders in the elderly in that depression was not a universal feature of early dementia; two-thirds of the mildly depressed elderly patients did not meet the criteria for depression, and one-third had no recognizable symptoms of depression. Finally, Reifler et al. (1986) found that 25% of demented elderly patients also suffered from a depressive disorder.

In a study which used the Mini Mental State and the Beck Depression Inventory, researchers sought to relate the severity of depression and cognitive dysfunction when they coexist in an inpatient population (Cavanaugh & Wettstein, 1983). They found no relationship between the severity of depression and cognitive dysfunction among subjects younger than 65, and in those older than 65, only an insignificant trend was reported. Although the trend indicated that elderly patients with moderate to severe depression tend to have more cognitive dysfunction, the authors state that both conditions should be evaluated independently, as it appears the severity of depression is not directly related to

alterations in cognitive processes (Cavanaugh & Wettstein, 1983).

Age and Compliance in the Elderly

One of the factors that has been studied in association with compliance is the effect of increasing age. The evidence regarding the influence of age is confusing, and it is still not clear whether or not compliance decreases as age increases. German et al. (1982) found that patients over 65 were significantly less knowledgeable about their diseases than were younger patients and had less knowledge of the drugs prescribed, although knowledge was not related to compliance. They did not look at the specific relationship between age and compliance. Davis and Eichhorn (1960) found that the age of patients affected the direction and degree of change in compliance, with the younger age group continuing the highest rate of compliance. Some years later, Stewart and Cliff (1972) found that the tendency to be noncompliant seemed to be correlated with increasing age, although this was not consistent. In a review of the literature, Marston (1970) states that only two studies found younger patients are more likely to compliant than older. Lastly, Schwartz et al. (1962) found that when they separated their sample into two groups based on age (60-74; 75 and over), age was directly correlated to error-making, with the patients 75 and over making significantly more errors than patients under 75 years of age.

On the other hand, several studies determined that age

was not correlated with compliance. Malah (1966) and Neely and Patrick (1968) found that in an elderly population age made no difference in the identification of noncompliers. More recently, Spagnoli et al. (1989) found that the effect of age on compliance was minimal when comparing the age groups of "young-old" versus "very-old" (over 75). Wong and Norman (1987) also found that in an elderly subject population age was not a factor affecting compliance. Darnell, Murray, Martz, and Weinberger (1986) found the effect of age on compliance in an elderly population was not significant. Rost and Rober (1987) found that age was not significantly related to recall of medication instructions in an elderly population. In a review of the literature, Marston (1970) concluded that age is probably not significantly related to compliance. Finally, Morrell et al. (1989) reported that age does not seem to be a contributing factor to noncompliance but that there are underlying factors in each age group that effect compliance behavior. In the present study, factors thought to effect compliance in the elderly include the presence of dementia and/or depression, and/or the complexity of the medication schedule, although the effect of age will also be studied.

Depression and Compliance in the Elderly

Reifler et al. (1986) state that 24% of elderly medical outpatients have significant depressive symptoms and that 11% suffer from a major affective disorder. Kinzie, Lewinsohn, Maricle, and Teri (1986) state that medical illness and

medication use are common in the elderly population and that they can contribute to depression. They found that 52% of middle-age and elderly subjects had depressions definitely or probably associated with a medical illness or medication.

It is disturbing that in many cases, health care providers rarely recognize the presence of depression (Fitton, Morley, Gross, Petry, & Cole, 1989; Kinzie et al., 1986). Rodin and Voshart (1986) report that since depression is common in the medically ill, it is important for the clinician to detect depressive symptoms in order to provide better overall health care. Folkman et al. (1987) recognize that health care professionals should be aware of symptoms of depression in an elderly patient and that these symptoms may be the result of drug misuse. Other authors have reported that physical illness and medication usage may precipitate or contribute to the development of depressive symptoms (Haggerty et al., 1988).

Considering this evidence, it is surprising that research has not been conducted to determine the specific relationship between depression and the ability to comply with medication instructions. In a review of the literature, Marston (1970) could find no study that assessed the presence or absence of depression and measured actual compliant behavior. Fitten et al. (1989) state that many health care providers may fail to identify symptoms of depression and monitor compliance in the elderly. No studies could be found that explored the specific relationship between depression

and compliance, but findings seem to support the hypothesis that the presence of depression could adversely affect the ability to remember to take medication. Weingartner et al. (1981) found that cognitive processes such as the ability to learn, remember, and encode information were disrupted in depressed patients. Morrell et al. (1989) suggest that anxiety associated with the presence of a medical illness in elderly individuals could adversely affect rates of compliance but did not test this hypothesis.

Complexity of Dosing Schedules and Compliance in the Elderly

There has been a great deal of research conducted on how the complexity of the dosing regimen affects compliance among the elderly. Complexity is an important factor because of the increased likelihood of polypharmacy and multiple illness in the elderly population (Morrell et al., 1989). Morrell et al. found that as the amount of drug information presented to old and young subjects increased, recall was significantly affected. The more complex the drug information, the less likely both groups were to remember it. Many researchers have found that as the number of prescribed medications increases, the more likely the elderly patient is to make errors in medication taking (Darnell et al., 1986; Malahy, 1966; Morgan et al., 1986; Neely & Patrick, 1968; Spagnoli et al., 1989; Wandless & Davie, 1977). In the majority of research found on this relationship, the participants who were studied were not cognitively impaired and were oriented. In contrast to these findings, Schwartz et al. (1962) found

that although patients who took 2-3 prescribed medications were more likely to make errors than were those taking only one, larger numbers of prescribed medication and increasing complexity did not produce a larger proportion of errors. Finally, Wong and Norman (1987) found that the total number of prescribed doses did not correlate with compliant behavior.

