MEDICATION KNOWLEDGE AND COMPLIANCE AMONG

THE ELDERLY: COMPARISON AND EVALUATION

OF TWO TEACHING METHODS

DISSERTATION

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By

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The problem of this study was to compare and evaluate two methods of teaching medication compliance to an elderly population with a variety of medical problems, cultural backgrounds, and educational levels.

Eighty patients over 65 years old who were attending clinic at a county health care facility participated in the study and were randomly placed into two groups. The Medication Knowledge and Compliance Scale was used to assess the patients' medication knowledge and self-reported compliance. Group I (control) received only verbal teaching. Group II (experimental) received verbal teaching as well as a Picture Schedule designed to tailor the patients' medication schedule to their daily activities. Each patient was re-evaluated two to three weeks later. Medications were also counted at each visit and prescription refill records were examined.
Knowledge and compliance did increase significantly among all 80 participants. Patients in Group II demonstrated a significantly greater increase in compliance than Group I but did not show a greater increase in knowledge. Patients in Group II also improved compliance as evidenced by their prescription refill records.

This study demonstrates that even though significant barriers to learning exist, knowledge and compliance can be significantly improved when proper teaching techniques are utilized.
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CHAPTER 1

Introduction

Educating patients regarding prescription drug therapy has become extremely important especially among the elderly. The elderly are the fastest growing age group in the United States. It is projected that by the year 2000, there will be nearly 32 million persons over the age of 65 (Allan, Brotman, 1981) and by the year 2030, one in five Americans will be 65 or over (AARP, 1984). One of the major factors in the prolongation and increased quality of life has been the use of medications (Basen, 1977). In a recent study of the elderly, the average number of medicines taken daily was 3.33 and the over 65 population used more prescription drugs than those under 65 years (Weber, 1980). The elderly are the group most likely to suffer the consequences of medication non-compliance because of the number of drugs taken.

Contributing factors to medication non-compliance include the lack of careful instructions regarding information about the medications, reactions that might
occur, correct dosage scheduling, medication interactions, and complications the person might suffer if the drugs are not taken or taken correctly. A number of factors such as language, educational level, cognitive changes, loss of hearing, and vision play a significant role in medication noncompliance in the elderly (Lundin, 1980; King, Martin, Morrell, Arena, Boland, 1986). Another major factor contributing to medication non-compliance is low literacy skills which limit the patient’s ability to read and understand medication labels and instructions received from the doctor, nurse, or pharmacist. Low literacy skills contribute to non-compliance because the individual has a limited ability to organize perceptions and thoughts about the medication instructions. The individual may also lack the vocabulary and ability to explain what is not understood. Therefore, confusion results and the medications are incorrectly taken (Doak, Doak, Root, 1985; Schatzman, Strauss, 1955).

Preparing the geriatric patient to take prescribed medications at home requires knowledge and clear explanations of the medication schedule (Pender, 1974; Caffarella, 1981)
and coordination of the medications in the patient's daily schedule (Schmidt, 1979). A study to evaluate the effectiveness of verbal versus verbal and written, tailored schedule instructions would be beneficial in assisting health professionals to know how to improve medication compliance in the elderly.

Theoretical Rationale

Recent research on learning in old age suggests that many variables influence learning. Learning deficits in old age are attributed to changes in sensory perception, loss of short-term memory and/or intelligence, heightened arousal of the autonomic nervous system, increased cautiousness, slowed responses to environmental stimulation, and instructional variables such as pace of presentation, task relevance, and task difficulty (Arenburg, Robertsen-Tchabo, 1977; Botwinick, 1978; Corso, 1971; Craik, 1977; Eisdorfor, 1959; Kim, Grier, 1982).

The elderly may also have a reduced problem-solving ability especially when needed information is unavailable or when irrelevant information is present. Providing simple and relevant information may improve problem-solving (Skolnick,
The elderly also may need extra time to learn (Marsh, 1980). The elderly as a group, tend to ask more questions than young adults and need more time to process information (Petersen, 1983). Association of new tasks with old behaviors may facilitate the learning process (Marsh, 1980). Learning should be addressed one step at a time because simultaneous learning tends to have a negative effect on the elderly learner. Learning many new ideas at once may confuse or slow the learning process (Arenberg, et al., 1977).

Changes in visual or auditory acuity may result in difficulty learning. Communication needs to be in simple, lay terminology.

There is no exact agreement in the literature regarding the degree or rate of decline in learning that occurs with aging. However, there are demonstrated differences in the way the elderly learn which must be considered while educating the geriatric patient (Dall, Gresham, 1982). Hallberg (1976) lists ten strategies for teaching aged adults:

1) Visual aids should be selected that minimize the need for visual acuity.
2) The person instructing should be positioned so that the persons receiving the instruction receive clear, direct sensory stimulation.

3) The rate of presentation should be adjusted so that elderly persons can hear clearly.

4) Elderly persons should be asked what methods help them learn (for example, auditory, visual, tactile, or a combination of methods).

5) Elderly persons should have control of the pace of presentation.

6) Elderly persons should be asked if the pace of content is acceptable.

7) A quiet environment should be selected for teaching.

8) Elderly persons should not be preoccupied with other concerns such as grieving or finances during the teaching series.

9) The presentation should have periods when elderly persons are asked for feedback or return demonstration.

10) The new materials should be related to past and present experiences.
The theory of comprehension is important to any type of teaching and learning especially among the elderly. Comprehension is a complex process that depends on the effectiveness of the interactions of logic, language, and experience. Comprehension occurs when a person understands the meaning of the instruction (Colvin, Root, 1976; Thornton, 1986).

In the process of comprehension, the goal is to understand and be able to act on the material. The first step in the process of comprehension is purpose. In order for adult learners to comprehend, purposes or intents must be made clear. If purposes are not clear to the learners, the teacher must ready the learners to receive the information by explaining why the need to learn is important. This task can be accomplished by providing an explanation for the learning. Learning readiness is critical if learners are to understand what is taught.

The learners must also perceive the message as relevant, logical, and attainable. This means the language that explains the message must be understandable to the learners. In addition, the learners must be able to reorganize previous
knowledge to incorporate the new material into their daily lives.

To remember the information, learners must process several different forms of information such as verbal, written, or tactile stimuli. Research indicates that when a person is attentive to what is being said or shown, several centers of the brain are active (Jonassen, 1982). This is short-term memory.

As the learners begin to interact with the information, chemical changes begin to occur in the brain that signal long-term memory storage. Long-term memory is stimulated by repeated encounters with the material and review or return demonstration by the learner.

Critical elements of the learning process must be addressed to teach those with low literacy skills. Limitations of persons with low literacy skills may lie in the organization of perception or thought or in the disabilities of vocabulary and language. Logic, language, and experience operate interdependently in the process of comprehension. Processing of information for persons with low literacy skills is much slower and less complete than for
highly literate readers. Low literate learners may also have a limited vocabulary for common words. This slows the process of interpretation (Doak, et al., 1985).

Because their process of interpretation is slow, persons with low literacy skills may react to learning situations which are too complicated or fast-paced by withdrawing or avoiding the learning situation completely (Doak, et al., 1985). If low literacy persons are questioned about understanding, they will most likely indicate understanding even when they do not. They would rather not learn than try to explain what they do not understand. This response may be due to a lack of vocabulary, fluency, or the ability to explain what was not understood. Low literacy persons may not possess the problem-solving abilities to explain what was not understood.

Schatzman and Strauss (1955) researched the problems persons with low literacy skills have with learning and have summarized that:

1) the learners' perspective tends to be limited to direct personal experiences. Information is perceived only through its meaning to the learner. No relationships to
other times or people exist.

2) The learners may not know there is a need for them to give information. The learners assume that others understand in the same way they do.

3) The learners do not think in terms of categories of information. Thinking is specific and concrete.

4) The learners give information in small amounts without identifiable patterns. There is no logical connection from one statement to the next. Therefore, confusion of learning arises because of differences in organization of thought and perception and a limited vocabulary.

The elderly patient, by virtue of age, may have greater difficulty learning than a younger counterpart. The elderly patient who also may have limitations with organization of perception and thought due to poor reading skills presents the health care professional with a challenge when dealing with medications.

To enhance medication compliance, then, certain interventions can be utilized. Fozard (1977) has presented three types of interventions designed to diminish age
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To enhance medication compliance, then, certain interventions can be utilized. Fozard (1977) has presented three types of interventions designed to diminish age
differences in memory:

1) Task re-design - this consists of operations that simplify either the display of information or the achievement of response. By displaying information, memory capacity may be increased and the number of items to be memorized may be decreased. Aural presentation of materials may also increase capacity and, by incorporating the task into familiar procedures, may decrease anxiety.

2) Individual differences - considering cognitive or personality factors.

3) Training - to increase short-term memory capacity. Ordering and grouping skills may increase memory.

Schmidt (1979) also discusses similar interventions to improve compliance and refers to the process of tailoring. Tailoring refers to the coordination of medications with the patient’s daily schedule. For example, a patient who regularly has morning coffee or reads the newspaper after rising may be asked to take his medication at that time.

Schmidt (1979) also has described several types of prompts or reminders that may increase the patient’s compliance. For
example, a patient might be asked where he might readily see his medication bottle and place it there to increase the likelihood that he will remember to take his medication. Therefore, memory may be increased by relating new materials to established routines and habits.

Statement of Problem

The problem of the proposed study was a comparison and evaluation of two educational methods of teaching medication compliance to an elderly population with a variety of medical problems, cultural backgrounds, and educational levels.

Purposes

The purposes of this study were to:

1) develop two teaching methods for this elderly population.

2) determine the effectiveness of the two teaching methods which may lead to increased compliance to the medication regime.
Hypotheses

To carry out the purposes of this study the following hypotheses were tested:

1. The level of knowledge among elderly patients about their medication regime increases following verbal instruction.

2. Compliance to their medication regime increases following verbal instruction.

3. Elderly patients who are taught visually and verbally will show a greater increase in knowledge than those taught verbally only.

4. Elderly patients who are taught visually and verbally have a higher compliance level to their medication regime than those taught verbally only.

5. Elderly patients who are taught visually and verbally will demonstrate a higher rate of compliance by refilling their prescriptions in a specified time period than those taught verbally only.

6. Elderly patients who are taught visually and verbally will demonstrate a higher rate of compliance to their medication regime than those taught verbally only as
The alpha level for all six hypotheses is .05.

Significance of the Study

The proposed study focused on evaluating and comparing two educational methods to address the multifaceted problem of medication noncompliance in the elderly. The experimental teaching method utilized a picture schedule that summarized and simplified the geriatric patient's medication schedule.

Medication noncompliance represents a serious threat to the elderly. Regardless of the number of medications taken or frequency with which they are taken, correct administration is essential to ensure maximum therapeutic action. Health care professionals are ethically obligated and legally responsible to provide the most effective teaching possible for every patient. The elderly represent an educational challenge to the health care professional because of chronicity, multiple health problems, and special needs that the aging process imposes.

The population chosen for this study consisted of the patients of the Geriatric Consultation Clinic at Parkland
Memorial Hospital, Dallas, Texas. These geriatric patients have an especially high risk for being noncompliant to their medication schedule. The typical geriatric patient in the target population:

1) has more than one chronic health problem
2) has a high rate of noncompliance to their medication regime
3) takes an average of four to six medications per day
4) are of a low socioeconomic status
5) has a low literacy level (Glazer-Waldman, Hall, Weiner, 1985)
6) is 78 years old.

The cultural backgrounds of the patients of this clinic vary widely.

As previously discussed, numerous research studies have been conducted on medication compliance. Most programs have involved oral consultation with the patient but have used limited written or audiovisual reinforcement. The written materials vary widely in content, readability, and potential application to the patient’s learning abilities. Audiovisual methods which may involve the use of films, tapes, and
medication dispensers, also present the same problems to the geriatric learner. The medication dispensers may not be affordable to lower socioeconomic groups. Language barriers and low literacy skills also limit the effectiveness of many written materials. These problems compounded with those of the elderly such as poor vision, memory, or hearing, further reduce the effectiveness of conventional educational methods. Tailoring the medication schedule to the patient’s daily routine has proven successful in promoting compliance (Haynes, et al., 1976). This study attempted to determine the effectiveness of a visual teaching method that summarized and centralized the geriatric patient’s medication schedule and tailor it to his daily life. The visual method would also assist the health care professional to provide more effective patient education. However, the main reason for developing this teaching method was to explore a new way to assist the geriatric patient to self-administer a usually complex medication regime to improve compliance.
Definition of Terms

Medication noncompliance - the inappropriate use of legal medications not taken according to a physician’s prescribed directions (Raffoul, Cooper, Love, 1981).

Inappropriate use - overuse, underuse, or erratic or contraindicated use (Whittington, 1978).

Medication compliance - the appropriate use of legal medications taken according to a physician’s prescribed directions.

Geriatric patient - a person over the age of 65 years who is under the medical care of a physician.

Medication errors - a medicine which is

1) taken by the patient but not ordered by the doctor

2) ordered by the doctor but not taken by the patient

3) ordered by the doctor but taken in incorrect doses or at the wrong time or with a total lack of understanding (Schwartz et al., 1962).

Self-medication - self-administration of a non-prescription medication selected by the geriatric patient or
a prescription medication which has been ordered by a physician. In both of these instances, self-medication implies that the drug is being taken without medical or nursing supervision by a patient who can assume the responsibility for adequate self-care (Brock, 1979).

Self-administration - "the patient taking prescribed medications as part of a total plan of treatment for some [health] condition" (Warren, 1979).

