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APPLICATION OF THE SOCIAL ECOLOGICAL APPROACH TO COMPLIANCE WITH HEMODIALYSIS TREATMENT

by

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ABSTRACT

The social ecological approach of Moos (1979) was applied to the study of compliance with treatment regimen by hemodialysis patients. A total of 180 hemodialysis patients from six dialysis units in the Metropolitan Detroit, Michigan area participated in this research. These patients responded to two questionaires and provided background information about themselves. This information provided data on three variable groups as designated by the social ecological approach: person, environment, and mediating variables. Compliance data, the fourth variable group used in this research, was obtained from patient medical charts. The data were analyzed to determine the following; (1) Is there support for considering person, environment, and mediating variables as unique groups of variables as suggested by the social ecological approach? (2) What is the relationship that exists among the different compliance measures? Is compliance a unitary factor or is it multidimensional? (3) Can compliance be predicted using measures of environment, person and mediating variables?

The results of this research supported the social ecological concept that measures of person and environment were unique. The mediating variables were not found to be independent of measures of the person. In examining the relationship among the different measures of compliance, it was found that they could be summarized by four compliance factors:

(1) Leaving Treatment Early, (2) Phosphorus Levels, (3) Potassium Levels, and (4) Weight Gains. There was no support available for consideration of compliance as a unitary factor or concept. This raises serious questions about the meaning of previous compliance research which has used different measures of compliance interchangeably. It was possible to predict a modest but significant amount of variance in the four compliance factors using measures obtained of person, environment, and mediating variables. Additional support for the finding of discrete compliance factors was obtained in the different pattern of variables found to be predictive of the four compliance factors. The results of this research were discussed in terms of implications for the social ecological approach, future dialysis research, and application to dialysis treatment.

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CHAPTER I

INTRODUCTION

Psychology has recently become more involved in health care research (Olbrisch, 1977). Research in this area ranges from determining characteristics of the patient that have an effect on the patient's health (Gunderson & Rahe, 1974) to modifying and applying various therapeutic techniques to medical patient populations (Anderson, Baskers & Dalton, 1975; Lazarus & Hagens, 1968). However, until recently psychology has shown little interest in social environment and its effect on health, and in the relationship between patient and social environment and its effect on health. There are indications that these interests are changing and that psychology is beginning to realize the importance of patient-social environment relationships for understanding health. One of the important theoretical developments that addresses these interrelationships is the social ecological approach of Moos (1979). The purpose of this research was to contribute to the growing understanding of these relationships using the social ecological approach. Examination of these relationships occurred within the specific context of chronic hemodialysis treatment.

Changes in perspective in health care research have followed changes in thinking in broader areas. The acknowledgement of behavior as a function of both person and environment can be partially credited

to the often cited work of Mischel (1968) which pointed out that cross-situational consistencies were infrequently found, while situational differences were generally ignored but were important for understanding human behavior. Additional support for examining person-situation relationships was provided by Bem and Allen (1974), Endler and Magnusson (1976), and Magnusson and Endler (1977). Despite this support, Bem and Funder (1978) point out that little additional research has been conducted which addresses person-situation relationships and acknowledges the importance of such relationships for understanding behavior. Unfortunately, it seems that despite the general acceptance of the importance of such relationships, " . . . we persistantly continue to underestimate the influence of situations" (Bem & Funder, 1978, p. 485).

In health care research several observers have suggested that the health care setting has a profound effect on the functioning of the individual (Baker, 1971; Kornfeld, 1972; Miller, 1970). The most specific description in this regard was by Kornfeld (1972), who outlined what he believed to be crucial environmental aspects of different hospital treatment units (i.e., intensive care unit, operating room, etc.) which might affect patient behavior. While his observations suggest numerous areas for future research, they also identify the conspicuous absence of research that reflects an interest in the relationship between the patient and his environment in health care settings. Obviously then, a review of the literature in health care research which

reflects such an interest would be futile. Therefore, a summary of model building efforts in other areas which support the stated interest in evaluating person-environment relationship in health care settings will be presented. The areas selected for this purpose are public health, psychosomatic medicine, environmental psychology ecological psychology and interactional psychology.

Public Health

One field in which there are developments important to the study of patient-environment relationships is public health. Public health is not based on the traditional biophysical model of modern medicine but rather a holistic model of health and illness. This holistic approach proposes that social, ecological, and political factors as well as biological and physical factors are important in understanding health (Rosen, 1972). Consequently, when identifying factors which result in the onset or spread of disease, it is important to look beyond the individual's biophysical condition. The focus of such an approach underscores the importance to health of social-ecological factors (acceptance of potentially self-destructive behavior, smoking, drinking, etc.) and political factors (national versus private health insurance, debedding policies, funding of new programs, etc) which had previously been ignored. This broadened scope for understanding health has important implications for developing research in health care settings. It suggests that there are many factors in addition to biological and physical ones which

deserve consideration in health care research. Developments in public health therefore support the notion that examination of various environmental factors is essential to understanding the health of the individual.