Memory Loss and Compliance in the Elderly

The relationship between declining cognitive function and compliance has received attention. Dementia causes loss of memory and impairments in cognitive function that could impair a patient's ability to do everyday tasks such as remembering dosing schedules (Mulley, 1986). To be able to comply with dosing schedules, an elderly patient must be able to remember instructions and retrieve them at the proper time and then must be able to remember to take the medication at the proper time (Morrell et al., 1989). Cavanaugh, Grady, and Perlmutter (1983) found that the elderly encounter more memory failures in their everyday memory experiences and that forgetting routines was a significant problem. Morrell et al. (1989) point out that loss of memory could affect compliance and tested the ability of elderly patients to recall medication instructions. These researchers did find that the elderly consistently manifested poorer recall of medication instructions. However, they did not assess memory functions using scorable measures which could be correlated with compliant behavior. Furthermore, they did not test

actual compliance since they simply asked participants fill out a medication instruction recall sheet. Meyer and Schuna (1989) did use a cognitive screening instrument and found that elderly patients scoring in the impaired range were less likely to correctly read and interpret prescription labels. However, they did not assess the actual medication-taking behavior of the participants because the purpose of the study was to only assess functional ability to take medication. It appears that many studies which have assessed functional competence in relation to compliant behavior have used participants who are not experiencing significant memory problems (Darnell et al., 1986). Spagnoli et al. (1989) found that poor understanding of the drug regimen was the most frequent reason for noncompliance, but they did not have an index of cognitive functioning. Wong and Norman (1987) gave a mental status exam to their elderly participants and found that scores on the exam did not correlate with compliant behavior. However, they only included individuals in their sample who did not fall into the demented range.

Therefore, although many researchers have stated that cognition appears to be a crucial factor in assessing elderly person's ability to comply with dosing schedules, very few have actually addressed the problem specifically. Only one study could be found that assessed memory using instruments that would supply an index of cognitive functioning that could be directly correlated with the ability of elderly individual to recall medication instructions they would use

in their everyday environment.

That study used short, standardized depression and dementia instruments, the Zung Depression Scale and the Mini Mental State, and attempted to assess and correlate cognitive and affective functioning with the ability to recall medication regimens (Rost & Roter, 1987). Their sample included elderly outpatients, 84% of whom were oriented to the date and 66% of whom could remember at least 2 of 3 words on a memory test. Thus, even before they were given the mental status exam it appears that the majority of the participants were not experiencing major memory problems and might not have been representative of the general ambulatory elderly population. Recall was assessed by asking participants to list all medications recommended by their physicians. Thus, compliance was assessed indirectly. It does not seem surprising, therefore, that in this study memory loss and/or depression were not correlated with compliance. There is a need for a study designed to assess more accurately the relationship between memory loss and/or depression and other factors which might correlate with compliance in the elderly.

Health Care Providers and Compliance in the Elderly

Since there is a large body of research substantiating the importance of the relationship between the health care provider and the elderly patient, it seems practical to find new ways in which clinicians can better meet the needs of their elderly patients. Bergmann, Foster, Justice, and

Matthews (1978) sought to determine how demented patients who are able to live independently in the community can be identified from those who will not be able to function independently and whether other factors such as depression that threaten the independence of the community-dwelling elderly with dementia can be identified. The presence of dementia and/or depression in the elderly population is frequently undetected even though suitable instruments and questionnaires are available for assessing this population's cognitive and emotional functioning (Currie et al., 1981; Freedman et al., 1982; Knights & Folstein, 1977; Williamson, et al., 1964). It seems necessary to develop a routine method to test the cognitive abilities and emotional status of elderly individuals who could benefit from multidimensional assessment in that clinicians could tailor an appropriate health care plan to the level of functioning (American Geriatric Society Public Policy Committee, 1989).

Since the present study is interested in developing a routine assessment procedure for the office-based professional, it must be taken into account that instruments requiring a long administration time will meet with resistance and that targeted shorter instruments would have the greatest utility and would better meet the needs of the patient and clinician (Applegate, 1987). Instruments appropriate for the health care provider must also meet the criteria set forth by Pace (1989) who states that what clinicians desire most is a way to assess clinically

significant change in their patients. Finally, instruments and questionnaires selected for use must be reliable and valid for use in the elderly population, and they should provide information that will aid the clinician in helping the elderly to maintain functional status in the community.