Self-care - being physically, emotionally, and/or mentally capable of providing everyday necessities for oneself.

Functional impairment - the inability to perform usual activities of daily living and instrumental activities of daily living due to complex physical and/or social health problems. These health problems are severe enough that:

1) the geriatric patient requires medical and/or nursing assistance for management and long-term care

2) the geriatric patient's lifestyle and level of independence is adversely affected

3) the geriatric patient's family's and/or significant others' lives are being adversely affected.
Activities of Daily Living - normal, routine care that a person provides for himself such as eating, bathing, and dressing.

Instrumental Activities of Daily Living - normal routines or chores that a person performs to be able to maintain himself in his home such as grocery shopping, buying clothes and supplies, driving a car, or traveling on a bus.

Tailoring - the coordination of the medication schedule with the patient's daily schedule (Peck, King, 1982).

Limitations

1) There was no control of the patients' prior knowledge about their current medication regimes.

2) Patients who were blind or color blind could not be placed into Group II unless there was a family member or friend present who normally assisted them in their daily care.

Delimitations

The population that was studied was the patients followed by the Geriatric Consultation Clinic at Parkland Memorial Hospital, Dallas, Texas. The total patient population of this clinic is approximately 200. Eighty
patients were assigned to two groups for this study and were randomly assigned into two treatment groups. Non-English speaking patients were excluded from participation in the study.
CHAPTER TWO

REVIEW OF THE LITERATURE

Overview

Compliance is an important issue in health care. Serious complications and costly hospitalizations can result if the prescribed medical regime is not followed. Patients may fail to comply with medical recommendations because they choose to ignore them (intentional noncompliance) or because they do not understand and/or remember what they were supposed to do (unintentional noncompliance) (Ley, 1982).

Noncompliance results from a variety of reasons. The attitude of the patient towards himself and the disease is usually one of the best ways to predict the level of compliance (Haynes, Taylor & Sackett, 1979). According to Becker’s (1976) Health Belief Model, a patient will be more likely to comply if he believes that the diagnosis is correct, the illness can cause him serious harm, and the recommended therapy will improve his condition.
Most studies have not supported the assumption that patients will automatically follow medical advice (Cluss & Epstein, 1985) especially when medications are involved (Inui, Yourtee & Williamson, 1976; Sackett & Snow, 1979). Compliance has many definitions. One definition offered by Haynes et al. (1979) defines compliance as “the extent to which a person’s behavior (in terms of taking medications, following diets, or executing lifestyle changes) coincides with medical or health advice.” Others have expanded the definition to include specific components of compliance such as knowledge of the correct name of the medication, keeping follow-up appointments (Becker et al., 1972; Nessman, Carnahan & Nugent, 1980) and failure to fill prescriptions (Becker, Drachman & Kirsch, 1972; Haggerty & Roghmann, 1972). Other definitions may also include omission of doses, taking medications for the wrong reasons, errors in dosage or timing of sequence, and discontinuing therapy before the end of the prescribed course of treatment (Blackwell, 1973; Haggerty et al., 1972).

Medication compliance has become a major issue in health care and the focus of many research studies.
Before the advent of outpatient care, medications were usually prescribed and administered in a hospital setting almost guaranteeing compliance. Because responsibility for treatment has been shifted to the patient in the outpatient and home setting, compliance to a prescribed regime has often been assumed but not guaranteed or realized.

Effectiveness of medications to control or cure a disease depends not only on the physician's ability to diagnose and treat, but also on how well the patient adheres to or complies with the regime. Research has shown the level of compliance unfortunately to be rather low. Bergman and Weiner (1963) were among the first to document that patient noncompliance is a major health problem. Their data showed that out of 70 outpatient children prescribed a 10 day regimen of penicillin, 56% stopped taking the drug by day 3 and 82% discontinued the drug by day nine. Noncompliance rates among the over 65 population are more serious. Researchers have estimated that noncompliance rates among geriatric patients range from 60-95% (Davis, 1968a; Davis, 1968b;
Fox, 1969; Madden, 1973; Malahy, 1966; Schwartz, et al., 1962). The results varied as to what type of noncompliance errors were made but all concurred that the problem was serious. Others place the noncompliance range between 25 and 50% (Cooper, Love & Raffoul, 1982; German, Klein, McFhee & Smith, 1982). Medication errors may result in increased rate of side effects, dangerous drug interactions, drug potentiation, or therapeutic failures. Other consequences of noncompliance include exacerbation or deterioration of the disease (Stewart & Cluff, 1972), more frequent medical emergencies, unnecessary prescriptions of more potent and/or toxic drugs (Norell, 1979) and failure of treatment (Dixon, Stradling & Wooten, 1957; Hoggarty & Golberg, 1973; Sackett, Haynes, Gibson, Taylor, Roberts & Johnson, 1978).

In recent years, research has proliferated on medication compliance. One area of study is the high level medication-taking errors which have produced conflicting results. Boyd, Covington, Stranaszek, and Corissons (1974) found that the most frequent error in the outpatient setting was improper dosing intervals that occurred at least once in over one-half of all
prescriptions, followed by premature discontinuation of the medications, forgetting doses, and intentional omission. Other investigators have shown omission of medications to be the most frequently occurring error among the elderly, chronically ill patient followed by inaccurate knowledge, errors in correct dosage, and improper timing or sequencing of medications (Blackwell, 1973; Haggerty & Roghmann, 1972).

Duration of medication therapy has been found to have a negative effect on compliance. For example, Maddock (1967) found that the longer a patient has a disease, the less likely he is to follow the prescribed regimen for it. Numerous other studies have documented a decrease in compliance over time (Bergman, et al., 1963; Bonnar, 1969; Frances, 1969; Ireland, 1960; Johnson, 1965; Luntz & Austin, 1960).

This information in conjunction with the fact that the incidence of chronic disease increases with age (Atchley, 1972), places the elderly at especially high risk for medication noncompliance. Furthermore, among the elderly who are ill, 86% have chronic conditions,
many of which cause disability. In contrast, among the 25-44 year olds who are ill, only 3% are disabled (Brock, 1979).

Elderly patients receive medications for their chronic illnesses that require long-term, self-administration (Cooper, et al., 1982; Hale & Marks, 1982; May, Stewart, Vener, Krupka & Cline, 1979). Noncompliance becomes a greater problem when elderly patients administer potent drugs incorrectly. Mistakes are usually not corrected until a future visit to the physician (Schwartz, et al., 1962).

Poor medication compliance is not just due to the presence of chronic disease, but can also be related to the number of medications the patient takes. The elderly often take 2 to 3 drugs per day and some take as many as 10 to 13 (Gryfe & Gryfe, 1984; Lamy, 1971). Jenkins (1954) reported that compliance decreased when four doses per day were prescribed than when fewer than 4 doses were prescribed. This was substantiated by Hulka, Cassel, Kupper, and Burdette (1976) who found that the more medication the elderly patient was prescribed, the
greater the rate of noncompliance. Also, Hulka et al. (1976) and Davis (1969) found that the more complex the medication schedule, the greater the rate of noncompliance. The potential for adverse interactions also becomes high if an elderly patient takes more than three medications per day (Karsh & Karsh, 1978). Murray, Darnell, Weinberger, and Mertz (1986) found that noncompliance was significantly higher in patients taking more than 5 drugs. The Governor's Task Force Report on Substance Abuse Among Michigan's Senior Citizens (Senior Citizen's Substance Abuse Task Force, [SCSATF], 1978) found that almost 25% of persons over 65 were concurrently using 4 or more prescription medications. The Task Force also reported that 50% of the sample used over-the-counter drugs 4 to 5 times per week. Further complicating the matter, physicians prescribing these seemingly high numbers of medications, often fail to remember that geriatric patients require a lighter dosage of a medication than a younger person due to the physiologic changes that occur with aging. Many medications deplete the body of essential trace elements, such as potassium and magnesium, which can
lead to dizziness, confusion, and/or fainting if proper nutrition is not maintained (SCSATF, 1978). Therefore, if the patient believes the medication is causing a problem, he may discontinue it without consulting the physician.

**Demographics**

Demographic variables studied in relation to compliance include age, sex, socioeconomic status, education, religion, marital status, and race. The results of early investigations showed that age is probably not a significant influence on compliance (Neely & Patrick, 1968; Roth & Berger, 1960). Other studies reported that the elderly are less likely to comply than middle aged patients. These studies do not specify the cause of noncompliance but relate it to problems of short-term memory, a large number of medications to take, financial limitations, and mental confusion (Dunbar & Stunkard, 1979). The elderly are also more likely to confuse both oral and written directions due to a decline in visual acuity and hearing which may interfere with their ability to accurately
receive instructions. (Levy & Glanz, 1981). An earlier study (Boyd, et al., 1974) had already documented that patients 65 or older have both the lowest level of comprehension and the most medication errors of any other age group. Another study concluded that visual problems contributed to noncompliance in patients 75 and older (Law & Chalmers, 1976). This was verified by Atkinson (1978) who found only 84% could read the printed labels of their medications and only 74% could read a standard handwritten message by the pharmacist. This may be due to the fact that the information the elderly patient was trying to read may have been incomplete or too technical (SCSATF, 1978).

Although the literature is somewhat divided on the role of social support facilitative of compliance, the influence of the family, overall, has been proven to be an important determinant of patient compliance. Social support may increase compliance to a medication regime because it may decrease psychological barriers, may induce greater faith in medical care, and may reduce perceptions of threat through reassurance from a credible
source (Glanz, 1979). Klinger (1984) reported that in 60 post-myocardial infarction patients, compliance was facilitated in patients with social support. Lack of family members or spouse to support drug therapy tends to contribute to medication noncompliance (Hulka, et al., 1975; Levy, et al., 1981; Sackett, et al., 1976) because the patient has no social support system to confer with or to help interpret instructions.

The elderly may also be too embarrassed to ask questions or hesitate because they think they may bother the health care professional with what they may consider inappropriate questions (Levy, et al., 1981). Other investigators, however, reported no relationship between these variables (American Pharmaceutical Association, 1974; Green, Levine & Wolfe, 1979; Gordis, Markowitz & Lilienfeld, 1969; Hodes, Rodgers & Everitt, 1975; Paulsen, 1976; Wynne & Heller, 1973).

Religious beliefs may influence the degree of compliance (Carnevali & Patrick, 1979; Chang, 1980). One investigator found a significant relationship between religion and compliance among Protestants who demonstrated the highest degree of compliance (Johnson, 1965). Other
studies, however, reported no association between religion and compliance (Davis, 1966; Morrow & Rabin, 1966).

Physical problems that contribute to noncompliance are poor vision which may limit the ability of some elderly to read prescription labels, and loss of dexterity that may be caused by diseases such as arthritis, which may create difficulty opening flip-off type medication containers lids (Carnevali & Patrick, 1979). Other problems that increase noncompliance among the elderly are hearing loss, forgetfulness, feeling overwhelmed about taking many medications (Sivertsen & Fletcher, 1982).

The elderly are also more susceptible to not understanding the medication regimen due to a language barrier or deficiency. For many, English is a second language (Levy, et al., 1981).

Estimates from the Office of Health Registration Statistics and Technology of the United States Department of Health and Human Services (Lawrence & McLemore, 1981) revealed that those 65 and older make 25% to 50% more office visits to the physician per year than any other age group. The average number of drugs
prescribed per office visit is 18 - 49% higher in this age group compared with younger groups.

Patients with limited finances are less likely to comply because they lack money for transportation to the physician's office and/or pharmacy (Garrity, Wilson & Hafferty, 1984). Failure to refill prescriptions due to lack of financial resources (Caldwell, Cobb, Dowling & DeJongh, 1970) may be due to the inability to pay for medications which increases noncompliance (Brock, 1979; Sivertsen, et al., 1982).

Adequate knowledge about medications seems to be necessary in order for compliance to occur (Becker, 1979). What knowledge is actually necessary or how knowledge is defined varies (Leventhal, Meyer & Gutman, 1980). One definition of what knowledge is adequate to increase compliance is drug name, purpose, administration schedule, adverse effects, and special administration instructions (Brody, 1980; Crichton, Smith & Demanuele, 1978; Fletcher, Fletcher & Thomas, 1979; German, et al., 1982; Martin & Mead, 1982). Other researchers incorporate knowledge of the medication into
a more general measure designed to represent understanding of the disease and its treatment (Green, et al., 1979; Sackett, et al., 1976; Tagliacozzo, Lushkin & Lershof, 1975).

While understanding of the drug regimen does not guarantee increased compliance, poor understanding will prevent even the most willing patient from complying. The geriatric patient and very poor patient often make medication errors because they have difficulty understanding the timing and dosages of multiple drugs (Wandless & Davie, 1977). For example, in a study of 128 indigent outpatients, 9% of the prescriptions were misused because the patient did not understand how to take the medication (Latiolais & Berry, 1969) and over 15% of 480 outpatient prescriptions in another study could not be correctly interpreted by the patient (Herman, 1978). In a recent study, Markey and Igou (1987) found that increasing knowledge of medications prior to hospital discharge decreased hospital readmission. This same study also found that those readmitted took more medications than those not readmitted.
However, knowledge of the medication regime does not guarantee compliance. In a study by Swain and Steckel (1981) the dropout rate for patients with hypertension receiving an educational program was higher than for patients receiving routine care. The researchers concluded that the patients who received information about what they were supposed to do developed feelings of guilt about not complying, therefore, they stopped coming for treatment. In another study, Raymond (1984) reported that patients became irritated with constant repetition of material and therefore the study group did not increase their compliance rate.