Psychosomatic Medicine

A second area which has implications for understanding patient-environment relationships in health care settings is psychosomatic medicine. Psychosomatic medicine traditionally has focused on the interaction of psychosocial and physiological variables in disease processes. The underlying assumption is that emotional experiences affect body functions, health status, onset and course of disease. Psychosomatic medicine is based on the principle that mind and body are one and that they function as interactive and interdependent processes. The traditional approach in psychosomatic medicine has been to identify personality traits or conflicts in an individual with a particular disorder and to theorize about the contribution of that trait to the development, onset and course of the disease (Wittkower, 1974). Consequently, the personality of the individual is seen as an important factor in understanding health from this perspective. Recently, however, Lipowski (1973, 1975) has sought to expand the psychosomatic medicine perspective beyond examination of individual personality factors by combining it with an ecological approach. He calls his proposed approach psychobiological ecology of man. In order to understand the disease

process, he believes it is necessary to study the person, the person's body and the human and non-human environments of the person. By doing so, he proposes an expansion of psychosomatic medicine to include social and physical environments as factors for consideration when attempting to understand psychosomatic relationships. Consequently, health behaviors and outcomes are seen as being influenced by psychological, biological, and environmental factors. This proposed broadened model of Lipowski (1973, 1975) reflects an increased awareness that environmental factors have an important effect on human behavior and inclusion of these factors in his model increases the ability of that model to predict onset and course of illness.

Environmental Psychology

Although "environment" includes the total milieu of an individual, environmental psychology has generally focused on physical features of the "environment" thus omitting social, cultural, and interpersonal aspects. Specifically, environmental psychology has been concerned with the manner in which physical properties of the situation, such as temperature, spatial dimensions, and architectural design, influence behavior (Kasmar, 1970; Proshansky, Ittelson, & Rivlin, 1976). Research in environmental psychology has provided evidence of the importance of physical properties within the individual's environment and the influence of these properties on the manner in which the individual perceives the environment and interacts with others within that environment. An example

of this influence can be seen in environmental research in hospital settings which typically has involved examination and manipulation of unit design and furniture placement in psychiatric wards (Holahan, 1972; Trites, Galbraith, Sturdarant & Leckwart, 1970). They demonstrated that simple placement of ordinary furniture in sociopetal arrangements (environments that encourage contacts with others) resulted in more social interaction among psychiatric patients than did furniture placed in sociofugal arrangements (environments which discourage contacts). Research such as this underscores the importance of environmental factors and serves to emphasize that comprehensive models of human behavior must include a consideration of environmental factors or else overlook a significant influence on human behavior.

Ecological Psychology

An area of study which focuses both on physical and social environments is ecological psychology. Ecological psychology developed from Lewinian notions of "life space" (Lewin, 1935) which included aspects of the physical environment imbued with psychological meaning (Cartwright, 1951). Roger Barker, a student of Lewin, was largely responsible for developments in this area. He defined ecological psychology as the naturalistic study of the individual's behavior as a function of the psychological situation in which that behavior takes place (Barker, 1968). He demonstrated that behavior settings strongly control the behavior of individuals (e.g., reading and quiet speech in a library) as well as the experiences of the individual. He found, for example, that in

comparison to settings with an abundance of people, participants in settings with few people experienced more pressure to become involved in numerous activities and were more likely to feel important, challenged, etc. The significant contribution of ecological psychology therefore, is the recognition of the fact that environmental influences are not limited to physical characteristics of the environment but can also include the behavior "demanded" or prompted by the behavior setting.

Interactional Psychology

The interactional model of psychology focuses on the person, the situation in which behavior takes place, and the interaction between the two. Interactional psychology rejects both trait theories and behavioristic theories which seek to identify the causes of human behavior as being either totally due to individual differences or environmental influences. "Behavior involves an indispensable, continuous interaction between individuals and the situations they encounter. Not only is the individual's behavior influenced by significant features of the situation he or she encounters but the person also selects the situations in which he or she performs and subsequently affects the character of these situations" (Endler & Magnusson, 1976b, p. 958). One important issue in interactional psychology involves the definition of "interaction" in either mechanistic or dynamic terms. The view of interaction cited above strongly implies that interaction should be considered a dynamic process in which people and environments are mutually interwoven. Unfortunately, statistically techniques which would promote this type of research are not currently available and interactional research typically utilizes a simpler mechanistic model of interaction. The mechanistic model of interaction "implies a distinction between

dependent and independent variables and the assumption of an additive linear relation between situational and person factors" (Magnusson & Endler, 1977, p. 18). Consequently, typical interactional research has examined certain personal characteristics in different settings and the interactions between these characteristics and settings in which they take place. Examples of this type of research include studies of leadership style (Fiedler, 1977), obesity (Schachter, 1968), and anxiety (Auerbach, 1973), all studies under several different conditions or situations. Research using an interactional model has typically helped document some advantages of examining person by situation interactions. Specifically, certain behaviors can be better understood when information is known about the person and the situation in which that behavior takes place.