The most obvious health care provider to make use of a routine assessment method is the office-based physician. Most of the general health care of the elderly is done by family practitioners, and the office setting provides a suitable place in terms of the practicality of doing assessments (Freedman et al., 1982). In addition, practicing physicians should be encouraged to utilize the expertise of other disciplines when developing an appropriate health care plan (AGS Public Policy Committee, 1989). There are several studies which espouse the use of the pharmacist as an important health care professional who can influence patient compliance (Gabriel et al., 1977; Kazis & Friedman, 1988). Johnston et al. (1986) also found that a pharmacist was an appropriate and cost-effective professional whose expertise could be tapped when dealing with compliant behavior. Therefore, it appears that both physicians and pharmacists could be trained to use assessment tools which would identify those elderly patients at risk for noncompliant behavior.

Significance of the Study

Many researchers have addressed the problem of compliance in the elderly. However, few have studied specific factors which directly affect how compliant an

elderly individual will be. Not only will this study try to identify specific risk factors for unintentional noncompliant behavior, but it will also provide a way for the trained health care professional to identify those community-dwelling elderly at risk. This study may help in facilitating better health care for the elderly and enabling them to more successfully function.

METHOD

Participants

The participants for the present study were over 60 years of age, ambulatory, residing independently, and caring for their own needs in the community. Each participant was taking at least one medication on a scheduled basis with no help from care givers. They volunteered to participate with the expectation that they would receive feedback about cognitive functioning and information about prescribed medications.

Procedure

Participants, after learning about the study through advertisements and health care providers, contacted the Psychological Clinic at Michigan State University to schedule appointments with investigators. They were encouraged to participate after being told a little about the study, namely that many people worry about memory problems as they get older and that this study would provide them with useful information about their memory. They were also told that the study included asking them questions about the way they were feeling and doing a survey of the medication they were taking, since in some cases medication can affect memory and mood. Therefore, demand characteristics were minimized in that compliance was never directly addressed.

Participants were asked to bring all of their scheduled medications (those not taken on a prn basis) to the initial

testing session. They were also informed that they would be expected to return in 3-4 weeks in order to complete the study and receive feedback and information about their medications. At this time any further questions they had about the study were answered.

When participants first arrived, they were greeted by the principle investigator, a graduate student in clinical psychology, and asked to enter a room in which memory and mood were assessed. Participants completed a subject information sheet which obtained their name, address, age, phone number, and primary care physician. Participants were assured of confidentiality at this time and were told their subject number would be used to identify them at a later date. The principle investigator had access to participants' names in order to match interview one and interview two data; others have access to subject numbers only.

Participants were then instructed to read and sign two research consent forms, one of which they kept. The consent form contained information about the study and testing procedure.

The actual assessment procedure lasted approximately one hour. The first test administered was the Mini Mental State Examination (MMSE) and was followed by a battery to assess Senile Dementia of the Alzheimer Type (SDAT). Both of these instruments were used to determine whether or not participants suffered from dementia. Next they completed a self-report questionnaire, the Beck Depression Inventory

(BDI). If participants had vision problems and/or were not able to write, the questionnaire was read by the examiner, and participants answers were recorded. These instruments were used to determine whether or not participants were mildly, moderately, or severely depressed.

The first investigator then led participants to an area where the second examiner, a pharmacist, was waiting. The pharmacist recorded the drug regimen from the label of each prescribed medication and did a pill count for each drug. At this time he explained that participants would need to return in 3-4 weeks with their medication in order to receive feedback about their memory and information about their medication. A follow-up appointment was made, and participants were free to leave.

At the follow-up session, participants were greeted by the principle investigator and received feedback about their cognitive function. They were then taken to the second investigator where their pills were recounted. Compliance scores were calculated from the following formula:

$$a) \frac{\text{ideal count} - \text{actual count}}{\text{ideal count}} \times 100\% = \text{compliance score}$$

Complexity was considered to equal the exact number of pills participants had to remember to take in one day and was calculated from the dosage directions recorded from each scheduled medication.

To determine the proportion of participants who were intentional noncompliers, the pharmacist asked, "Do you always try to take your pills in the right dose at the right

time, or do you sometimes decide not to take your medication for some reason?" The pharmacist recorded answers and queried participants if needed about reasons for intentional noncompliance. The pharmacist also asked participants the following: (a) "If your physician or pharmacist asked you whether you try to take your medication as prescribed, what would you tell them?" (b) "In the past, have you stopped taking your pills before the prescription ran out, and if so why?" and (c) "In the past, have you ever taken different dosages of medication than what was prescribed, and if so why?" In asking these questions, the examiners were able to record the number of intentional noncompliers, the reasons they chose not to comply, and whether a self-report assessment for intentional noncompliers would serve to identify them.

Finally, the pharmacist gave participants information about their medications and answered any questions they had about the drugs they were taking. Participant were then free to leave.

Instrumentation

The assessment tools used in the present study were the following: (a) the Senile Dementia of the Alzheimer Type (SDAT) test battery, (b) the Mini Mental State Examination (MMSE), and (c) the Beck Depression Inventory (BDI).

The SDAT battery consists of tests of logical memory, trailmaking, word fluency, and mental control (Storandt, Botwinick, Danziger, Gerg, & Hughes, 1984). Storandt et al.