The most effective way some researchers have found to increase compliance is by providing both verbal and written information about a prescribed drug (Linkewich, Catalano & Flack, 1974; Morris, et al., 1979; Paulsen, et al., 1976). Others have developed and tested these types of programs and have had mixed results. Sackett et al. (1976) manipulated both health education and augmented accessibility of medical follow-up for 230 Canadian steel workers with primary hypertension. The health education program included brochures, slide-tape presentations, and
pill-taking remedies. These methods proved very effective in increasing knowledge but did not increase compliance. Other researchers have not found compliance to increase as knowledge increases (German, et al., 1982; Haynes, et al., 1976; Martin, et al., 1982; Sackett, et al., 1976; Steckel & Swain, 1977).

Hecht (1974) found that increased verbal and written counseling did not significantly improve compliance after discharge for 47 tuberculosis patients. However, Rosenberg (1971) used an education program including pamphlets which led to greater recognition of medications and decreased readmissions among a group of heart patients. Studies using a drug reminder chart increased knowledge of the regimen and compliance (Gabriel, Gagnon & Bryan, 1977), and increases in patient knowledge attributed to physician’s participation in tutorials also increased compliance.

The Health Belief Model suggests there might be an association between a patient’s increased perception of the severity of the illness being treated and better adherence to the prescribed regimen (Becker, et al., 1975). The patient’s increased perception of susceptibility to the
illness and the perception that the prescribed medication is likely to benefit the patient may also be associated with better compliance.

How a health care professional communicates with the patient also may influence compliance. Causes of noncompliance have been blamed on a failure to communicate between the health care provider and patient (Hulka, et al., 1976; Ley, Jarn & Skilbeck, 1976; Svarstad, 1976). Research has demonstrated that if the patient is satisfied with the medical care and the relationship with professional staff, then compliance will increase. This relationship is enhanced with quality communication (Bettinghaus & Bettinghaus, 1976; Fletcher, et al., 1979; Sackett, et al., 1976).

A group of elderly patients was studied (German et al., 1982) and compliance and knowledge were correlated with an indicator of communication between the patient and health care professional according to patient reports. Although the findings were not statistically significant, this study did show there was consistent positive association between perceived communication with the health care professional and proportions of patients with correct knowledge and
compliance.

Characteristics of communication which impair the health care professional-patient relationship are the use of medical jargon and terms the patient does not understand. If the patient perceives that the health care professional expects understanding, no questions will be asked, the patient will lose interest. Consequently, no meaningful communication takes place, and the patient does not gain any information to help him comply with the medication regime (Ley, 1977). This problem of communication is exacerbated as age, educational, and socioeconomic differences increase (Garrity, et al., 1984).

Other aspects of verbal behaviors also create problems, especially for the elderly. When the pace of the health care professional’s speech is too rapid for the patient to fully understand and there are no pauses for questions, repetitions or clarifications, patient comprehension is likely to be minimal (Ley, 1977). In a study by Kim and Grier (1982), medication instruction for the elderly was paced at a slow rate of 106 words per minute as compared to a normal pace of 159 words per minute. In the groups who
were taught at a slow pace, significantly greater gain scores were noted than in the group taught at a normal pace.

Other common barriers to effective communication include patient comments in the conversation that interrupt the health care professional’s train of thought, the health care professional monopolizing the conversation, and ignoring patient questions and comments (Svarstad, 1976).

Non-verbal aspects of communication may also create barriers to effective communication. Health care professionals who look disinterested, hurried, or impatient, and watch the clock send a nonverbal message that there is no time for the patient. Also, body position and posture send messages to the patient. In the typical professional-patient interaction, the patient assumes the sitting or dependent position, and the health care professional assumes the standing or dominant position. This posture gives the patient the feeling of insignificance, dependence, or helplessness (Svarstad, 1976).

Communication is another method that can have a great effect on medication compliance. Many studies have examined the effectiveness of the process of communication between
physician and patient. Hulka et al. (1975) determined the effect of communication on subsequent patient outcomes and patient knowledge. The results of this study showed no major beneficial effect from good communication, although several items measured demonstrated excellent behavioral compliance when proper communication from physician to patient had been effective. In a similar study on communication and medication compliance, Hulka et al. (1976) focused on the impact of medication regimen and doctor-patient communication in affecting patient medication-taking behavior and physician awareness of these behaviors. Neither the characteristics of the patients nor the severity of the disease was influential in determining the extent of errors in taking medication. Poor communication during instruction and information from physician to patient were associated with low levels of all types of errors.

Characteristics within the health care setting also give clues to the patient of their value to the health care professional. Crowded waiting areas or long waiting times for appointments minimize the patient's feeling of importance. The absence of teaching materials written and
presented at the appropriate reading level and in an attractive manner may inhibit communication (Garrity, et al., 1984).

Preconceived ideas held by both patients and health care professionals of how each other should behave may have an impact on the interaction (Leigh & Reiser, 1980). For example, if the patient expects the health care professional to take time to answer questions and provide explanation for prescribed treatment and the health care professional does not, the potential for patient dissatisfaction is high (Garrity, et al., 1984). Therefore, the patient may not follow the health care professional's advice.

Johnsten et al. (1986) devised a teaching plan for a group of geriatric patients whose a median age was 76. One group received usual teaching by the professional staff, and the other received a 15-minute counseling session by a pharmacist, including drug name, action, administration, dosage, side effects, and special instructions on each medication. All patients were assessed for knowledge prior to discharge. The counseled group was significantly better informed about their medications. Good communication,
therefore, through counseling improved knowledge.

The effectiveness of written communication in the form of drug leaflets for elderly consumers has been studied (Morris & Olins, 1984). In a mail survey of 1650 elderly patients, 95% said they read the drug leaflets, 76% said they kept them, and 56% discussed them with another person. Patients on long-term anti-hypertensive medication therapy were more likely to use the drug leaflets than those on short-term therapy.

Clear communication between the health care professional and patient is necessary so misunderstanding is avoided. If the patient does not understand why the medication must be taken in a certain way, he will probably not take it correctly (Brock, 1979). Negative stereotypes about the elderly can influence the health care professional's interaction with the patient. The treatment of a chronic condition is often viewed as less desirable by the health care professional than is the treatment of acute conditions (Ort, Ford, Liske & Pattishall, 1965). Such a belief system may influence the health care professional to limit the number of elderly seen or adversely affect communication.
The attitude that an elderly person's life expectancy is short and therefore the extra effort will not be rewarded by complete cure or return to productivity may also decrease the health care professional's ability to communicate and treat effectively (Wright, 1977).

This extensive review has outlined what contributes to the problem of medication noncompliance especially among the elderly. Many studies have investigated methods to improve compliance in response to the way the elderly learn best.

**Methods**

Numerous studies have used different types of written memory aids. One by Gabriel et al. (1977) utilized daily drug reminder charts to reinforce verbal instruction for a group of geriatric hypertensive patients. They found a significant increase in patient compliance with the medication regime, greater knowledge of drug use, dose, frequency of administration, and time intervals. In another study, Wandless et al. (1977) compared groups of patients who received verbal instruction only, verbal instruction with a tear-off calendar aid and verbal instruction and a table
identification card. Subjects that received the tear-off calendar aids were significantly more compliant than subjects that received the table identification card. Both these groups had higher rates of compliance than the group who received verbal instruction only. Other types of memory aids to increase compliance have also been used, such as egg crates to pre-pour medication for daily doses, daily flow charts, and pill dispensers (Skolnick, et al., 1984).

In 1961, Moulding described the use of a pill calendar and later developed a pill calendar dispenser that is similar to those now used in dispensing oral contraceptives (Moulding, 1961; Moulding, Knight & Colson, 1967).

Rehder, McCoy, Blackwell, Whitehead, and Robinson (1980) conducted a study using 100 patients and divided them into four groups. Subjects in group A (control) received only a 28-day supply of medication. Subjects in group B received their medication with verbal instructions. Subjects in group C received no counseling but were instructed how to use the medication containers. Subjects in group D received counseling about their medications from a pharmacist and a
medication container. Subjects in group D had a significantly higher rate of compliance. Although the medication containers proved effective in increasing compliance, educating the patients about the importance of taking their medication was the most important variable affecting compliance.

When health care professionals provide patients with information about their medications, they normally include the drug's name, purpose, administration schedule, side effects, and special administration instructions (Brody, 1980; Crichton, et al., 1978; German, et al., 1982; Fletcher, et al., 1979; Martin, et al., 1982; Woroniecki, McKercher & Flagin, 1982). When evaluating a patient on knowledge and understanding of these facts, some researchers measure these components separately (Brody, 1980; Fletcher et al., 1979; German, et al., 1982). Others use an index that is comprised of several components (Crichton, et al., 1978; Martin, et al., 1982; Woroniecki, et al., 1982) to evaluate them collectively. Fletcher et al. (1979) found that after studying 149 ambulatory patients with chronic conditions, 81% could identify their drug by name only, 65% could state the purpose, and 58% could state the drug dose
schedule. Boyd et al. (1974) had similar findings. In their study of 134 patients, 90% knew the correct amount of medication to take, but only 70% knew the correct timing.

German et al. (1982) found that after following a group of geriatric patients, increased knowledge about their medication did not significantly affect compliance, although small positive effects were observed. The researcher did find that with ongoing communication with the physician, geriatric patients did increase their level of knowledge about action and purpose of their drugs.

In assessing knowledge and compliance with the medication regime, Brown, Wright, and Christenson (1987) assessed the knowledge of 30 chronically ill patients before and after medication instruction. The group that received verbal and written instruction scored significantly higher than those patients who received verbal instruction only. However, compliance was not improved by either method of teaching.

Another study which utilized 29 cardiac patients, gave an oral pretest to determine existing knowledge. The test each patient was given consisted of the following:
1. What is the name of your medication?

2. Describe what the medicine is for.

3. Describe the action of the drug in your body.

4. When would you need to call the doctor?

5. When do you take your medicine and how much do you take?

6. Is there anything special you need to do before taking your medicine?

Each was instructed in a 15-minute session that included all the information from the pretest. Each patient was given a drug card for each medicine. All 29 patients showed improvement from the pretest to posttest (Deberry, Jeffries & Light, 1975).

Felsenthal, Glomski, and Jones (1986) described an inpatient geriatric medication education program. Each patient's knowledge of his or her medication was evaluated upon admission, discharge, 90 days post-discharge, and in a one year follow-up by home visit or phone call. Their results showed that patients who scored highest in knowledge at discharge returned to a noninstitutional setting sooner than those who did not.
Hladik and White (1976) conducted a study on 50 cardiothoracic surgery patients who received medication instruction sheets. The results showed that the patients accepted the medication sheets well, although their effectiveness was less easily measured.

There has been no one technique that has proven totally dominant in its success over other methods. Compliance, like any other lifestyle and behavioral change, remains extremely difficult to attain. The best approach is a multifaceted educational and behavioral intervention tailored to the needs of the patient.

Morris, Shoupe, and Mikeal (1979) utilized a sticker for a medication bottle informing patients to finish all medications unless otherwise instructed and a one-page sheet that explained why patients should not discontinue their medications even if their condition improved. The study was conducted on patients that were primarily low income. For the instruction sheets to be effective, large type and easy-to-read materials were necessary. Only about 5% of the patients failed to read the instructions.
In two other studies, medication reminders such as pill calendars and special packaging combined with written instruction produced improved compliance when compared to usual pharmacy dispensing procedures (Linkewich, et al., 1974; Limer, Nazarian, Charney & Lahti, 1976). Other studies indicated that written information can be useful in educating patients, but compliance is not a guaranteed outcome. Sackett and Snow (1979) found that mastery learning does not necessarily improved medication-taking behavior. McKenney, Slining, and Henderson (1973) found improved compliance only for as long as patients were intensely and continuously monitored by the health care professional.

Beardsly, Johnsen, and Wise (1977) conducted a high education versus low education study. The high education group received both verbal and written medication instructions, and the low education group received only verbal instructions. Compliance measured by home or telephone interviews indicated the high education group had a significantly higher rate of compliance than the low education group.
Wandless et al. (1977) studied geriatric patients and compared knowledge and compliance using three educational methods: (a) verbal instruction only, (b) verbal instructions plus a medication calendar, and (c) verbal instructions plus a medication identification card. Results indicated significantly increased compliance with the calendar and card.

Boyd et al. (1974) studied the completeness of instructions on the prescription labels. They found that the more complete the label directions, the greater the comprehension of the name and number of daily doses. The researchers also reported a positive relationship between increased educational information on the label and compliance.

Newcomer and Andersen (1974) administered a drug counseling program to 47 surgical patients. The experimental group received printed medication instructions. They found no significant difference in medication compliance or knowledge of the drugs. However, the study group did have better knowledge of the name of the drug, common side effects and optimal dosage intervals, and they were more likely to report adverse drug reactions to their doctors.
Studies which have examined the effect of written instruction for a series of drugs tend to prove that this is an effective way of enhancing communication of drug information (Greiner, 1972; Paulsen, et al., 1976; Rosser & Flett, 1977; Weibert, 1977). MacDonald, MacDonald, and Phoenix (1977) also studied the effects of counseling on compliance in 165 elderly patients after hospital discharge. Counseled patients made two-thirds fewer errors than patients not counseled. Three types of memory aids supplemented counseling: (a) the pill wheel which increased errors, (b) a tablet identification card which proved not helpful, and (c) a tear-off daily calendar, which improved compliance modestly.