Overview of Developments

This review of model building efforts in other areas of research illustrates several common characteristics and developing ideas considered important for this research. First, each of the approaches reviewed has contributed in one way or another to the legitimization of the inclusion of environmental factors in the study of human behavior. The study of environmental factors is now seen by many as essential to understanding human behavior (Bem & Funder, 1978). Second, developments within these fields demonstrate the attention being paid to a broadening variety of variables in the study of behavior. This is particularly obvious in psychosomatic medicine and the changes in focus proposed by Lipowski (1973, 1975). In a field where previously only personality

differences were judged to be important factors for understanding health and illness, Lipowski's model proposes the examination of social and physical environmental factors as important in understanding psychosomatic relationships. Finally, research in interactional psychology has demonstrated one methodology for illustrating the importance of person-situation interactions. Not only can a person effect and situation effect be identified using this methodology, but an interactional effect of the two can be identified. Clearly, a wider range of factors is being understood to have important implications for understanding behavior. These variables and the methodology for examining these variables are being integrated into a variety of different approaches. These developments, while still in very early stages, demonstrate a growing recognition of the complexity of human behavior and necessity of research models to reflect this complexity.

While these crucial developments have taken place, limitations in the areas reviewed are great. Although the notion that behavior is a function of both person and situation (Bem & Funder, 1978) is commonly accepted, as pointed out earlier there is a shortage of research reflecting this type of interactional approach, and, in particular, there is a lack of this type of research in health care settings. In order to address such deficiencies in health care settings, it is necessary to adopt an approach which integrates the study of both individual and environmental factors. It is also necessary to adopt an approach which suggests specific variables to be examined in health care settings. Moos' (1979) social ecological approach addresses these person-environment relationships, makes recommendations about variables to be examined,

and appears closest to meeting the requirements of this research for application to health care settings. The remainder of this section will describe the development of this approach and outline how it can be used to study person-environment relationships in a health care setting.

Development of the Social Ecological Approach

The social ecological approach was developed and named by Moos (1974). He cites numerous advancements in the fields outlined earlier as being influential in the development of this approach. The major difference between this and previous theories of human behavior was the inclusion of environmental variables in addition to personal variables as being necessary for understanding human behavior. Since most research prior to this had focused on the individual, there was little information available on how to systematically classify environments. The development of a systematic method for classifying social environments was the first major goal and accomplishment of the social ecological approach.

Moos (1974) originally defined the social ecological approach as, "the multidisciplinary study of the impacts of physical and social environments of human beings. Primarily concerned with the assessment and development of optimum human milieus... (p. vii)." Clearly, at this point, the social ecological approach emphasized the development of a system for measuring social environments. This work resulted in what are called social climate scales. Moos believes that environments have unique social characteristics which exert pressure on an individual to behave in a specific way. These social characteristics are called social climate and scales to measure social climate have been developed for various settings. These scales are completed by participants in the specific environment and their mean scores are taken as a measure of the

social climate of that particular setting. Considerable research was generated using these social climate scales and much of this research is summarized by Moos (1974, 1976). This research typically illustrated the effect of certain social climate characteristics on the participants in that environment. Social climate research rarely went beyond exploring the use of these scales. The occasional comparison of individual differences with perception of social climate were limited to demonstrating that measurements of perceived climates were not simply a different way of measuring individual differences (Moos, 1978).

In more recent years (Moos, 1979) the social ecological approach was extended into a model which specifically proposed the examination of the relationships between the person and the environment: "A social ecological perspective provides a distinct framework by which the transactions between people and their environments, and the impacts of these transactions of human functioning, can be conceptualized" (Moos, 1979; p. 527). This social ecological approach obviously is not the same as the "first" social ecological approach and therein lies a major source of potential confusion. The "first" social ecological approach involved research which measured social climates of various settings and determined relationships between these climates and various behaviors. The social ecological approach that Moos (1979) proposes is a broader examination of person and environmental relationships for understanding behavior. The present research is based on the "second" proposed social ecological approach of Moos (1979). This approach also differs from the first in that the original social ecological approach, which essentially was research on social climates,

has a large body of research supporting its existence while the later social ecological approach has had no direct empirical verification as of this writing. Therefore, the social ecological approach selected for use in this research has not been applied and at this point is an untested model. The variable groups considered to be important in this approach are outlined below.

Variables in the Social Ecological Approach to Health

The following sections will describe the major variable groups thought to be important for understanding health outcomes using the social ecological approach. The major variable groups are: 1) Environmental system, 2) Personal system, 3) Mediating factors, and 4) Health factors (see Fig. 1).

Environmental system

There are an infinite number of environmental variables which have an influence on human behavior. Moos (1979) proposes that for the sake of simplicity these variables can be combined into four major groups, each of which can influence health outcomes directly and/or indirectly. The four major groups of environmental variables are: physical setting, organizational factors, human aggregate and social climate.