(1984) defined this battery of tests in order to differentiate older individuals with mild SDAT from normal older adults. Logical memory is assessed by asking the participant to recall a prose passage after it is read to them. Trailmaking A is a neuropsychological test involving tracing lines from one circled number to another in consecutive order. Word fluency is assessed by counting how many words a participant could think of that began with the letter S and P in a 60 second time limit. Mental control is assessed by determining how quickly and accurately the participants can recite the alphabet, count backwards from 20 to 1, and count by threes (1, 4, 7, etc). Following the equation given by Storandt et al. (1984), a participant's raw score on the test is multiplied by the corresponding unstandardized coefficient and then summed with the constant to produce the canonical score. Those with canonical scores equal or greater than 0 are classified as having dementia, and those scoring less than 0 were classified as normal. The norms on each test are as follows: (a) Mental Control demented = 4.50; normal = 7.21, (b) Logical Memory demented = 2.02; normal = 8.65, (c) Trailmaking A demented = 12.40; normal = 25.48, and (d) Word Fluency demented = 13.29; normal = 27.07. Major analysis involved a stepwise discriminant function analysis designed to determine which measure and their weights would discriminate maximally between subjects with mild SDAT and normal controls. The first discriminate analysis conducted with 42 subjects correctly classified all

subjects on the basis of a discriminate function using the four measures mentioned above. Applying weights obtained from this analysis to the cross-validation sample ($n = 42$), all but 2 persons were classified correctly (98%). The two samples were then combined to obtain more stable coefficients.

The Mini Mental State (MMSE) is a mental status examination developed to provide a practical method for grading the cognitive state of patients using a brief test designed to assist clinicians in recognizing cognitive impairment (Folstein & McHugh, 1975). The MMSE is divided into two sections; the first covers orientation, memory, and attention, and the second covers the ability to name, follow written and verbal commands, write a sentence spontaneously, and copy a simple design. Folstein et al. (1975) used 206 patients with dementia syndromes, affective disorder with or without cognitive impairment, mania, schizophrenia, and personality disorder, as well as 63 normal subjects to test the reliability and validity of the MMSE. In validating the MMSE, it was determined that the MMSE scores agreed with the clinical opinion of the presence of cognitive difficulty and as the cognitive difficulty is usually less in depression than in dementia the scores dispersed in a fashion agreeing the severity of the illness. Scores were not due to age effects and unrelated clinical conditions ($\bar{M} = 24.5$ for patients with depression under 60 years; $\bar{M} = 25.7$ for patients with depression over 60 years). Graphs show that

the change over time in the MMSE score matches the actual improvement or decline in cognitive state. Folstein et al. determined that the MMSE is reliable on a 24 hour or 28 day retest by single or multiple examiners (Pearson $r = .887$ when given 24 hours apart; $r = .98$ when given 28 days apart).

The maximum score on the 5-10 minute test is 30. Bleecker, Bolla-Wilson, Kawas, and Agnew (1988) established age-specific norms for the MMSE, and the lowest quartile cutoff scores by decade are as follows: 60s = 28; 70s = 28; and 80s = 26. Using these age-specific norms provides greater sensitivity than the recommended cutoff score of less than 24.

The final instrument to used in this study assessed depression using a self-report format. The Beck Depression Inventory (BDI) consists of 21 self-report symptoms and attitudes which are rated from 0 to 3 in terms of intensity by the participant (Beck, Steer, & Garbin, 1988). The cutoff scores established to distinguish those who have affective disorder from those who do not are as follows: (a) less than 10 is considered minimal depression, (b) 10-18 is considered mild to moderate depression, and (c) 30-63 is considered to be severe depression (Beck et al., 1988). The mean BDI scores are as follows: (a) minimal = 10.9, (b) mild = 18.7, (c) moderate = 18.7, and (d) severe = 30.0 (Beck et al., 1988). Beck et al. (1988) report that for psychiatric populations, the mean coefficient alpha from 25 previous studies for internal consistency was .86. For 15

nonpsychiatric studies, the mean alpha for internal consistency was .81. Split-half reliability has been shown to be .93, and test-retest reliability is .74 for 3 months. The BDI correlates well with other symptom inventories and can discriminate between diagnostic groups. For a detailed discussion on the excellent content, concurrent, discriminant, construct, and factorial validity of the BDI, Beck et al. (1988) have reviewed the psychometric properties of the inventory.

Statistical Analysis

Pearson Product Moment Correlational analysis and Chi Square analysis were used to determine whether there were statistically significant differences between proportions of the following variables and compliance--memory loss, depression, complexity of regimen, and age. These analyses examined whether there was a significant relationship between any of the preceeding variables and the ability to comply with medication instructions.

Multiple regression was used in order to study the ability to comply as a function of these variables of interest: (a) age, (b) complexity of dosing regimen, (c) presence of dementia and/or depression. Employing such a strategy yielded results indicating whether these independent variables were correlated with each other as well as with the dependent variable--the ability to comply.

This method of statistical analysis determined the following: (+a) the tendency of the variables to covary, (b)

whether compliance is associated with each of the independent variables, (c) whether an independent variable is a surrogate for another independent variable in the relationship with compliance, and (d) whether an independent variable is enhancing the effect of another independent variable on the ability to comply.

Therefore, multiple regression was used to determine the strength and nature of the relationships among the variables--age, complexity, depression, dementia, and compliance.