DeTullio, Eraker, Jepson, Becker, Fujimoto, Diaz, Loveland, and Strecher (1986) examined whether a medication instruction sheet given to clinic patients by their health care professional affected knowledge and/or attitudes more than a pharmacy dispensed sheet of their antihypertensive medication regime. After testing 255 male patients, results indicated that the levels of knowledge about their drug and the satisfaction with their knowledge was higher for subjects who received the medication regime provided by their health
care professional than for subjects who received the medication regime dispensed by the pharmacy.

All these studies point out the fact that better methods of instruction are needed to help the elderly remember to take their medications. Because the most frequent noncompliance error is that of omission, that is the patient forgets to take the drug (Schwartz, 1975), various measures may help to jog the memory, including simple charts that associate pilltaking with regular daily events such as meals, large monthly calendars, and egg cartons or plastic pill boxes that supply enough medicine for a specified length of time.

Tailoring and curing have also been utilized in the research of medication noncompliance. Tailoring is a principle that centers on the patient’s daily schedule to coordinate the medication with it rather than having the patients adjust his or her lifestyle to the medications (Peck & King, 1982). This principle is derived from theories of behavior modification which define problems in terms of the current immediate behaviors of patients and analyze the events that normally occur immediately prior to and after prescribed
medication times.

The proper combination of timing and situation is also used to cue or remind the individual to take the medication. When the event of taking a medication is followed by a pleasant experience, the individual will be more likely to take the medication again (Zifferblatt, 1975). For example, an individual with a headache who takes aspirin for relief will be very likely to take aspirin again if this medication relieved the headache the first time. The event of taking the medication is rewarding or pleasant because the headache was relieved. However, the rewards of taking other medications may not be so quickly apparent. For example, a 35-year-old male newly diagnosed with hypertension probably has not experienced signs or symptoms. The rewards of taking one or two medications a day may be scarce. The individual’s reward for taking these medications may be a high pharmacy bill or devastating side effects such as impotence. The likelihood that this patient will be compliant is greatly diminished, no matter how high the blood pressure reading, because of the unpleasant experiences. Behaviors that provide positive events will have a high probability of recurrence.
whereas those lacking cues or posing negative consequences will be less likely to recur. With effective environmental manipulations, the event of taking medications can be tailored to a patient’s lifestyle.

Other examples of tailoring include placing the medication where the patient can see it, for example, on the television, next to a toothbrush, or near glasses. Other events that might cue the patient to take medications are meal times, reading a newspaper, or setting an alarm clock before bed. Through the use of tailoring, important events in the patient’s everyday life can provide empirical insight into compliance problems and events which can be brought to bear on the patient’s problems (Zifferblatt, 1975).

In a study utilizing this principle (Haynes, et al., 1976), 38 hypertensive Canadian steelworkers were researched. None had been compliant with medications nor were at a goal diastolic blood pressure six months after beginning treatment. A control group and experimental group were utilized. Subjects in the experimental group were instructed on how to measure their own blood pressure, asked to chart their blood pressure and pilltaking, and were taught how to tailor the
medication regime into their daily habits. After 12 months of intensive follow-up, the 20 men in the experimental group significantly increased their compliance and significantly decreased their diastolic blood pressure.

Another study which developed a method to tailor the medication regime was conducted by Abel and Blackstone (1981). These researchers developed a color-keyed system of medication calendars using colored self-adhesive dots. These dots were placed on each medication container and a corresponding dot of the same color and size was placed on the appropriate medication calendar next to the correct time. They found that this system significantly increased compliance for 80% of the patients in the study group. It also was well-received by patients. The researchers found that this method was applicable to almost any patient situation. The authors also suggested that the color-keyed system would be useful in a patient education situation where the patients were primarily illiterate or where language barriers existed. The combination of self-measurement, recording of pilltaking, tailoring, and reinforcement seems responsible for increase in compliance. Tailoring minimizes
both inconvenience and forgetfulness by matching the medication regime to the patient's daily activities (Sackett, et al., 1978).

Although methods to improve medication compliance in the elderly have been researched, physiologic factors of the aging process must be considered when developing these methods.

**Learning and Intelligence**

A variety of factors that influence medication compliance have been discussed. Knowledge, it seems, is needed to increase compliance. To gain knowledge, a person must be able to learn and have some degree of intelligence. There have been many studies conducted that have attempted to determine if intelligence and learning ability changes or declines with age (Petersen, 1983). However, definitive answers are not available, and controversy exists concerning the relationship of intelligence to age.

Intelligence is difficult to explain. It is usually defined as "the cognitive capacity of the individual, the ability to learn, the facility at manipulating and understanding common and unique items" (Petersen, 1983, p.
Because intelligence is impossible to measure directly, indirect methods have been developed to measure underlying traits of an individual. This is accomplished by measuring performance in a variety of settings.

Intelligence Quotient (IQ) is one measure of one's intelligence and relative to that of others. An IQ of 100 is considered average. IQ has an age factor built into it. As a person ages, the test score is adjusted. For example, a person at age 25 must score 110 to have an IQ score of 100, whereas a person at 75 years of age can score only 68 to have an IQ of 100 (Botwinick, 1978). However, IQ is widely overused and cannot be the only basis for judging a person's learning ability. One conceptualization of intelligence that has become widely accepted over the past 15 years is the distinction between fluid and crystallized intelligence (Cattell, 1963).

Crystallized intelligence depends on sociocultural influence and involves the ability to perceive relationships, to engage in formal reasoning, and to understand one's intellectual and cultural heritage. Therefore, the amount a person learns, the diversity and complexity of the environment, the
openness to new information, and the extent of formal learning opportunities are likely to increase crystallized intelligence. Crystallized intelligence continues to grow slowly throughout adulthood and can increase even after age 60 through continued acculturation through self-directed learning.

Fluid intelligence is considered to be independent of instruction or environment and depends more on genetics. It consists of the ability to perceive complex relations, use short-term memory, create concepts, and reason abstractly. Fluid intelligence involves the abilities that generally decline minimally through middle age and throughout the remainder of life (Knox, 1977).

Botwinick (1978) has described the classic aging pattern of intelligence. Over the adult portion of the life span, verbal abilities decline very little, whereas psychomotor abilities decline earlier and to a greater extent. On the Wechsler Adult Intelligence Scale (WAIS), the verbal tests show stability from ages 20 to 60, whereas performance tests show decline from the late twenties (Figure 1).
Figure 1

Changes in Verbal and Performance Scores According to Age

Verbal Score

Performance Score

Full Scale Score

Age 22.5 30 40 50 60 62.5 67.5 72.5 79.5

After age 65 to 70, decline in both areas decreases but does not reach the point of incompetence. This has been proven to be true for all races, socioeconomic levels, both sexes, and is independent of living conditions (Eisdorfor, Busse & Cohen, 1977). These findings are consistent with the theory that crystallized intelligence is maintained throughout adult life. Decline in fluid intelligence and increase in crystallized intelligence assumably balance so that the loss of genetic potentials is offset by experience, wisdom, and knowledge acquired throughout life. Although ability may decline after age 60, the tasks that become more difficult are fast-paced, unusual, and complex (Knox, 1977).

Some researchers have suggested that the reason younger persons outscore older persons because of timing. Research conducted by Klodin (1975) and Storandt (1977) tested both age groups in a timed and untimed condition. Their results revealed that the older group scored lower (Klodin, 1975; Storandt, 1977). This is consistent with the fact that older people tend to show a decline in the speed of central nervous system functioning, response rate, and
perceptual acuity. When the condition of timing is eliminated, however, it helps older people only minimally and does not explain the differences in scores between the younger and older cohorts (Botwinick, 1977). Speed alone does not sufficiently explain differences in test scores based on age. The amount the deficit that occurs after age 70 is also unclear. Usually a fairly sharp drop is demonstrated. This has been referred to as terminal drop (Reigel & Riegel, 1972). Terminal drop refers to the phenomenon of decline in IQ score which occurs a few years before death and is thought to be caused by physical deterioration.

For reasons unknown, intellectual functioning appears to be one way to predict approaching death. A substantial decline in IQ scores has been observed in persons nearing death (Riegel et al., 1972). Improved medical treatment and health care may prolong the healthy portion of life and consequently extend the period during which intelligence remains basically stable.

Age is not the only factor associated with IQ. Education, socioeconomic status, and cohort are also major factors in determining the intelligence of any individual (Birren &
Morrison, 1961). Education is much more important than age in determining IQ. With increased amounts of education, IQ scores rise sharply.

Higher socioeconomic status is associated with higher IQ scores. This is associated with greater acculturation by travel and education; moreover, encouragement of continued learning is likely to be available.

Cohort differences are also important. Persons born in 1900 have experienced a world quite different from those born in the 1950s. Changes in philosophies, family structure, education, and other variables have created differences in knowledge, attitudes, behavior, and beliefs among the generations. These differences may be directly or indirectly reflected in IQ.

Personality is also a major factor in determining intelligence scores. Persons who are self-deprecating, have little self-assurance, are unwilling to take risks, inflexible, or are suffering from poor mental health are likely to score low on intelligence tests. These factors are usually involved when older people are tested. This may be because society tends to devalue the aged therefore, they
may not value themselves.

There are many other considerations that can influence the level of intellectual functioning. Health has been found to reduce intelligence functioning, especially in areas in which psychomotor or fluid abilities are involved (Botwinick & Birren, 1963). When testing older people who had suffered some hearing loss, persons who had less loss were likely to score higher on the WAIS (Granick, Kleben & Weiss, 1976). Fatigue is another variable that will affect test performance. Furry and Baltes (1973) reported that older people tire during the course of an intelligence test. Botwinick (1977) emphasizes fatigue, perception, health, education, and socioeconomic status are part of the make-up of every older person. When teaching older adults, these cognitive variables must be taken into consideration so effective teaching and learning can occur.

Individual differences in intellectual performance increase throughout the adult years. In teaching any group of older adults, the instructor must expect the intellectual range to be great the experience to be diverse,
and the individual learning skills to differ significantly.
The most effective ways of teaching are to design the
learning experience simply, allow for feedback, and tailor
the learning experience to the needs of the individual or
group. The pace needs to be slow enough for learning to take
place. The teaching should be individualized, that is, re-
lated to past experiences and knowledge of the older person.
Review must also be provided. Opportunities for rest and re-
freshment during the instructional period are vital to
increase teaching effectiveness.

The ability to learn continues throughout life. The fact
that a person can learn does not necessarily mean that
material will be remembered. That is, poor performance does
not mean insufficient learning has occurred. It may mean,
however, that learning occurred, but, the information was not
remembered.

There are three common approaches to life-span changes
in learning:

1. Learning performance will decline over a life
time and little can be done to change it.
2. Learning is basically stable over the life span
and cohort differences are due to variations in education, health, or intellectual functioning of groups not changes due to age.

3. A modest decline in performance occurs in the later stages of life, but this decline can be modified through intervention (Willis, 1977).

The third view is gaining support because it assumes that a person can maintain an acceptable level of functioning and continue as a productive member of society.

Factors Affecting Learning Performance

Many studies have produced data on changes in learning performance and what influences these changes especially in later life. One factor that can influence learning is interference. This can prevent the learning of new material or impede the learning process.

Interference can occur in several ways. First, it can result from a conflict between previous knowledge and the new knowledge to be learned. For example, telling a hypertensive patient it is all right for him to eat salty foods after he has been taught for a long time that salt is detrimental and increases blood pressure.
produces conflict. To minimize interference, the teaching must decrease conflicts between old, possibly incorrect knowledge and new correct knowledge. Studies have shown that older people benefit more than young adults when material is familiar or consistent with what they already know (Arenburg & Robertson, 1974). This past experience can be either positive or negative, depending on whether it agrees with new material being learned.

A second type of interference occurs when the older learner is expected to learn two things at once. When older individuals must divide their attention among intake and retrieval, they are at a great disadvantage (Arenburg, et al., 1974). The older learner must concentrate on one task at a time and ensure that one item is learned sufficiently before the rest is tackled (Botwinick, 1978). Also, environmental factors such as background noise, personal anxiety, or climate considerations can divide the older person's attention.

A third type of interference is called retroactive. Retroactive interference occurs when a person completes one learning task and then must concentrate on another. This
subsequent diversion may impair memory (Arenburg, et al., 1977). Learning must be paced so time is allowed for integration so that the previous learning is not forgotten. Pacing of material has been shown to be a factor that influences learning among the elderly. Older people learn more successfully when given extra time to learn the information and to respond (Monge & Hultsch, 1971).

Learning performance also depends on whether the person is able to retrieve what has been learned. The information must be learned so that the individual can organize it into categories or into a sequence to increase memory and learning. Older people are less likely than others to spontaneously organize material to increase memory (Arenburg, et al., 1977; Botwinick, 1978). When older people were encouraged to categorize words to be learned and organizational strategy was provided, memory improved significantly (Gonda, 1977).

Another method of improving learning performance is through the use of mediators to associate the word or information that needs to be learned with some other word, image, or story. Rote memory is not used by older learners
(Petersen, 1983). The older person learns by forming pictures, stories, or examples in order to make an association and organize the material.

Motivation is always a factor in learning. Older people are usually thought to be less motivated. One way to increase motivation is to make the learning more meaningful to the learner. Calhoun and Grounard (1979) reported that older people learn significantly more of highly meaningful materials than of material with low to medium meaningfulness. An increase in meaningfulness increases motivation.

Feedback is another important element in teaching older adults. Studies have shown that an older person's learning increases as feedback is provided (Hornblum, Overton, 1976; Schultz & Hoyer, 1976). However, older people are typically less able to accept negative feedback and continue to do well (Bolton, 1978).