Physical setting. Variables combined under the classification of physical setting are variables that are typically associated with environmental psychology. They include geographical, meterological, architectural and physical design characteristics of an environment.

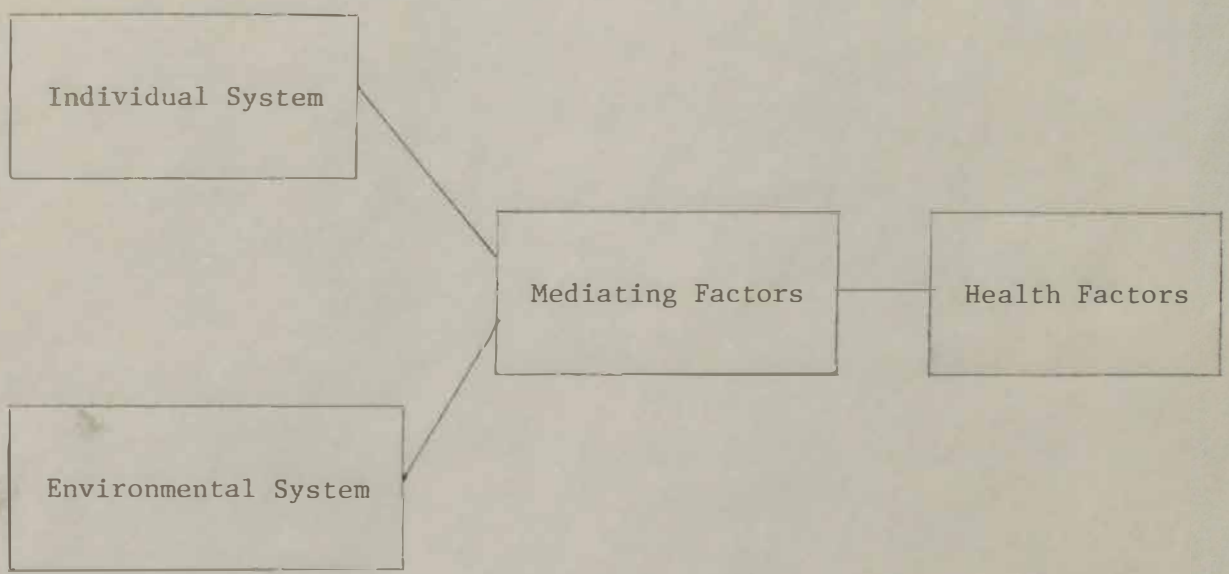

Figure 1. A social ecological model of health outcomes.

Organizational factors. Characteristics of the organization in which behavior is examined have been found to influence behavior. These characteristics can include size, staffing patterns and function of the environment being studied.

Human aggregate. These variables describe the environment using the average characteristics of the inhabitants of that environment. The variables used include age, socioeconomic background and educational level.

Social climate. These variables describe the environment based on the participants' perceived requirements of that environment. Moos believes that social climate is to an environment as personality is to a person: "For example, some people are supportive; likewise some environments are supportive. Some men feel the need to control others; similarly, some environments are extremely controlling. Order and structure are important to many people; correspondingly, many environments emphasize regularity, structure and order" (Moos, 1974, p. 35). The social climate methodology has been used in a wide variety of settings including psychiatric units (inpatient and outpatient) (Alden, 1978; Otto & Moos, 1974), alcoholism treatment programs (Cronkite & Moos, 1978) and juvenile and adult correctional facilities (Trickett & Moos, 1972; Wenk & Frank, 1973).

As the result of this extensive research, Moos suggests that a wide variety of environments can be characterized along three broad categories (relationship dimensions, personal growth dimensions and system maintenance dimensions). The relationship dimension is composed

of involvement, support and spontaneity subscales which assess how active the respondents are in the particular environment, the encouragement and support that they receive and provide for each other and the amount of encouragement for open expression of feelings. The personal development dimension is measured by the individual's perception of the opportunities in the setting for self-enhancement and the development of self-esteem. Finally, system maintenance is determined by order and organization, program clarity and staff control subscales. This dimension is concerned with the degree of orderliness, clarity in rules and expectations and extent to which rules are used to control the participants. Social climate variables are the environmental system variables which are emphasized in the social ecological approach. Moos believes that these perceptions of social climate "tend to be more important than do physical environmental or organizational variables" (Moos, 1979, p.542) for understanding health outcomes.

Personal system

Many different variables help explain individual differences seen in response to different environmental settings. Personal system variables are seen as influencing the meaning of an environment and the psychological resources available to cope with that environment. Variables included in this category are age, sex, socioeconomic status, previous coping experiences, values, traits and roles. As mentioned earlier the social ecological approach has paid relatively little attention to person variables and specific measures of the personal system have not been recommended or tested.