RESULTS

Data for the present study was collected during the summer and fall of 1990. The 40 participants in the study ranged in age from 60 to 92 years and included 37 females and 3 males. The average age of the participants was 75.4 years.

Descriptive Statistics

On the Beck Depression Inventory (BDI), 50% of participants were classified as depressed, with 16 participants scoring in the mildly depressed range, 3 in the moderately depressed range, and 1 in the severely depressed range. The mean BDI score of the 40 participants was 10, which is in the mildly depressed range.

On the Mini Mental State Examination, the majority of the participants scored in the normal range of cognitive functioning; 9 scored in the demented range. The mean score on the Mini Mental State was 26.1, which is indicative of normal cognitive functioning. On the Senile Dementia of the Alzheimer Type (SDAT) battery, scores ranged from -3.160 to +2.103, and the mean score was -0.226. Scores less than 0 are considered normal, and scores greater than 0 are indicative of memory impairment. Seventeen participants (42.5%) scored in the demented range.

Total number of chronic diagnoses per participant ranged from 1 to 9, and the mean number of diagnoses was 4.7.

Total number of scheduled prescribed medications per participant ranged from 1 to 11, and the mean number of

scheduled drugs was 4.3. Fifty-five percent of the participants received 4 or less prescriptions.

Nine of 19 participants questioned used some type of memory aid to help them remember to take their medications as instructed. Twenty-one of 27 participants questioned indicated that they tried to comply with medication instructions from physicians. Only 6 out of 27 admitted intentional noncompliance.

Complexity, based on the total number of pills a participant would have to take each day, ranged from 1 pill to 18 pills. The mean number of pills participants took every day was 6.4 pills. Of the 40 participants, 72% took 8 or less pills each day.

Compliance percentages ranged from -25% to +100%, with perfect compliance equalling 0, hypercompliance being -1 to -100 and hypocompliance being +1 to +100. Compliance percentages were calculated using a formula previously discussed. Readers should note that there is a fundamental lack of any agreed definition of noncompliance, and various studies have described the noncompliant patient as one who takes less than 3%, 50%, or 90% of prescribed drugs. Patients in this study were considered to be compliant if they took at least 90% of their prescribed medications correctly. Fourteen participants met this criterion for acceptable compliance. The mean compliance percentage was +14.484, which is in the range of noncompliance with drug regimens due to missed doses.

Correlational Analysis With Pearson Product Moment and Chi Square

Pearson Product Moment and Chi Square analyses were conducted to determine whether there were statistically significant differences between proportions. Table 1 presents the findings of Pearson Product Moment analysis.

Table 1

Pearson Product Moment Correlations for Compliance
With Independent Variables

	MMSE Score	SDAT Score	BDI Score	Complexity	Age
Comply	-.03	.09	.18	-.06	-.05
N = 40					

Hypothesis 1 stated that there would be a statistically significant correlation between memory loss and compliance. Pearson Product Moment correlation analysis did not approach statistical significance ($r = .09$, $r = -.03$).

Additional analysis using Chi Square was not statistically significant though the results were in the expected direction (Chi Square(1) = 1.78, $p = .18$). In analyzing overall dementia score (MMSE and SDAT battery) and the ability to comply, the hypothesized relationship between memory loss and compliance was not supported. Participants falling within the demented range split almost equally between either taking at least 90% of their medication correctly or not complying with dosing regimens.

Furthermore, participants with memory loss who did comply significantly outnumbered those participants without memory loss who were also compliant. Participants without memory problems were more likely to be noncompliant than compliant.

When Chi Square analysis was conducted using only the score from the Mini Mental State Examination, a possible relationship between memory loss and the ability to comply was discovered (Chi Square(1) = 3.17, $p = .07$). Twenty of the 28 participants who scored in the normal range on the Mini Mental State were not compliant with prescribed medications. Scores indicate that those without memory problems as measured by the MMSE were significantly less compliant than their demented counterparts.

Statistical significance was achieved for an additional analysis conducted using Chi Square which examined the relationship between score on the MMSE and the ability to comply with dosing regimens 90% of the time while controlling for intent to comply. For those who intended to comply, Chi Square(1) = 6.11, $p = .01$. Clearly, those who intended not to comply were intentional noncompliers who did not take their medications as instructed. Significant findings occurred when analyzing participants who indicated that they intended to comply with dosing schedules. Participants without memory problems who intended to comply were significantly less compliant, while participants with memory problems who intended to comply were significantly more compliant.

Hypothesis 2 stated that there would be a statistically significant relationship between compliance and depression. Pearson Product Moment correlation analysis did not approach statistical significance ($r = .18$). However, additional analysis using Chi Square yielded a result that does approach significance (Chi Square(1) = 2.67, $p = .10$). Participants who were not depressed were just as likely to be compliant as noncompliant. However, those participants who were depressed were more likely to be noncompliant than compliant.

Hypothesis 3 stated that there would be a statistically significant correlation between the presence of both dementia and depression and the ability to comply with medication regimens. Chi Square analysis was conducted to determine the relationship between memory loss and depression while controlling for compliance. For those who were compliant, Chi Square(1) = 1.25, $p = .26$. As in all other analyses, compliance was defined as taking medication correctly 90% of the time. Findings, although not statistically significant, suggest that those who are not demented or depressed account for the largest number of noncompliers. Interestingly, those who are both depressed and demented did not appear to be at a greater risk for noncompliance.