Because an older person often has less interest, greater anxiety, and a lower self-concept, negative feedback can cause great detrimental effects. Every effort on the instructor's part should be made to avoid being judgmental or critical. A supportive helpful attitude should be
assumed.

The learning needs of the older adult are also different because of age-related physical changes. Although these changes are prevalent in the over-60 age group, they are highly individualized and vary among members of this cohort. All persons over the age of 60 have experienced some reduction in physical activity, but the use of artificial aids such as glasses or hearing devices enable most persons to adjust to their losses and function fairly normally well into old age.

Physical Changes That Affect Learning

The physical decline that a person experiences with age happens so gradually that it is barely noticed until a major portion of the sense is lost. Vision, for example, changes and declines throughout life. At age 65, approximately 8% of the population has 20/50 or worse vision. At age 75, the number increase to 15% and at age 85 reaches 4% (Fozard, 1977; Petersen, 1983).

The aging process of the eye mainly involves changes of the pupil and lens. Pupil size begins to decline from adolescence. Therefore, as people age, the eye
allows in less light. Consequently, as people age, greater amounts of light are needed in order to see adequately. Approximately one-third as much light enters through the pupil at age 60 as it did at age 20. By age 80, approximately three times as much light is needed to read by than is needed in the teen years.

The lens changes also. It loses elasticity which results in presbyopia, or the inability to see close objects clearly. This is usually noticeable around age forty. The lens also becomes more opaque. The opacity can result in a cataract that requires surgical removal. Approximately 9% of the over-60 population has cataracts (Petersen, 1983). The incidence of cataracts increases to 18% in the seventies and 36% in the eighties (Fozard, 1977). As the lens becomes opaque, it scatters light rays as they enter the eye causing a glare.

The lens also becomes more yellow. Although the cause of this is not exactly known, the result is loss of some color vision, especially in the color spectrum of dark green, blue, and violet. Consequently, red, yellow, and orange are more vivid and easier for the older person to
see. The lens also loses its ability to adjust from a brightly lit room to a dark one. The adjustment is not slower but less complete.

Changes of vision have implications for education. Lighting in the room should be adjusted for the older person's needs. Large print on contrasting paper should be considered whenever possible. The accommodations needed by an older person do not require a tremendous amount of change or an entirely different setting. However, small adjustments may be needed to substantially increase learning.

Decreases in hearing acuity are common in later life. Reduction in hearing is likely to increase risk of accidents, limit interpersonal communication, and lead to depression caused by lack of social interaction. The highest incidence of deafness occurs after the age of 65. The incidence of hearing loss rises in persons over age 75 to 27% as compared to 1.6% in persons 25 to 34 years of age (Rockstein & Sussman, 1979). The major hearing loss that occurs in later life is called presbycusis. It is a progressive bilateral hearing loss for high frequency tones which
is the result of degenerative physical changes in the ear. A child of age 10 can hear frequencies of almost 20,000 cycles per second (cps), whereas the upper range of a 65-year-old is only about 8000 cps. By age 70, there is at least a 10 decibel loss in hearing at all frequencies (Rockstein, et al., 1979).

Discrimination of pitch decreases from ages 25 to 55 declining more rapidly thereafter. A decrease in hearing often limits how well a person enjoys a social gathering or entertainment such as radio or television. A hearing loss may isolate the older person and has the potential to cause paranoia. This is derived from growing suspicious of others whose conversation cannot be heard.

The implication for the education setting are that the instructor must present in a loud, distinct manner. It is usually preferable to speak slowly and allow time for the older listener to consider meanings and formulate questions. The speaker should also keep the pitch of his voice in a lower range so it is more easily understood. Extraneous noises need to be eliminated so they do not interfere with the understanding.
Energy Levels

Many physical and psychological conditions affect the elderly's level of energy and influence how much energy they have devoted to a learning situation. In general, the person over 65 has lower levels of strength and endurance. Many factors influence this, especially physical and mental health and physical condition that can only be controlled rather than cured (Petersen, 1983). Learning can be affected negatively. These chronic conditions limit mobility of about 20% of the older population, and others are forced to adjust with assistive devices such as glasses, hearing aids, walkers, and the like (Tager, 1981). Some of these devices aid learning and improve the functioning of older adults; however, many reduce the level of energy and enthusiasm.

Chronic conditions, recent surgery, and infections tend to have a debilitating influence (Tager, 1981). Each of the conditions may be under treatment with medications that could interfere with energy levels by causing drowsiness or unpleasant side effects. Because the rate of medication-taking is so high in the older
population (Tager, 1981), learning and its benefits are greatly affected.

Depression is common among the elderly population (Plopper, 1981). Approximately 20 to 25% suffer from occasional depression. This is manifested as fatigue, sleeplessness, low self-esteem, and anxiety. These behaviors can adversely affect learning. To maximize learning, short teaching sessions should be utilized. The instructor needs to be sensitive to the needs and limitations of the older learner, providing breaks and learning opportunities that stimulate the learner.

Low Literacy

The term illiteracy has no standard or universally-accepted definition. Illiteracy is sometimes defined in terms of literacy levels. The 1981 United Nations Education, Scientific and Cultural Organization [UNESCO] report defined a literate person as "one who can both read and write a short simple statement about everyday life" (p.1). Other definitions of literacy involve "the number of grade levels completed" (Kirsh, Guthrie, 1978-79, p.3) or the equivalent on achievement tests" (Jensen, 1982 p. 24).
Because these definitions vary, they do not provide consistent guidelines that can be used to define literacy or illiteracy. Twenty-five million adults in the United States cannot read the warning on pesticide labels, read a letter from their child’s teacher, or the front page of the newspaper. The United States ranks 49th among 158 United Nation countries in literacy (Kozol, 1985). In a study by Cates (1975), 20% of the adult population studied was illiterate. The lives of the illiterate tend to be economically and socially restrained or deprived. Historically, minorities have been over represented within the illiterate and poverty categories. Thirty-three percent were in poverty in 1976 compared to 34% in 1984 (Statistical Abstracts, 1986).

The 1980 United States Census Bureau stated that there were 50 million under-educated adults (Statistical Abstracts, 1986). These adults were identified as those persons sixteen or over not currently enrolled in high school whose highest grade level completed was less than the fourth year of high school (Whitesel, 1986). The state of Texas has the third largest population of persons over 16 in the United
States and ranks third highest in under-educated adults (Whitesel, 1986). Groups with the highest rates of illiteracy are the poor, the aged, minority groups, the unemployed, and the employed with low skill jobs (McGrail, 1984).

Illiteracy levels are further established by Kirsch and Guthrie (1978-79), who found that reading abilities of 8th graders ranged from a 4.4 grade level to 10.5. Another study using adults in an adult basic education class as a sample found that even though the average number of years of school was 8.6, the median reading level was grade 2.0 (Darling, 1984).

Illiteracy costs the United States approximately 237 billion dollars in unrealized lifetime earnings by men 25 to 34 years old who have less than high school reading skills (Kozol, 1985). The United States military has realized the cost of illiteracy when recruits nearly ruin or jeopardize delicate equipment because they cannot read instructions.

Even though a person may possess adequate reading skills, understanding and interpretation is not guaranteed. The idea of being able to function or act on content after reading it has lead to the development of another
concept-functional illiteracy.

Functional illiteracy is defined as "anything and everything connected with basic skills education for adults" (Levine, 1982, p. 27). Another way functional illiteracy is defined is performance-based illiteracy. Functional illiteracy is lack of the ability to perform skills in reading, writing, comprehension, and simple math that are necessary to function in society (Whitesel, 1986). These definitions imply that a person needs to be able to read well enough to understand and be able to interpret what is read and use it as it was intended. However, a person with poor reading skills usually also lacks other types of communication skills that would enable correct or intended interpretation.

A study by Bradshaw and Paulu (1986) reported statistics on 3600 adults between the ages of 21 and 25 to determine how well they could perform basic survival skills. Most performed simple tasks well. However, in more complex tasks:

1. Eighty percent could not use a bus schedule.
2. Sixty-three percent could not follow directions
76

using a map.

3. Approximately 27% could not interpret a lengthy newspaper feature story.

4. Twenty-eight percent were unable to write a letter protesting a billing error.

5. Three percent could not enter personal information onto a job application.

6. Twenty-one percent were unable to locate gross pay-to-date on a pay stub.

7. Sixteen percent had trouble completing an address on an order form.

8. Thirty-four percent had difficulty summarizing in writing an argument made in a lengthy newspaper article.

This study also reported that blacks performed at levels significantly below whites. Hispanics' performance ranged in the middle.

The point must be made here that although a person may not be able to read, or read well enough to understand or interpret meaning, that does not mean intelligence is lacking. Illiteracy or low literacy does not equal low IQ or
intelligence.

Poor reading skills not only influence understanding and interpretation of meaning, but also the person's organization of thought, perception, and vocabulary development. All these factors can cause confusion and misunderstanding so that instructions are misinterpreted.

People with poor reading skills have difficulty analyzing instructions, which negatively affects their ability to formulate questions. They may hesitate to ask questions because they do not want to be regarded as incomprehensible or irrelevant. If learning experiences have been poor, they may prefer not knowing the answer to a question rather than placing themselves in an awkward or embarrassing situation.

Another characteristic of individuals with poor reading skills is lack of the ability to synthesize information so it fits into their behavior pattern. If the behavioral change required or the reason why it is needed is not understood, it will be disregarded. Problem-solving skills that enable an individual to draw inferences and conclusions may not develop without adequate reading
skills because vocabulary has neither developed nor expanded (Doak et al., 1985). Therefore, the individual has difficulty interpreting words heard or read. Understanding may only occur in the literal meaning.

Many societal factors compound the problems of the individual with low literacy skills. Society almost demands literacy so that a desirable lifestyle is attainable. In this century, education credentials for many jobs have been raised without any real change in job requirements. Many articles on income level and other statistics link higher lifetime income with higher levels of schooling (Kozol, 1985). Technological advances demand constant updating of skills, knowledge, and abilities to remain literate in certain fields. Therefore, the illiterate person may be anxious about the need to learn to read, become depressed, or be oblivious to the need for change.

The influx of refugees, immigrants, and illegal aliens also influences the extent of illiteracy, and ultimately, compliance. It is estimated that between 850,000 and two million people entered the United States illegally during the late 1970s (Hunter & Harmon, 1979).
Among this large group are undoubtedly some who are literate in their native tongue, others literate in English, and some illiterate in both languages.

Another facet of literacy involves culture. To be culturally literate means an individual must possess the necessary background information and perspective to read with understanding. The individual must understand the undertones of a comment or conversation and intonation of voice and in what context the comment is being used, whether it is slang terminology or idiomatic. Cultural literacy involves knowing how to communicate without having to explain. It becomes obvious that the impact of illiteracy on compliance is broader than the inability to read. People with low literacy skills may not realize what information the health care professional needs for a history and physical. The individual may take for granted that others understand in the same context; therefore, he may think no further explanation is needed when, actually, the health care professional may not be gathering important information. A patient who does not understand the reasons for questions asked during a history and physical may regard
the health care professional as incompetent. Consequently, the patient may listen to the advice, but because he does not regard the information as reliable or valuable, the patient probably will not comply with treatment and/or find another health care provider. Patients with low literacy skills think in concrete, specific ways. They cannot classify information into categories, especially in large amounts. For example, a patient who needs to learn to take several different types of medications may become totally confused by the regimen and ignore the information. Conversely, another patient may be 100% compliant when taking his immunosuppressive drugs and incorporate the medication regime so firmly into his daily routine that when a scheduling change is prescribed, a tremendous amount of teaching and retraining is needed to convince the patient that this regime will benefit him as did the previous regime.

Poor reading skills can also cause confusion and misunderstanding in everyday life as well as affect the quality of the patient's health. A poor reader cannot help his child with homework, read a teacher's note, or may even be afraid to visit the classroom. A poor reader may not be
able to read instructions on a prescription bottle or notices from welfare offices or the federal government. Poor readers tend to buy more expensive brands at the grocery store because they cannot read labels of generic foods. They identify with pictures of labels they have seen on television. Poor readers are not able or willing to travel freely because they cannot read signs to give them directions. These people also cannot read warnings on cigarette cartons; therefore, they may smoke not knowing how they are increasing their risk of cancer (Kozol, 1985).

The implications of low literacy in medication compliance in the elderly are great. Because the elderly have a higher incidence of chronic disease and take a greater number of medications, they experience a decline in memory and learning abilities and are more prone to have a high rate of noncompliance. Compounding these characteristics with that of illiteracy or functional illiteracy makes the task of taking multiple medications extremely difficult.
CHAPTER THREE

PROCEDURE FOR COLLECTION OF DATA

Materials and Methods

Permission was obtained from the Project Director of Parkland Memorial Hospital's Geriatric Consultation Clinic to utilize 80 (40%) of its patient population for this study. In order to participate in the study, the geriatric patients of this clinic were asked to:

1. Sign an informed consent,

2. Answer questions about their medication knowledge and compliance during a normally scheduled clinic visit,

3. Answer questions on the Demographic Data Sheet (Appendix A),

4. Return in two to three weeks to the clinic for posttest evaluation. The two-to three-week time period was selected and considered appropriate for the following reasons:
(a). The typical patient of this clinic averages four to six medications per day at one to four doses per day of each medication. In fourteen to twenty-one days, the patient self-administers between 112 to 252 doses of medications.