Mediating factors

The concept of mediating factors was first included in the "second" social ecological model of Moos (1979). He identified appraisal, activation and adaptation as three mediating factors important for understanding health outcomes. Unfortunately, Moos (1979) has provided no explicit rationale for inclusion of these factors in this model and therefore, no explicit rationale for this decision can be provided for the reader.

A thorough description of these specific mediating factors is also hampered by the lack of clarity in this most recent formulation. However, it appears that, at least in part, Moos is drawing on a body of research which emphasizes the importance of cognitive processes for understanding behavior. He cites the work of Lazarus (1966) who uses cognitive appraisal as a central concept in describing the coping process. Appraisal of the particular environment or situation is presumed to mediate the effects that the personal and environmental systems have on health factors. The second mediating factor, activation, "usually occurs when the environment is appraised as necessitating a response"(Moos, 1979, p.532). If an environment is appraised as necessitating a response, efforts at adaptation or coping are introduced. When this occurs, the individual can make a change or adaptation in the environmental system or personal system which can have an influence on health outcomes. Moos (1979) alludes to a growing literature on coping and adaptation (Haan, 1977; Lazarus & Cohen, 1977) as well as specific sets of coping strategies which are thought to be important for health related behavior (Moos, 1977;

Weisman & Worden, 1976) as justification for inclusion of adaptation as one of the mediating factors.

A common problem in dialysis can be used as an example of this proposed process. A new hemodialysis patient is faced with recommendations for beginning a radically different diet. If the patient appraises this recommendation as requiring a response then he becomes activated or aroused to make an adaptive response. This response could either be to change his personal system (e.g.,decide it is better to follow medical recommendations and adjust the diet rather than suffer through treatment, refuse to believe that diet will effect life, etc.) or to change his environmental system (e.g.,seek out a treatment facility that will provide him with support and structure for the diet, request to become a home dialysis patient where he will feel less restricted and more independent, etc.). Depending on the adaptation made, various health outcomes will develop. Clearly, a decision that changing diet will not help will have a different health outcome for the patient than a decision to attempt to stick carefully to the diet.

Despite their recent inclusion in the social ecological approach, mediating factors remain an ambiguous and certainly untested part of the model. Moos (1979) has briefly described these variables but has provided no clear definitions nor provided any method for assessment of these factors. Perhaps one way of additionally clarifying these mediating factors is to contrast them with variables in the personal system. Mediating factors are thought to be more immediate responses to the environment and as such may change frequently depending upon the envir-

onment. Personal system variables, on the other hand, are considered to be more enduring qualities of the individual that remain relatively stable over time.

Health factors

Health status and health related behavior can be measured in many different ways. Consequently, no one set of variables can accurately or completely describe the wide range of behaviors and conditions related to health. Therefore, Moos (1979) has categorized these variables into five sets of measures of health status and health related behavior. The groups are: 1) the onset and development of illness, 2) the course of illness and outcome of treatment, 3) the utilization of health services and compliance with treatment, 4) functional effectiveness and 5) satisfaction and well-being.

In summary, the social ecological approach assumes that in order to understand health status and health related behavior, one must first examine both the individual and the environment. The relationship between these two systems and health outcomes is mediated by appraisal of the situation, activation of the individual and adaptation. This adaptation leads to individual health status or health related behaviors. This process, as proposed by the social ecological approach is portrayed in Figure 1. Although this model has been presented in linear fashion, this was done out of convenience. This model is seen by Moos (1979) as a functioning system which is subject to feedback from each of the components which can mutually influence each other. Finally, although the social ecological approach has proposed a model for use in under-

standing health outcomes, this model remains untested.

Application of the Social Ecological Approach to Hemodialysis

In an exploratory effort, this research applied the as yet untested social ecological approach in a health care setting specifically exploring the use of this approach in chronic hemodialysis treatment settings. Chronic hemodialysis treatment settings were viewed as appropriate settings for exploring this approach for several reasons. First, chronic hemodialysis is a treatment in which patients experience a great deal of stress (Czaczkes & Kaplan De-Nour, 1978; Goldstein & Reznikoff, 1971; Kaplan De-Nour, 1970). Numerous requirements are made of and limitations imposed on the patients in their treatment. Despite the tremendous amount of energy required of the patients in their treatment, they must ultimately face the fact that dialysis will not likely extend their life to a normal limit. Facing each of these problems constructively requires a great deal of personal effort and adaptation. Consequently, personal characteristics and adaptability are critical in chronic hemodialysis patients. Another reason that hemodialysis was seen as an appropriate treatment for application of this approach is the importance of the treatment environment. Chronic hemodialysis usually requires three treatments weekly, each of which lasts for 4-6 hours. These treatments are generally obtained at the same unit for a fixed schedule; not only do patients return to the same physical setting, they also return to the same social setting. Attitudes toward the setting and relationships which develop between patients and staff at dialysis units can take on

great importance for the patients and their treatment. Patients have ample time to develop relationships both with other patients and with staff. A typical dialysis "run" offers the patients time for socialization with other patients before treatment in a waiting room, with other nearby patients and staff during dialysis and immediately after dialysis in the waiting room. In addition, many units organize occasional outings or parties which are separate from the regular treatment. For some patients these opportunities for socialization are obviously welcomed and enjoyed while for others, hemodialysis is conducted with as little interaction as possible.