Hypothesis 4 stated that there would be a statistically significant correlation between complexity of dosing regimen and compliance. This hypothesis was not supported by Pearson Product Moment analysis ($r = -.06$), although the findings were in the expected direction.

Hypothesis 5 stated that there would be a statistically significant relationship between age of participant and compliance. Analysis determined that there was no statistically significant correlation between age of participant and the ability to comply with dosing schedules ($r = -.05$).

There was a significant relationship between age of participant and score on the Mini Mental State Examination ($r = -.34$, $p = .05$). This finding can be described as an inverse relationship between the variables, with score on the MMSE decreasing significantly as age of participant increases.

Analysis With T-Tests

In order to determine whether there were statistically significant differences between group means, t-tests were conducted on memory strategies and intent and the following variables--depression, memory loss, complexity, and compliance. This was a post-hoc analysis without specific hypotheses, and results are shown in Tables 2 and 3.

Table 2

Comparison of participants using memory strategies with those not using memory strategies on each of the following variables: depression, memory loss, complexity of dosing regimen, and ability to comply.

	<u>N</u>	<u>Mean</u>	<u>SD</u>	<u>t</u>	<u>df</u>
BDI Score					
Uses memory aids	9	8.89	4.94	-.66	17
No memory aids	10	11.10	8.86		
SDAT Score					
Uses memory aids	9	-.47	1.75	-.84	17
No memory aids	10	.08	.99		
Compliance					
Uses memory aids	9	8.62	16.00	-1.02	17
No memory aids	10	17.75	21.96		
Complexity					
Uses memory aids	9	7.00	3.90	1.07	17
No memory aids	10	5.10	3.81		

Table 3

Comparison of participants intending to comply with instructions with those intending not to comply with instructions on each of the following variables: depression, memory loss, complexity of dosing regimen, and ability to comply.

	<u>N</u>	<u>Mean</u>	<u>SD</u>	<u>t</u>	<u>df</u>
BDI Score					
Intend to comply	21	8.90	5.32	-1.90	25
Intend not to comply	6	14.50	9.40		
SDAT Score					
Intend to comply	21	-.27	1.45	-.10	25
Intend not to comply	6	-.21	.83		
Compliance					
Intend to comply	21	7.05	16.11	-4.66*	25
Intend not to comply	6	50.13	30.98		
Complexity					
Intend to comply	21	6.17	4.30	.00	25
Intend not to comply	6	6.17	3.31		

*p = .001

There was one statistically significant difference between the independent variable, intent to comply with medication instructions, and actual compliance, the dependent variable ($t(25) = -4.66$, $p = .001$). Intent to comply was determined by asking participants whether they attempted to comply with prescribed medications and identifying specific reasons for intentional noncompliance. Those participants who stated their intent to comply were significantly more compliant than those who were intentionally noncompliant.

There was not a statistically significant difference between scores on the BDI and using memory strategies.

Memory strategies were defined as any aid participants admitted to that made it easier to remember to take medication in the right dose at the right time. Although the difference was not significant, participants who were not depressed used more memory strategies than those who were depressed.

There was not a statistically significant difference between noncompliance score and using memory strategies. The difference observed did suggest that those who used memory strategies were more compliant (+8.623) than those who did not use memory strategies (+17.526).

There was not a statistically significant difference between complexity of dosing regimen and using memory strategies. Although the difference was not significant, those with more complicated dosing regimens used more memory strategies than those with less complicated regimens. There

was not a significant difference between intent to comply with medication instructions and scores on the BDI. Even so, those who intended to comply had a mean depression score in the normal range, while those who were intentional noncompliers had a mean depression score in the mildly depressed range.

Regression Analysis

An analysis of variance was conducted using stepwise multiple regression. Hypothesis 6 stated that the variables (memory impairment, depression, complexity of dosing regimen, age) would account for a significant proportion of the

variance. This hypothesis was not supported. None of the variables fit into a step-wise regression model of compliance.

DISCUSSION

Compliance with prescribed medication therapy is essential for successful medical care. Studies have estimated that a large percentage of the elderly population does not follow prescribed treatment, and physicians are often the last to know when patients are noncompliant. Misuse of prescribed drugs--taking too much or too little, at the wrong time or in the wrong way--can cause treatment failures and pose serious threats to health.

Variables hypothesized to affect unintentional noncompliance include poor cognitive functioning, depressed mood, complex dosing regimens, and a host of others. While some studies have attempted to identify correlates of poor compliance, results have been inconclusive. Most studies have relied on patient self-report in order to measure rates of compliance. Yet it is well documented that patients generally overstate the extent of their compliance.

Several studies attempted to examine compliance rates using pill counts but did not isolate specific variables that may have been related to noncompliance. Other studies have used more sophisticated methods for determining compliance, such as measuring blood levels of medication, but most control for specific disease populations and do not attempt to correlate variable to rates of compliance. Ideally, researchers should specify for each disease and treatment the degree of departure from medication instructions known to be

associated with a clinically significant deterioration in condition in order to define what must be considered noncompliance with prescribed treatment regimens.