(b). No ideal time period has been established for re-evaluation.

Studies that re-evaluate learning/compliance have utilized varying periods of time. Lundin, Bros, Melloh, and Sands (1980) re-evaluated instruction and intervention in four weeks, whereas Paulson, et al, (1976) re-evaluated learning in one day. Ascione and Shimp (1984) in evaluating knowledge and compliance, utilized a one-week time period on a group of cardiovascular patients taking at least one cardiovascular medication. A time table for data collection is presented in Table 1.
### Table 1

**Time Line for Data Collection**

<table>
<thead>
<tr>
<th></th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Patients</td>
<td>8-10</td>
<td>8-10</td>
<td>8-10</td>
<td>8-10</td>
<td>8-10</td>
</tr>
<tr>
<td>Patients</td>
<td>(a)</td>
<td>(b)</td>
<td>(c)</td>
<td>(d)</td>
<td>(e)</td>
</tr>
</tbody>
</table>

**First Clinic Visit**

**Second Clinic Visit**

Note. Data Collection continued until 80 patients completed two visits for pretest and posttest sessions.
Confidentiality of the patients' responses was assured before the pre-test. In a one-to-one session, the investigator gave each patient the pretest to determine knowledge of and compliance with the medication schedule. The Medication Knowledge and Compliance Scale was used (Appendix B). The investigator asked each question as it pertained to each medication the patient was taking. If the patient could not identify a medication by its correct pharmaceutical name, a lay term was also accepted as correct (for example, heart pill for digoxin).

Questions were scored as correct = 1, wrong/does not know = 0. There was only one investigator scoring these questions to assure consistency. After the patient was questioned on each medication, the answers to each question were averaged. An average score of 0.8 or higher was graded as correct = 1 on the composite scale. The higher the score, the more knowledgeable and/or compliant the patient was.

Hallberg's (1976) strategies for teaching aged adults were utilized as much as possible for both the interview
(pretest) and medication teaching session and focused on the following:

1. A quiet, calm environment was used,

2. The interviewer was positioned to maximize learning effectiveness during the interviewing and teaching sessions,

3. The pace of the interview and teaching session was set by the geriatric learner,

4. Feedback was obtained from the geriatric patient concerning understanding of the medication schedule,

5. The medication schedule was related to the geriatric learner’s daily routine.

The geriatric patients interviewed were then randomly divided into two groups to control for differences of knowledge and compliance. A table of random numbers was used. All patients randomly assigned odd numbers were placed into Group I. All patients randomly assigned even numbers were placed into Group II. Subjects in Group I received verbal medication instructions only regarding the names, action, dosage, and purpose of their medications. Verbal instructions also included information about side effects and when it was necessary to call the doctor, the correct dosage
schedule of their medications and any special precautions or
directions they needed to be aware of before they took their
medications.

Group II received verbal instructions on the same
topics about their medications and the Picture Schedule
(Appendix C). Various colors of self-adhesive dots were
used. One color of dot was assigned to each medication
the geriatric patient took. For example, red may have
been assigned to Furosemide. A red dot was attached to
the medication bottle. If the elderly patient needed to
take one Furosemide tablet twice a day, one red dot was
placed on the line next to the picture of the person
getting out of bed. If the patient was to take two
Furosemide tablets in the morning, two red dots were
placed on the line next to the appropriate picture. The
patient's usual time of rising was indicated by the
clock next to that picture. A second red dot was placed
next to the person eating dinner. The clock next to
that picture indicated the patient's normal dinner time.
Other medications were assigned different colors and
placed at appropriate times. The colored dots were placed
at appropriate times. The colors of dots selected represented
the long-wavelength spectrum (i.e., red, orange, yellow)
minimizing the effects of color discrimination deficiencies
(Daldrup & Fredericks, 1969). Each geriatric patient was
asked to discriminate between colors before they were used on
the Picture Schedule (Appendix C) and was tested for color
blindness using the Ishihara cards.

The Picture Schedule (Appendix C) was enclosed in a
plastic protector. Each patient in Group II was given a
non-permanent marker. Each patient was instructed to
cross off each dosage of medication after it was
taken. After the last doses of medication were taken for
the day, the patient was instructed to erase the marks.

Nurses of the Geriatric Consultation Clinic who
work exclusively with these patients were trained to use
the Picture Schedule (Appendix C). They provided
teaching to participants of both study groups. They did
not see the scores from the pretest to influence or
direct their teaching to a specific area. They assessed
the patient’s knowledge as they normally did and taught
according to their assessment.
During the training session, the investigator and nurses of the Geriatric Consultation Clinic discussed and agreed on the depth of verbal teaching. A simple definition including major side effects and special instructions was given to each patient. A typical teaching session was as follows:

Furosemide (Lasix) is a water pill. It helps your body get rid of extra water. You will probably notice you will have to urinate more often after taking it. Lasix may make you a little dizzy, but this is normal. Take your time standing up from a chair to get your balance. If you begin having muscle cramps, call the doctor. [Dose prescribed per day]: Take Lasix in the morning and the last dose no later the 5:00 p.m. so you can sleep through the night.

The verbal instruction session averaged fifteen to twenty minutes.

After the teaching session, the patient's medications were counted and/or measured. This established a baseline for each patient's medication supply. The investigator calculated the number of medications the patient should have taken by the time he or she returned for the posttest evaluation.

When the geriatric patient returned in two to three weeks, the investigator tested each patient with the
Medication Knowledge and Compliance Scale (Appendix B).

Patients assigned to Group II were also asked three questions that provided feedback about the Picture Schedule:

1. Did the Picture Schedule help you remember to take your medicines?
2. How often did you look at this schedule?
3. Will you keep using this chart?

The patients' prescription records were also examined. This information was obtained from Parkland Memorial Hospital's computerized pharmacy records. All patients of the Geriatric Consultation Clinic utilize Parkland's pharmacy to purchase their medications. Each patient's prescription record was reviewed for two months prior to and two months after the pretest visit. Policy mandates that Parkland's Department of Pharmacy not refill a prescription more than ten days before medication is needed. Therefore, this policy was utilized for this study. For example, if a prescription needed to be refilled by the twentieth of the month, the patient was judged compliant if he refilled it between the eleventh and the twentieth. If a patient took more than one medication, he was judged to be compliant if he
refilled eighty percent of the medications within the
specified time period.

Wording on the prescription labels was analyzed for
reading level using a computer program (Decisionware, 1988).

The data were collected over four months (Table 1).

**Instruments**

Three instruments were used for this study. The
first instrument was the Medication Knowledge and Compliance
Scale (Appendix B) designed by the investigator. No other
similar research instrument is available in the literature.
It was designed on a two-point scale. Content validity was
established by a panel of twenty nurse experts. Reliability
of the instrument was established using coefficient alpha
after conduction a pilot study with twenty-five participants.
The participants in the pilot study were in the same age
range as the study sample and had chronic health problems but
were not necessarily from the study population. Questions 1,
2, 3, 5, 7, and 8 of this scale measure knowledge, and
questions 4, 6, and 9 measure compliance.

The second instrument was the Picture Schedule (Appendix
C). This sheet utilizes simple line drawings to represent
various times of the day such as time of awakening, meals, and bedtime. Each drawing has a picture of a clock and several lines next to it. The Picture Schedule was tested for clarity of interpretation by a group of geriatric patients who were from the target population. For the study, the Picture Schedule was enlarged to an 8.5 by 14 inch size.

The Picture Schedule was developed by the investigator to find a way to summarize and centralize a normally complex medication regime. The average number of medications taken by the patients followed by the Geriatric Consultation Clinic is 4 to 6 per day, with the highest number being reported as 17.

It is extremely difficult for patients with poor visual acuity and other physical problems to read labels and decide when to take their medications. Two studies (Abel & Blackstone, 1981; Martin & Mead, 1982) have demonstrated success with color-keyed medication systems that graphically and simply remind the patient when medications are due. The Picture Schedule (Appendix C) utilizes this color-coded idea and should be applicable to virtually any medication schedule. It is applicable to
the low literacy patient because no words are used. Also, simple line drawings are most useful in teaching patients with low literacy skills (Doak et al., 1985). The clock individualized the medication regime so that it fit into the subjects activities of daily living rather than have the medication schedule intrude upon them.

The third instrument was a Demographic Data Sheet (Appendix A) used to collect information about each patient.

**Population**

The study population was 200 geriatric patients who were under the care of the Geriatric Consultation Clinic at Parkland Memorial Hospital. To be accepted by the Geriatric Consultation Clinic, the individual had to be over 65 years and present evidence of functional impairment. The individuals are accepted on referral from physicians, health care professionals, family, and friends.

**Sample**

To insure an adequate sample, 80 geriatric patients (40% of the total population) were utilized for the study. The selection of individuals began on a normal clinic day. Any patient coming for an appointment was asked to
participate. All subjects were informed that a nurse would ask them about their medications and that they needed to return in two to three weeks to answer the same questions about their medications. The patients were assured confidentiality and were required to sign an informed consent.

Testing of Hypotheses

Hypothesis One was tested by adding the scores on the Medication Knowledge and Compliance Scale (Appendix B) from questions 1, 2, 3, 5, 7, and 8. Pretest scores for Groups I and II were totalled. The mean scores were calculated and dependent t-test was used to test for differences at the 0.05 level of significance.

Hypothesis Two was tested by adding the scores for questions 4, 6, and 9 on the Medication Knowledge and Compliance Scale. Differences in scores were computed for Groups I and II using a dependent t-test at the .05 level of significance.

Hypothesis Three was tested by adding scores of questions 1, 2, 3, 5, 7, and 8 from the Medication Knowledge and Compliance Scale for Groups I and II. The data were analyzed by using analysis of covariance.
Scores on questions 1, 2, 3, 5, 7, and 8 from Groups Ia
and IIa were used as the covariate. The dependent
variable was knowledge (posttest scores). The educational
treatments of visual and verbal versus verbal only teaching
were the independent variables.

Hypothesis Four was tested by adding the scores of
questions 4, 6, and 9 from the Medication Knowledge and
Compliance Scale for Groups I and II. The data were analyzed
by using analysis of covariance and multiple regression.
Pretest scores from Groups I and II were used as
the covariate. The dependent variable was compliance
(posttest scores). The educational treatments of visual
and verbal versus verbal only teaching were the independent
variables.

Hypotheses Five and Six were tested using the chi-square
of independence.

The questions regarding the effectiveness of the Picture
Schedule and demographic data were descriptively reported.

Reporting of Data

After all computations were made, the data were entered
into tables for ease of reporting and interpretation. A
sample for demographic characteristics is presented in Table 2.

Table 2

Sample Table for Reporting Data

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Diagnoses</td>
<td>x.xx</td>
<td>x.xx</td>
</tr>
<tr>
<td>Number of Medications</td>
<td>x.xx</td>
<td>x.xx</td>
</tr>
<tr>
<td>Number of Doses</td>
<td>x.xx</td>
<td>x.xx</td>
</tr>
<tr>
<td>Age</td>
<td>x.xx</td>
<td>x.xx</td>
</tr>
<tr>
<td>Educational Level</td>
<td>x.xx</td>
<td>x.xx</td>
</tr>
</tbody>
</table>

This is a sample table to represent how the data were organized for ease of reporting. More detail is given in Chapter Four.
CHAPTER FOUR

PRESENTATION AND ANALYSIS OF FINDINGS

The purposes of this study were to (a) develop two teaching methods for this elderly population and (b) determine the effectiveness of the two teaching methods, which may lead to increased compliance with the medication regime.

The first purpose of the study was accomplished by devising and testing two teaching methods. To develop these teaching methods, a scale to assess an individual’s knowledge and compliance was needed. Because no other appropriate scale has been devised that measures an individual’s knowledge of and compliance with a medication regime, the investigator developed the Medication Knowledge and Compliance Scale (Appendix B) to satisfy the needs of the study.

Content validity was established by distributing the nine-question scale to twenty nurses with varying educational backgrounds and clinical expertise. Each nurse was registered to practice nursing in the State of Texas, agreed to provide feedback, and had a high degree of
interest and knowledge in the process of patient education.

To establish reliability, a pilot study was conducted utilizing twenty-five patients from Parkland Memorial Hospital’s Geriatric Outpatient Clinic. Patients were sought who were attending clinic during a routinely scheduled visit and who were at least 65 years old. Each patient was approached and the purpose of the study was explained to gain the patient’s verbal consent. Each question of the Medication Knowledge and Compliance Scale was asked, and the patient’s response was recorded. The pilot study was completed in five days. Fourteen men and eleven women participated in the pilot study.

The data from the pilot study were analyzed by using coefficient alpha. The reliability factor was calculated to be .852.

The second teaching method developed for this study was the Picture Schedule (Appendix C). It was piloted on 10 geriatric patients. All ten original participants identified all but one of the pictures as the investigator intended. The one picture that caused confusion (the man eating dinner—second from the bottom) (Appendix C) was
changed to its present state. Originally, the participants interpreted this picture as a man writing rather than eating dinner. After revision, the picture was pretested on 10 geriatric patients and all interpreted the picture as a man eating dinner/supper.

The second purpose of the study was to determine the effectiveness of the two teaching methods, which may lead to increased compliance with the medication regime.

This purpose was tested by the following six hypotheses:

1. The level of knowledge among elderly patients about their medication regime increases following verbal instruction.

2. Compliance with their medication regime increases following verbal instruction.

3. Elderly patients who are taught visually and verbally will show a greater increase in knowledge than those taught verbally only.