A third reason for doing research with hemodialysis patients was that chronic hemodialysis patients are also required to make numerous measureable adjustments in their lives in order to permit the treatment to be effective. Lack of cooperativeness in making these adjustments can exacerbate the illness or even hasten death. The adjustments required of patients include limitations on diet, limitations on fluid intake, and attendance at regular treatment sessions. Whether or not the patient makes these adjustments or the degree to which he does can be determined on a regular basis through standard information regularly obtained from the patient (weight gains, blood values, etc.). The result of the ease at which these critical measures can be obtained is that a significant body of research has developed to identify variables predictive of compliance. Identification of these variables is important for making interventions to optimize compliance. These adaptations ultimately lead to specific health outcomes, and as mentioned earlier, failure to make

adaptations can result in increased illness or death.

Finally, chronic hemodialysis was seen as an appropriate research area for applying this approach because of an obvious need for a comprehensive approach to examining the problems facing dialysis patients. This need will be outlined more clearly in the following review of relevant dialysis research literature. The research available is limited and is specifically deficient in the area of examing relationships among the patient, environment and health outcomes. The social ecological approach is seen as a significant way to alleviate this deficiency.

In the following sections, the importance of treatment regimen compliance for dialysis patients will be outlined and a review of compliance literature for dialysis patients will be presented.

Importance of Compliance for Dialysis Patients

The ideal substitute for a poorly functioning kidney would be either a successfully transplanted kidney or an artificial unit which carries on dialysis at a continuous level similar to a healthy functioning kidney. Continuous operation would be an optimum solution because changes in the fluid and vital chemical state of the body effect total bodily functions. Consequently. if large amounts of waste are retained in the tissues and blood stream, as occurs without dialysis, patients can become seriously ill. On the other hand, if these wastes are rapidly reduced, the patient can also become quite ill. Dialysis, therefore, must be carried on as often as possible while simultaneously allowing for practical and economic restrictions. Consequently, the

current acceptable compromise between these two factors is generally three to six hours of dialysis three times a week. Unfortunately, however, the use of a dialysis machine is not suffucient treatment by itself to alleviate the complications of renal failure. Successful treatment of hemodialysis patients also depends on the patient's compliance with a strict dietary regimen.

The dietary restrictions on hemodialysis patients are demanding. Since the patient's kidneys are no longer functioning properly, fluid wastes are no longer being removed from the body. Consequently, the hemodialysis patient is required to limit two very basic habits, eating and drinking. Dietary restrictions include limitations on the intake of potassium, proteins and fluids are necessary. A typical diet for a hemodialysis patient would include: 1) 60 grams of protein, 2) 2,200 mg potassium and 3) 1,500 cc's fluid (Hopkins, 1972). Deviations from this diet can lead to additional physical problems and discomfort for the patient.These restrictions are often quite difficult and it requires a major adaptation on the part of the patient to comply with this dietary regimen. The stress involved in complying with this regimen has been amply described (Czaczkes & Kaplan De-Nour, 1978; Goldstein & Reznikoff, 1971; Kaplan De-Nour, 1970) and estimates of noncompliance in the dialysis population range from 45% to 75% (Friedman, Goodwin & Chaudtry, 1970; Kaplan De-Nour & Czaczkes, 1972; Winokur, Czaczkes & Kaplan De-Nour, 1978).

Even though compliance with treatment is extremely critical, noncompliance is often observed. Procci (1978) noted that the high incidence of dietary abuse found in dialysis patients corresponds with notions

about compliance by medical patients in general. He states that treatment programs that require substantial modification of personal habits and interfere with daily activities (such as for dialysis patients) are associated with high levels of non-compliance. Requests which involve the least amount of discomfort on the part of the patient are more likely to be followed than those which require a great deal of effort or discomfort. For dialysis patients, control of their weight requires strict fluid and salt restriction while control of their potassium levels requires rigid avoidance of specific foods. Since non-compliance with the treatment regimen is so common and such a potentially serious problem for dialysis patients, there is a strong interest in understanding and improving compliance with treatment regimen.

Research on Compliance in Dialysis Treatment

The available research concerning compliance with dietary regimen in dialysis patients will be reviewed in this section. Several of these studies were designed to aid practitioners screen patients who were determined to be unsuitable for dialysis treatment at a time when such practice was necessary. Their aim was a practical rather than theoretical one. While the need to screen patients does not currently exist, there is a continuing need to improve dialysis treatment through better understanding of compliance with treatment regimen

and to identify patients who need additional psychological support.