The intent of this study was to isolate factors that would identify those elderly patients who are at risk for unintentional noncompliance with prescribed medication regimens. The assessment procedure made use of pill counts and standardized assessment instruments to collect data on specific variables hypothesized to contribute to unintentional noncompliance in the community-dwelling elderly population. Variables hypothesized to be related to noncompliance included cognitive function, emotional status, age of participant, and complexity of dosing regimen. Furthermore, intent to comply and use of memory aids were included in the final analysis.

Results indicated that slightly over half of the participants were not experiencing significant memory problems. Among those with memory problems, most declines appear to be attributable to either late-life forgetting or to the early stages of a dementing condition. It is unclear whether there was a selection bias in that participants who volunteered may have had fewer memory problems than other community-dwelling elderly. The proportion of participants experiencing memory impairment in this sample is in the range quoted by other studies.

Results also indicate that the elderly living independently in the community often experience a mildly

depressed mood. The prevalence rate of depression in this study was higher than that found in other studies, but 16 of the 20 who were depressed scored in the mildly depressed range.

Almost all participants questioned stated that they felt it was important to comply with instructions given by physicians and that they tried to take their medication as prescribed. Several participants did admit to intentional noncompliance, but this proportion was lower than expected. It is possible that the participants wanted to look good for the investigators and did not accurately report their actual pill-taking behavior. Those who did intentionally noncomply cited factors that are substantiated in other research. Reasons given included cost of medication, busy schedule, and adverse side effects of medication.

Results indicated that the elderly who reside independently are able to care for themselves even if they suffer from mild memory loss and/or depression. Most participants were fairly well informed about their diagnoses and prescriptions, and it may be possible that physicians and other health care providers do not give these patients enough credit for their ability to cope successfully. Some participants documented their condition, allergies, and treatment protocol with elaborate notes. Almost half used one or more memory aids to remind them to take pills in the right doses at the right times. Most kept fewer than 10 over-the-counter medications in the house, and few kept

expired medication. Those with chronic medical conditions who were compliant with 90% of their prescribed pills had developed a routine to cope effectively with any number of prescribed medications. Nevertheless, the sample was not compliant (65%); missed doses accounted for the majority of noncompliers. This percentage is supported by findings of other studies.

This study tested the hypothesis that age and complexity of dosing regimen are correlated with the ability to comply with prescribed medication instructions. Results indicate that the age of participants and the complexity of dosing regimen do not significantly affect the ability of elderly participants to comply with dosing schedules. Although it is not surprising that age was not related to compliance, it is surprising that complexity of dosing regimen was not correlated with ability to comply.

Most studies have found that as complexity of regimen increases, compliance rates decrease. It is possible that this sample had less complex schedules because they were prescribed less medication than samples from other studies. Since over half of the 40 patients who participated in this study took 4 or less prescribed drugs, it may be possible that a more medicated sample would have yielded statistically significant results. However, since this sample was two thirds noncompliant, it appears that variables other than complexity were important risk factors.

This study hypothesized that the elderly who are

depressed will be significantly less compliant with prescribed medication regimens. Results indicate that elderly patients who are depressed are more likely to be noncompliant. The findings, while not statistically significant, appear to be clinically meaningful, since 15 of the 20 depressed participants were not taking their medications as prescribed. Furthermore, since the majority of these patients scored in the mildly depressed range, it is likely that the number of noncompliers would escalate as intensity of depression increases.

This study hypothesized that there would be a statistically significant relationship between memory impairment in the elderly and ability to remember to take prescribed medication. When analyzing the effect of memory loss on the ability to comply, results were not clear cut. When an overall memory score using both assessment tests of cognitive functioning was correlated with compliance percentage, there appeared to be no statistically significant relationship between memory impairment and the ability to comply.

However, when scores on the Mini Mental State alone were correlated with compliance, a possible relationship was discovered. It appears that for this sample of relatively able elderly, those without memory problems are less compliant than those with memory problems. It is possible that those elderly patients who recognize that they are experiencing memory loss try to compensate for their

declining cognitive functions. Perhaps they persevere in that they persistently remind themselves to comply, resulting in the counterintuitive result of increased compliance. Paradoxically, those individuals who are not experiencing significant memory impairment appear to be at greater risk for noncompliance.

There is further evidence for this speculation when intent to comply is controlled in the analysis of scores on the Mini Mental State and compliance percentage. Elderly patients who suffer from memory impairment and intend to comply do so at a statistically significant higher rate than their nondemented counterparts. Even though just as many nondemented participants said they meant to take medication as prescribed, they were significantly less successful than those with memory impairment who also indicated they tried to comply. All but one of the admitted intentional noncompliers were individuals who were not cognitively impaired. It is possible that those with memory impairment rely on memory aids much more often and with more success than more cognitively healthy elderly patients. This could not be accurately assessed from the data gathered in this study.

It was also hypothesized that the presence of both dementia and depression would adversely affect the ability to take medication as prescribed. Findings lean in the opposite direction. While not statistically significant, it appears that those who are not depressed or demented are actually worse at complying, while those individuals who are both

depressed and demented do not appear to be at greater risk for noncompliance. Although the sample was not severely depressed or demented, this population may be representative of a more competently functioning elderly population than has been tested previously. It should be noted that this result was obtained when only the Mini Mental State examination, a measure of global cognitive functioning, was used as the measure of impairment. Analysis of the Senile Dementia of the Alzheimer Type (SDAT) battery alone as well as the SDAT battery and the MMSE did not yield statistically significant results.