4. Elderly patients who are taught visually and verbally have a higher compliance level with their medication regime than those taught verbally only.
5. Elderly patients who are taught visually and verbally will demonstrate a higher rate of compliance than those taught verbally only by refilling their prescriptions in a specified time period.

6. Elderly patients who are taught visually and verbally will demonstrate a higher rate of compliance with their medication regime than those taught verbally only as evidenced by medication counts.

Eighty elderly patients agreed to participate in this study. The demographic data of the eighty participants is presented in Table 3. This table points out the average number of diagnoses (1.975), medications (4.05), and number of doses each patient took on a daily basis (7.36). The average age was 75. The average number of years in school was 7.86. All participants attended school in the United States. Fifty of the participants were Afro-American, twenty-six Caucasian, and four were Hispanic. Twenty-four males and fifty-six females participated in the study. The majority of participants lived alone or with a spouse. Sixty-four, or 80%, of the participants reported being of the Protestant faith. The majority of the participants (46) were
widowed. Data not reflected in Table 3 includes financial status. All participants of the study earned less than $10,552 per year.

Table 3
Demographic Characteristics of the Subjects

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Diagnoses</td>
<td>1.97</td>
<td>0.84</td>
</tr>
<tr>
<td>Number of Medications</td>
<td>4.05</td>
<td>2.3</td>
</tr>
<tr>
<td>Number of Doses</td>
<td>7.36</td>
<td>4.6</td>
</tr>
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<td>Age</td>
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<td>5.4</td>
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<td>Educational Level</td>
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<td>3.6</td>
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<td>Sex</td>
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</tr>
<tr>
<td>Female</td>
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<td>Male</td>
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<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>32.5%</td>
<td></td>
</tr>
<tr>
<td>Afro-American</td>
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<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>5.0%</td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
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<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>57.5%</td>
<td></td>
</tr>
</tbody>
</table>
Table 3

**Demographic Characteristics of the Subjects**<sup>a</sup> (con't)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
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</tr>
<tr>
<td>Never Married</td>
<td>3.7%</td>
</tr>
<tr>
<td>Divorced</td>
<td>5.0%</td>
</tr>
</tbody>
</table>

**Living Arrangements**

<p>| | |</p>
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<th></th>
<th></th>
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</thead>
<tbody>
<tr>
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<tr>
<td>Spouse</td>
<td>33.8%</td>
</tr>
<tr>
<td>Child</td>
<td>17.5%</td>
</tr>
<tr>
<td>Sibling</td>
<td>3.7%</td>
</tr>
<tr>
<td>Other</td>
<td>2.5</td>
</tr>
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</table>

**Religion**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Protestant</td>
<td>80.0%</td>
</tr>
<tr>
<td>Catholic</td>
<td>7.5%</td>
</tr>
<tr>
<td>Other</td>
<td>7.5%</td>
</tr>
<tr>
<td>None</td>
<td>5.0%</td>
</tr>
</tbody>
</table>

<sup>a</sup> N = 80

Characteristics of subjects by group are presented in Table 4. The mean number of diagnoses for each was 1.975. The number of medications for Groups I and II was virtually
the same, at 4.15 and 3.95, respectively. The number of doses taken per day was 7.65 for Group I and 7.06 for Group II. The mean age for Group I was 74.6 and 75.4 for Group II. Educational levels for each group varied slightly. The average number of years in school for Group I was 8.4 and 7.3 for Group II. The majority of the participants of each group were black females who were widowed, lived alone, and practiced a Protestant religion.
Table 4

Subject Characteristics by Group

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Number of Diagnoses</td>
<td>1.90</td>
<td>.89</td>
</tr>
<tr>
<td>Number of Medications</td>
<td>4.15</td>
<td>2.71</td>
</tr>
<tr>
<td>Number of Doses</td>
<td>7.65</td>
<td>3.23</td>
</tr>
<tr>
<td>Age</td>
<td>74.62</td>
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<tr>
<td>Educational Level</td>
<td>8.58</td>
<td>3.56</td>
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<td><strong>Sex</strong></td>
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<tr>
<td>Male</td>
<td>37.5%</td>
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</tr>
<tr>
<td>Female</td>
<td>62.5%</td>
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<tr>
<td><strong>Race</strong></td>
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</tr>
<tr>
<td>Caucasian</td>
<td>37.5%</td>
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</tr>
<tr>
<td>Afro-American</td>
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<tr>
<td>Hispanic</td>
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<tr>
<td><strong>Marital Status</strong></td>
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</tr>
<tr>
<td>Widowed</td>
<td>37.5%</td>
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</tr>
<tr>
<td>Married</td>
<td>52.5%</td>
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Table 4

Subject Characteristics by Group (con’t)

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<thead>
<tr>
<th></th>
<th>Group I</th>
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<tr>
<td>Never Married</td>
<td>0%</td>
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<td>Divorced</td>
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<td>0%</td>
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Living Arrangements

<table>
<thead>
<tr>
<th>Living Arrangement</th>
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<tbody>
<tr>
<td>Alone</td>
<td>32.5%</td>
<td>52.5%</td>
</tr>
<tr>
<td>Spouse</td>
<td>50.0%</td>
<td>17.5%</td>
</tr>
<tr>
<td>Child</td>
<td>10.0%</td>
<td>25.0%</td>
</tr>
<tr>
<td>Sibling</td>
<td>5.0%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Other</td>
<td>2.5%</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

Religion

<table>
<thead>
<tr>
<th>Religion</th>
<th>Group I</th>
<th>Group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protestant</td>
<td>77.5%</td>
<td>82.5%</td>
</tr>
<tr>
<td>Catholic</td>
<td>7.5%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Other</td>
<td>7.5%</td>
<td>7.5%</td>
</tr>
<tr>
<td>None</td>
<td>7.5%</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

* n = 40

A t-test for independent samples was used to evaluate Groups I and II on the demographic data. The results of the t-test are presented in Table 5. None were significant. That is, the difference in the means between the number of
diagnoses, number of medications and doses, age, educational level, knowledge, and compliance before and after the teaching were not significantly different between groups.

Table 5

Comparison of Characteristics for Groups I and II

<table>
<thead>
<tr>
<th>Variable</th>
<th>t-test</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
<td>.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Medications</td>
<td>.38</td>
<td>.70</td>
</tr>
<tr>
<td>Number of Doses</td>
<td>.55</td>
<td>.58</td>
</tr>
<tr>
<td>Age</td>
<td>.63</td>
<td>.52</td>
</tr>
<tr>
<td>Educational Level</td>
<td>1.83</td>
<td>.06</td>
</tr>
<tr>
<td>Knowledge (Before Teaching)</td>
<td>1.14</td>
<td>.25</td>
</tr>
<tr>
<td>Knowledge (After Teaching)</td>
<td>1.30</td>
<td>.19</td>
</tr>
<tr>
<td>Compliance (Before Teaching)</td>
<td>1.54</td>
<td>.12</td>
</tr>
<tr>
<td>Compliance (After Teaching)</td>
<td>.44</td>
<td>.65</td>
</tr>
</tbody>
</table>

*Not Significant

Hypothesis One was tested using a dependent t-test.

For the 80 patients, the dependent t-test showed
significance, with $t (79) = 3.493, p < .001$. That is, there was an overall significant increase in knowledge about the medication regime after verbal teaching.

Hypothesis Two was tested with a dependent $t$-test. The results of the dependent $t$-test showed significance with $t (79) = 2.776, p < .007$. Therefore, there was an observed overall significant increase in compliance with the medication regime after verbal instruction.

Hypotheses Three was tested using analysis of covariance (ANCOVA) and was not significant, $F (1, 76) = 0.383$. Elderly patients who were taught visually and verbally did not show a greater increase in knowledge than those taught verbally only.

Hypothesis Four was tested using ANCOVA. However, the basic assumption of ANCOVA, homogeneity of regression, was not satisfied. Significant interaction was found between the variable group (dummy coded) and the pretest variable, $F (3,76) = 40.629$. To determine the nature of the interaction, multiple regression was computed using the pretest compliance scores, the product of pretest times group membership, and the dummy coded group membership. The values in Table 6 were
used to plot the regression lines for Groups I and II.

Table 6

**Variables and Values for Regression Lines Using Dummy Coding for Group Membership**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Regression Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest compliance by group</td>
<td>-.424</td>
</tr>
<tr>
<td>Pretest compliance score</td>
<td>.841</td>
</tr>
<tr>
<td>Group Membership (Dummy Coding)</td>
<td>1.110</td>
</tr>
<tr>
<td>(Constant)</td>
<td>.470</td>
</tr>
</tbody>
</table>

The regression lines, as presented in Figure 2, show that patients in Group II who received the Picture Schedule and had low compliance scores at the pretest visit had a higher level of compliance than patients in Group I who had low compliance scores at the pretest visit. There was no difference in compliance between the groups for patients whose pretest compliance scores were high.
Hypothesis Five was tested using Pearson chi-square and a two-by-two matrix (Table 7). The Pearson chi-square was significant ($1, N = 80) = 24.897, p < .001$. Therefore, the way the patients refilled their prescriptions before and after teaching are not independent. This shows there was a significantly higher rate of compliance among elderly patients taught visually and verbally than among those taught verbally only as evidenced by their prescription refill records.
Table 7

Frequencies of Prescription Refill Records

<table>
<thead>
<tr>
<th>Prescription Refill Records</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Months After Initial Visit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>46</td>
</tr>
</tbody>
</table>

*Reflects if patient refilled medication on time.

Hypothesis Six was tested with a Pearson chi-square using a two-by-two matrix table. Data related to the testing of this hypothesis appear in Table 8. The Pearson chi-square value was not significant \( (1, N = 80) = 1.920 \). Compliance with the medication regime for both groups of participants did not differ significantly as evidenced by medication counts.
Table 8

Frequencies of Pretest and Posttest Medication Counts

<table>
<thead>
<tr>
<th></th>
<th>Posttest Visit</th>
<th>Medication Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Pretest Visit</td>
<td>No</td>
<td>16</td>
</tr>
<tr>
<td>Medication Counts</td>
<td>Yes</td>
<td>1</td>
</tr>
</tbody>
</table>

*Indicates if medication counts were correct.

The reading level of the prescription labels was also analyzed. All medication labels are listed in Appendix D. The overall reading level was grade 3.78. This was analyzed using the computer program entitled Rightwriter (1988). The average number of years in school, as shown in Table 3, was 7.86 (SD = 3.6) for each patient. Therefore, the average patient, in this study should have been able to read the medication labels on their prescription bottles. There were a number of patients, however, who had only attended school up to the third grade (n = 11). These
patients, therefore, might encounter problems reading their prescription labels. There were also five patients in the study who could not read at all and who signed their names with an "X" on the consent form. During the second visit, all patients in Group II were asked the following questions:

1. Did the Picture Schedule help you remember to take your medicines?

2. How often did you look at this schedule?

3. Will you keep using this chart?

Thirty-five of the forty participants who received the Picture Schedule stated that it did help them remember to take their medications better than they had been taking them without the chart. Three participants stated that the Picture Schedule did not help them remember to take their medications. However, they had no problems remembering before they received the chart. Two individuals did not like the chart and said it was of no benefit.

Thirty-eight participants stated they looked at the Picture Schedule every time they took their medication and three to four more times during the day to plan their medication schedule. Two participants stated they
did not look at it at all.

Thirty-three participants stated they would continue to use the chart. Five participants preferred to either use their previously written schedule or rely on their memory and keep their medication bottles in convenient places. Two participants stated they would not use the Picture Schedule.

Summary

In summary, the important findings of this study are that, overall, knowledge and compliance did increase significantly. Patients who were taught visually and verbally, however, did not show a greater increase in knowledge than those taught verbally only.

Furthermore, compliance with the medication regime did significantly improve in Group II after verbal and visual teaching with the Picture Schedule. There was also a significantly higher rate of compliance with the medication regime among elderly patients taught visually and verbally than among those taught verbally only as evidenced by their prescription refill records. Compliance with the medication regime, however, for both groups of
participants was not significantly different as evidenced by medication counts.

The majority of the patients in Group II did find the Picture Schedule helpful in remembering their medication. They also said they would use it again. Therefore, the Picture Schedule was useful in improving compliance.
CHAPTER FIVE

SUMMARY, DISCUSSION, CONCLUSIONS,
RECOMMENDATIONS, AND IMPLICATIONS

Summary

Medication noncompliance is a special problem among the elderly. Large numbers of medications prescribed in multiple doses accompanied by deteriorating physical capabilities such as poor eyesight and low literacy exacerbate the problem. The purposes of this study were to develop and determine the effectiveness of two methods of teaching an elderly population about their medications. Several hypotheses were tested: medication knowledge and compliance would significantly improve, patients receiving verbal and visual teaching would show a greater increase in knowledge and compliance, and patients taught visually and verbally would demonstrate a higher rate of compliance as evidenced by medication counts and prescription refill records.

Two instruments were developed for this study. The Medication Knowledge and Compliance Scale (Appendix B)
has nine questions which measure the patient's knowledge and self-reported compliance. The Picture Schedule (Appendix C) summarizes the medication schedule utilizing a system of colored adhesive dots placed next to specific times of the day which are represented by pictures and clocks.

A standard method of verbal instruction was established, and clinic nurses were trained. Eighty patients over the age of 65 participated in the study. Knowledge and compliance were assessed using the Medication Knowledge and Compliance Scale. Patients randomly assigned to Group I received verbal teaching only. Patients randomly assigned to Group II received verbal teaching and the Picture Schedule. Each patient was re-evaluated two to three weeks later during a second clinic visit. Medicines were counted on both visits. Prescription refill records were examined two months prior to and two months after the first clinic visit.