This review is organized according to the categories recently employed by Cummings (1980). The variable groups related to compliance are: social demographic characteristics, intelligence, coping style, social support and health beliefs.

Sociodemographic Variables

Age. The findings on the relationship between age and compliance are inconclusive. Using ratings of compliance made by dialysis staff, Meldrum et al. (1968) reported that younger patients were better able to cooperate with medical recommendations than were older patients. Hartman and Becker (1978) also report a modest negative relationship between patient age and compliance to taking medication and following dietary advice. However, neither Borkman (1976), Blackburn (1977) nor Procci (1978) found any association between compliance with treatment regimen and age in kidney dialysis patients.

Sex. Inconclusive findings were also found for the relationship between sex and compliance. For compliance with taking medication, Blackburn (1977) reported that female patients complied better than male patients, while Hartman and Becker (1978) found that males complied better. Blackburn (1977) also reported that females followed dietary advice better than did male patients. However, Procci (1978) and Borkman (1976) found no relationship between the sex of a patient and compliance with treatment.

Marital status. Numerous studies (Friedman et al., 1970; Hartman & Becker, 1978; Meldrum et al., 1968) reported that married patients

complied better than do patients that were unmarried or separated. However, Blackburn (1977), Procci (1978), Borkman (1976) and Towne and Alexander (1980) all reported no difference between the compliance levels of married and unmarried patients. Procci (1978) did find that patients living with a spouse, fiancee, or children did have better compliance levels than those who did not.

Education. Contrary to speculation, no definite relationship between educational level and compliance has been found (Blackburn, 1977; Hartman & Becker, 1978; Procci, 1978). Borkman (1976) reported mixed findings for the relationship between educational level and compliance, although educational level has been shown to be positively related to the patient's level of knowledge about the disease and treatment regimen. Blackburn (1977) reported that understanding of the treatment, rather than education level, has a positive effect on compliance.

Socioeconomic status. There has been no consistent relationship found between social economic status and compliance to medical recommendations (Blackburn, 1977; Hartman & Becker, 1978; Procci, 1978).

Employment status. Three studies have reported on the relationship between employment status and compliance. Winokur et al. (1973) reported that patients who were previously or currently employed complied better with medical recommendations than did patients who were unemployed. Similarly, Procci (1978) reported that greater compliance was found in patients who were employed or in school. However, Towne and Alexander (1980) using ratings of compliance made by staff did not obtain support for this type

of relationship between employment and compliance.

Intelligence

Findings of the relationship between intelligence and compliance are also inconclusive. Sand, Livingston and Wright (1966) found that more intelligent patients complied slightly better with medical instructions than do less intelligent patients. Other studies provide contradictory evidence regarding this relationship. Winokur et al. (1973) reported no relationship between intelligence and dietary compliance in dialysis patients. Hagberg (1974) reported that a patient's intelligence and compliance were related during the first six months of treatment; however, the relationship diminished by the end of the first year of treatment. Finally, Borkman(1976) reported a positive relationship between staff ratings of patient intelligence and compliance with regimen, but also found that this relationship disappeared when knowledge of the treatment regimen was taken into account. Consequently, she concluded that intelligence was only indirectly related to compliance, knowledge of the treatment regimen being the critical variable.

Coping Style

Several authors (Cummings, 1970; Goldstein & Reznikoff, 1971; Kaplan De-Nour & Czaczkes, 1972; Kaplan De-Nour, Shaltiel & Czaczkes, 1968; Shea, Bogdan, Freeman & Schriener, 1965; Wilson, 1974) have identified a common coping style for hemodialysis patients who are

compliant with medical regimens. Typical defenses used in this style are denial, repression and dependency. In addition to these characteristic defenses, Kaplan De-Nour and Czaczkes (1972) report that "low frustration tolerance" and "gains from the sick role" were the most frequent causes for noncompliance. Kaplan De-Nour, Shaltiel and Czaczkes (1968) report that patients who can accept dependency and/or patients for whom aggressive feelings or actions are more acceptable and more easily expressed may adapt more easily to dialysis.

Locus of control has been considered by numerous investigators to be a logical and potentially rewarding dimension to examine in relation to compliance. Goldstein and Reznikoff (1971) connected the high rate of externally oriented hemodialysis patients with a high rate of suicide attempts and speculated that since externally oriented patients view their actions to be unrelated to their medical condition, they are more likely to be poor dietary compliers. However, since that time, several studies of compliance to medical regimen by hemodialysis patients which have employed measures of locus of control (Blackburn, 1977; Hartman & Becker, 1978; Towne & Alexander, 1980) have found it to be a poor predictor of compliance behavior.