There were no hypotheses made about how the intentions of elderly patients would affect medication taking behavior. Nonetheless, it appears that intention is very important when analyzing why the elderly patient may not comply with medication regimens. As discussed above, when intent to comply was controlled in analyzing memory impairment and compliance percentages, significant results were achieved. There was also a difference, although not significant, between intent to comply and depression scores. Those who are depressed may be intentional noncompliers--those patients who do not take some or all of their medication for often legitimate reasons. This may be the result of a more negative mind-set that makes depressed individuals see the world in realistic terms. If this is true, it is possible that even mildly depressed individuals pay more attention to extraneous factors such as the cost of medication, adverse

side effects, and drug interactions. It also is likely that intentional noncompliance is underreported, since the interviewers saw clear evidence that many participants in this study intentionally noncomplied, yet when questioned specifically did not admit to this.

There were also no specific hypotheses made about the effect of using memory strategies on compliance. When this variable was analyzed in conjunction with depression scores, noncompliance percentages, and complexity ratings, results did not reach statistical significance but are interesting. Participants who were not depressed relied on memory strategies more often than those who were depressed. Not surprisingly, those who used memory aids of some type were more compliant than those who tried to remember to take medication without any aid. It also seems that those with more complex dosing regimens rely on memory aids more often than those taking less prescribed pills.

The results of this study indicate that there is much more work to be done in the area of compliance with medical treatment. Overall, the participants in this study were noncompliant with prescribed medication regimens. It seems more likely for depressed elderly patients to be at risk for noncompliance. Elderly participants who are demented are sometimes those with almost perfect compliance ratings. Obviously these individuals are finding a way to remember to take their medications.

It is possible to speculate about reasons for

noncompliance among elderly patients who are not cognitively impaired. Older patients may be less likely to challenge the authority of physicians and may lead them to believe they will be compliant with prescribed drug therapy. All of the participants questioned answered affirmatively when asked whether they felt patients should always try to follow instructions given by physicians. In reality, these patients may not always have complete confidence in their treatment protocol. Perhaps the more cognitively intact elderly patient is more likely to question the appropriateness of prescribed drug therapy and/or dosage and will noncomply more often than those who are experiencing problems with cognitive functioning. Depressed patients may also be more likely to question drug therapy because of their more negative outlook in general.

Therefore, one of the most important aspects of improving compliance may be patient-physician communication. Richardson (1986) suggests that social-psychological models that contain cognitive variables such as motivation and expectation may be more helpful in understanding reasons for some forms of noncompliance. The study seems to support this contention, as many of the participants who were noncompliant in this study were not depressed or demented and did not seem to be affected by age or complexity of dosing regimen.

The results of this study suggest that unintentional noncompliance may be exacerbated by a depressed mood. Those who are depressed do appear to be at risk for noncompliance.

Therefore, it may be helpful for physicians to utilize the Beck Depression Inventory in order to assess levels of depression, since even a mildly depressed mood appears to have a clinically meaningful effect on compliance rates.

Late-life forgetting and mild forms of memory impairment common among the able elderly living independently in the community do not appear to be risk factors for unintentional noncompliance. Those who have trouble remembering things seek more assistance than those with normal recall. Even so, it may be helpful to administer a mental status test such as the Mini Mental State examination. Those who do score in the demented range on this instrument should be carefully counselled as to how important their drug therapy is, since ability to comply was significantly affected by intent to do so. The provider may also choose to assess whether the patient is using reminder strategies, since this study showed that elderly patients with memory impairment who were successful in taking prescribed drugs relied on memory aids. It is interesting that some studies have found that patients cite "forgetfulness" when they are questioned about reasons for noncompliance. This study found that this "forgetfulness" is probably not due to any organic deterioration or confused mental state but due instead to psychological variables. It is possible that patients are very selective in forgetting.

The results of this study also suggest that those elderly patients who are cognitively intact and not depressed

are actually more at risk for noncompliance to prescribed therapy. It seems likely these are the patients who are intentionally noncomplying, even though they self-report that they intend to comply.

Summary of Findings

In summary, our major findings are as follows:

(a) There was no direct relationship between memory loss and compliance until there was statistical control for intent to comply. Then there was a statistically significant relationship between overall functioning and compliance.

Specifically, participants without memory problems were less compliant. The relationship between scores on the Mini Mental State and compliance approached statistical significance suggesting that participants without memory problems were less compliant.

(b) The relationship between compliance and depression approached statistical significance indicating that depressed participants are more likely to be noncompliant.

(c) The expected relationship between both dementia and depression and the ability to comply was not supported. Specifically, those who were not depressed or demented were just as likely to be noncompliant as those experiencing depression and/or dementia.

(d) The intent to comply with medication instructions is related to actual compliance. Specifically, those who admitted to intentional noncompliance were not compliant with prescribed regimens.

(e) The hypothesized relationships between age and compliance and complexity and compliance were not supported.

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