Knowledge and compliance improved overall for both groups in this study. Compliance, however, increased significantly in the group that received the Picture Schedule. Based on prescription refill records, an increase in compliance was also observed in the group that received
the Picture Schedule although medication counts did not support this finding.

**Discussion**

The first purpose of this study was accomplished when two methods of teaching were developed. Before knowledge and compliance could be tested, however, an appropriate assessment tool was needed. The Medication Knowledge and Compliance Scale was tested and proven to be a reliable way to assess a patient's knowledge and self-reported compliance. The first teaching method, verbal instruction, was used as the control. To verbally teach a patient effectively, communication must be effective. Communication is an important aspect of teaching patients about their medications (Leigh et al., 1980; Johnsten et al., 1986). How a health care professional communicates with the patient influences compliance. When a patient believes the health care professional is genuinely concerned and listening to what he or she is saying, communication is enhanced and the patient becomes more attuned to what the health care professional is saying. German et al. (1982) observed a consistent, positive
relationship between perceived communication with the health care professional and proportion of patients with correct knowledge and compliance.

The patient also internalizes more when terminology is in language he can understand. Jargon inhibits communication because the patient loses interest in what is being said and, consequently gains no benefit (Ley, 1977). As socioeconomic differences and age increase, the problems of communication are exacerbated (Garrity et al., 1984).

The second teaching method, the Picture Schedule, was designed to be an effective method for assisting the patient to remember a sometimes complex medication schedule and tailor it into his or her daily schedule. Various types of memory aids have proven effective in other research studies (Morris et al., 1979; Linkewich et al., 1974). Pill calendars, special packaging, and stickers for medicine bottles have increased compliance primarily because large type was used, and the charts reminded the patients to take their medicine.

The second purpose, to determine the effectiveness of the two teaching methods, was accomplished when eighty
elderly patients were taught and tested with these two methods. Knowledge significantly increased in both groups. This could possibly be attributed to the fact that principles of learning for the elderly were utilized in a non-hurried environment. Time was taken to assess the patients' knowledge and understanding of all their medications and the schedule they routinely kept. The patients' questions were answered until understanding and satisfaction were expressed.

Knowledge of the medication regime does not, however, guarantee compliance. Though knowledge increased in both groups, compliance significantly increased in the group that received the Picture Schedule and had low compliance scores. The literature has shown that knowledge seems to be necessary for compliance to increase (Becker, 1979; Leventhal et al., 1980) but does not guarantee it (Swain et al., 1981). This study concurs with what most of these studies have concluded.

The Picture Schedule proved effective in increasing compliance in a group of forty elderly patients. One possible explanation for its effectiveness may be that no reading or wording was necessary to use it. Although overall the patients of this population had an average
educational level of 7.86 years of schooling, their reading ability cannot be assumed from this statistic. There was also a small percentage of patients who could not read at all but who could see colors and understand what the colored dots meant and how to use the chart. Other patients had the ability to read but because of deteriorating eyesight could not read the small print on the prescription label. They could, however, see the large colored dots and clocks and understand how to use them so that correct dosages were taken at the correct times. Methods for improving the readability of the medication schedule and labels had previously been tested successfully (Morris et al., 1979; Rosser et al., 1977). These methods included large type and clear print. The Picture Schedule utilized several of these principles, which probably contributed to its effect on the significant increase in compliance.

Another reason for the success of the Picture Schedule may be that it provided an overall summary of the patient’s medication schedule. The patients were able to plan the day’s activities because the medications were tailored into his or her life.
Another possible explanation for the significant increase in compliance in the group that used the Picture Schedule is that it also provided a means to cross off the dosage of medication after it was taken. The non-permanent marker and plastic covering allowed the patient to note that the dosage had been taken. This decreased the chance of double dosing and assisted the patient to remember that the dose had not been taken because it had not been crossed off.

Although the Picture Schedule was effective in this study in increasing compliance, a few problems were encountered. The colored dots had to be securely affixed to the medication bottles. Several patients lost the dots off the prescription bottles and then became confused about taking their medications. The colored dots were also lost when patients took their medications to be refilled. The pharmacy kept all the old bottles and replaced them with new ones. This problem was solved by having the patient bring the newly refilled medication bottles back to the nurse to replace the colored dots.

The pharmacy's assistance was also requested. The clinic nurse sent a note to the pharmacy with the patient
explaining what the dots were for and requesting the pharmacist to either transfer the dot or utilize the same bottle. However, the best method for solving this problem was to educate the patient to look for the dot and seek out the clinic nurse so that the dot could be replaced.

Prescription refill records were used method to measure compliance. The refill prescription records indicated that the patients who received the Picture Schedule were more likely to refill their prescriptions on time after the pretest teaching session than they did two months prior. This could be possibly explained by the fact that they began to take their medications according to their prescribed regime and needed to refill them in a timely manner. However, the hypothesis that patients who received the Picture Schedule will demonstrate a higher rate of compliance with the medication regime than those taught verbally only as evidenced by medication counts was not supported by the data collected in the study. Many factors could have influenced this result. It is difficult to guarantee that the patient is bringing in all of his remaining medication to each clinic visit. Also,
subject may have brought all their medication to one visit and not to the follow-up visit, which could distort the counts. Furthermore, patients who were not taking their medications according to the prescribed regime could have brought in medication from previous prescription refills which also could cause inaccurate counts.

Conclusions

Findings in this study seem to warrant the following conclusions:

1. Elderly patients can significantly improve their knowledge and compliance rate even though medication schedules require numerous medications and dosages.

2. Tailoring a patient’s medication schedule can significantly improve compliance.

3. Regardless of the apparent barriers to learning, patients can learn to manage their care if the proper teaching techniques are devised and utilized.

Recommendations and Implications

Recommendations for Further Research

The sample of this study represented a significant portion (40%) of this clinic’s population. The demographic
data of these patients do, overall, reflect those of the general geriatric population of this county health care setting. However, these patients receive care from a team of doctors and nurses who are specialists in geriatric medicine and highly sensitive to the needs of this population. They also provide their geriatric patients with consistent follow-up care and treatment. Therefore, the results of this study, even though random from this population, may not be generalizable to other geriatric patients in the county health care clinic. Consequently, a similar study on geriatric patients seen in other clinics is recommended.

Non-English speaking patients were not included in this study. The Medication Knowledge and Compliance Scale and Picture Schedule need to be tested for effectiveness on non-English speaking patients.

Certain types of medication reminder sheets have increased compliance (DeTullio et al., 1986; Morris et al., 1984; Moulding, 1961; Rehder et al., 1980; Rosenberg, 1971; Wandless et al., 1977). Even though significant results were found using the Picture Schedule, it should be tested on other groups of geriatric patients not attending a
specialized clinic, and those who do not speak English.

One of the main concerns of the study in collecting data was the uncertainty that the patients would return for the second clinic visit for posttesting. The success of the study depended on the patient returning to the clinic for the posttest visit. Whenever possible, the posttest visit was scheduled the same day as another clinic visit or when a return was planned to refill a prescription. Frequently, the patient had to be called and rescheduled for another day within the two-to-three-week period. In future studies, it would be extremely beneficial to solicit the cooperation and participation of physicians who would be willing to schedule the patient for the follow-up visit. The degree of difficulty for getting the patients back for follow-up would be much lower.

Suggestions for further study include a long-term study over a period of a year utilizing a tool such as the Picture Schedule that would follow patients' compliance rates and correlate them with hospitalizations and complications. Also, it would be valuable to examine the patients involved in this study to determine how effectively they are
utilizing the Picture Schedule their rate of compliance over a longer period of time.

Recommendations for Implications for Practice

Medication compliance in the elderly has been the topic of research for many years. Although many techniques and methods have been used to combat the problems of noncompliance, verbal and written information about a medication regime has improved compliance (Johnsten et al., 1986; Linkewich, et al., 1974). This study has shown that knowledge and compliance in an elderly population who take multiple medications and have more than one chronic health problem can be improved significantly if appropriate techniques are utilized.

This study also demonstrates that looking at the patients' characteristics and providing a practical means for them to follow a prescribed regime is effective. Very little research has focused on low literacy groups. It is more difficult to teach patients who cannot read well. Being unable to read affects how a patient learns. The results of this study indicate that determining what a patient's individual learning needs and then specifically addressing
those needs is effective in improving knowledge and compliance.
APPENDIX A
DEMOGRAPHIC DATA SHEET

Patient Initials ______________ Study Group: I [ ] II [ ]

Diagnosis __________________________

Number of Medications Taken __________

Names of Medications (include dosage & frequency) ______

____________________________________

Age ______ Sex: Male [ ] Female [ ]

Marital Status: [ ] Married [ ] Divorced [ ] Never Married [ ] Widowed [ ] Separated

Presently Employed? [ ] yes [ ] no
   If yes, type of work _______________________

Race/Ethnic Background
   [ ] Black (not Hispanic) [ ] White (not Hispanic)
   [ ] American Indian [ ] Hispanic
   [ ] Other __________________ [ ] Asian or Pacific Isle

Living Arrangements: [ ] alone [ ] spouse [ ] child
   [ ] other __________________

Creed: [ ] Catholic [ ] Protestant [ ] Jewish
   [ ] Islamic [ ] Other ______ [ ] None

Highest School Grade Completed: Training Schools Attended:
   [ ] None [ ] None
   [ ] Elementary thru grade ______ [ ] Vocational
   [ ] High School thru grade ______ [ ] Business
   [ ] College - Number of years ______ [ ] Technical

Country in which School was attended __________________________

Income level per year: [ ] 0 - $10,552 [ ] 10,553 - 15,000
   [ ] 15,001 - 20,000 [ ] 20,000 - 30,000 [ ] over 30,000
<table>
<thead>
<tr>
<th>Name of Medication &amp; Prescription</th>
<th>Pretest Visit</th>
<th>Posttest Visit</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliant? [ ] Yes [ ] No</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

**Prescription Refill Records**

<table>
<thead>
<tr>
<th>Name of Medication(s)</th>
<th>Two Months Before Pretest</th>
<th>Two Months After Pretest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Refilled on time?</td>
<td>Refilled on time?</td>
</tr>
<tr>
<td></td>
<td>[ ] Yes [ ] No</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td></td>
<td>[ ] Yes [ ] No</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td></td>
<td>[ ] Yes [ ] No</td>
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</tr>
<tr>
<td></td>
<td>[ ] Yes [ ] No</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td></td>
<td>[ ] Yes [ ] No</td>
<td>[ ] Yes [ ] No</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>Total</td>
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<tr>
<td>Percentage</td>
<td></td>
<td>Percentage</td>
</tr>
<tr>
<td>Compliant? [ ] Yes [ ] No [ ] Yes [ ] No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B
MEDICATION KNOWLEDGE AND COMPLIANCE SCALE

<table>
<thead>
<tr>
<th></th>
<th>Correct</th>
<th>Wrong/ Doesn’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is the name of your medicine?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. What is this medicine for?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. What side effects of your medicine would you call your nurse or doctor about?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. When do you take your medicine?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. When should you take your medicine?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. How much of this medicine do you take?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Are there any special instructions you need to follow when you take your medicine?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. If #7 is yes, what are they?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Do you follow these special instructions when you take your medicine?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Medication: ____________________________

*This scale is used so the patient’s knowledge and compliance are tested on the medications individually.*
Take one tablet daily.
Take one tablet twice a day.
Take one tablet three times a day.
Take one tablet three times a day until finished.
Take one tablet four times a day.
Take one tablet every 6 hours for blood pressure.
Take one tablet every 8 hours.
Take two tablets in the morning and one tablet in the evening.
Take three tablets twice a day.
Take one tablet every other day alternately with two tablets every other day.
Take one to two tablets every 4 to 6 hours for pain.
Take 1 tablet twice a day with food.
Take one tablet three times a day with meals.
Take one tablet in the morning.
Take two tablets daily.
Take one tablet at bedtime.
Instill one drop into each eye twice a day.
Take 1 tablet by mouth four times a day.
Take 1 tablet by mouth twice times a day.
Take 1 tablet by mouth three times a day.

Use 2 inhalations every 4 hours if needed for shortness of breath.

Apply in the left eye at bedtime for one week.

Inhale 2 puffs four times a day.

Take 1 tablet twice a day for gout.

Inject 35 units under the skin every morning.

Take 1 tablet daily for high blood pressure.

Take 1 tablespoon every 4 hours if needed.

Take 2 tablets every 4 hours if needed for pain.

Take 4 tablets daily.

Apply to lesions twice a day.

Take 2 tablets three times a day.

Take 1 tablet by mouth every morning then 1 every evening.

Dissolve 1 tablet under tongue every 5 minutes for 3 doses for chest pain.

Take 1 capsule twice a day for constipation.

Take 2 tablets every morning and 1 every evening.

Take 2 tablets every morning by mouth.

Take 1 tablets every 4 to 6 hours if needed for pain. May cause drowsiness.
Take 1 tablet every other day alternately with 2 tablets every other day.

Take 7 tablets every day for 14 days. Then take 5.5 tablets every day for 14 days. Then take 4 tablets every day for 14 days. Then take 2.5 tablets every day for 14 days. Then take 1 tablet every day for 14 days.

Take 1 tablet every morning and 2 tablets every evening for blood pressure.

Take 2 capsules every 6 hours.

Apply to skin daily for heart.

Take 1 tablets three times a day for blood pressure.

*Reading level 3.78 (Rightwriter, 1988).
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