Social Support

Support from the patient's family and friends (Cummings, 1970; Friedman et al., 1970; Hartman & Becker, 1978; Hickey, 1972; Mlott &Allain, 1972; Pentecost, Swerenz & Manuel, 1976) and the relationships of patients to health care providers (Cummings, 1970; Ford & Castelnuovo-Tedesco, 1977; Kaplan De-Nour, Shaltiel & Czaczkes, 1968; Kaplan De-Nour & Czaczkes, 1971; Kaplan De-Nour, Czaczkes & Lilos, 1972; Wertzel,

Vollrath, Ritz & Ferner, 1977) have been shown to be factors affecting the patients' compliance to medical recommendations. The relationship between patient and provider is critical due to the importance and duration of the service provided. Dialysis unit staff typically interact with patients from the time of admission and the staff play a central role in helping the patient and the patient's family adjust to the rigors of the hemodialysis treatment routine (Cummings, 1970). In addition, the attitudes and expectations of the staff have been shown to be crucial to the patient's compliance with treatment regimen. Kaplan De-Nour, Czaczkes and Lilos (1972) in a study of three dialysis units reported that the staff's opinions, particularly its agreement or disagreement concerning expectations about patient behavior, have an effect on patient behavior. They found that if there is no open agreement on behavior required of patients, it is not likely that one could expect a high rate of compliance by patients. Wertzel et al. (1977) reported a similar finding showing that hemodialysis patients tend to adjust to the nurse's expectations about their behavior.

Health Beliefs

The Health Belief Model (HBM) describes decision making under conditions of uncertainty. The HBM suggests that the likelihood of an individual taking a recommended health action is determined by several different factors. The major factors include: the individual's perceptions of susceptibility to illness, perception of the severity of the illness and the benefits and costs associated with paths of

action that can be taken to prevent or reduce that illness. Obviously, this model relies on assessing beliefs of the individual in these three categories to determine the likelihood of that person taking a recommended health action. For hemodialysis compliance research, knowledge of the individual's perception of susceptibility to the effects of noncompliance, perception of the severity of effects of noncompliance and the benefits and costs associated with compliance are critical for understanding compliance behavior. Only two studies have been conducted utilizing the HBM with hemodialysis patients and compliance with treatment regimen. Hartman and Becker (1978) reported that compliers, who believed that noncompliance would result in serious harm to them, found complying easier and felt that the benefits of compliance were more substantial than did noncompliers. Compliers also felt themselves to be less susceptible to the negative results of noncompliance as well as that compliance would spare them of the negative results of noncompliance. Cummings (1980) found that patients' beliefs about benefits and barriers connected with compliance to a treatment regimen were strongly related to patients' self-reports of compliance but only weakly related to medical chart measures of compliance. The reason for this discrepancy remains unclear leaving questions concerning the measurement of compliance. The usefulness of the HBM for dialysis patients and compliance with treatment regimen remains uncertain at this time due to its limited ability to demonstrate a substantial relationship between health beliefs and measures of compliance other than a patient's self-report.

Summary of Compliance Research in Hemodialysis

A summary of the review of the literature produces the following tentative conclusions about the compliant dialysis patient.

Sociodemographic variables. No consistent relationship appears to exist between the patient's age, sex, socioeconomic status and his/her compliance with treatment regimen. Contradictory findings were reported for each of these variable's relationship with compliance. The review of sociodemographic variables does reveal that the compliant patient typically is married or living with someone, more aware of his/her disease or treatment regimen (which is related to educational level) and more likely to have been, or be employed, or in school than the noncompliant patient.

Intelligence and coping style. A slight positive relationship appears to exist between intelligence and compliance. However, this long held belief that intelligent patients are more compliant is questioned by Borkman (1976) who suggests that knowledge of treatment regimen, rather than intelligence, is the critical variable for prediction of compliance. Regarding coping style, there is consensus among several researchers that compliant patients demonstrate a common coping style characterized by the use of denial, repression, and dependence. Noncompliant patients are described as having a lower frustration tolerance and a higher tendency to isolate themselves from others than the compliant patients. No conclusions can be drawn from

the research examining internal-external orientation of the patients in relation to their compliance with treatment regimen.

Social support. Patients who report experiencing higher levels of support from family and friends are more likely to be compliant with treatment regimen. This finding corresponds with the finding that married patients living with someone were more compliant than those who lived alone. Support of the dialysis unit as measured by consistent attitudes of the staff also results in higher patient compliance with treatment regimen.

Limitations of the Dialysis Research Reviewed

A great deal of the research reviewed here is limited by methodological problems. Most of the studies have used fewer than 50 subjects while simultaneously examining several variables. Two studies, Kaplan De-Nour and Czaczkes (1972) and Winokur et al. (1973) are obvious examples of such inadequate sampling procedures. The studies involve 43 patients from six dialysis units and 38 patients from five dialysis units, respectively. No information is available concerning how these patients were selected from the various units and how they compare with those patients who were not selected. The obvious lack of information and the small sample sizes used in these studies increase the chances of obtaining nonrepresentative samples and thus drawing incorrect conclusions about the population studied. Thus, the conclusions drawn from this research are tenative at best and could possibly be misleading and nonrepresentative of a general hemo - dialysis population.

Another serious limitation in the compliance research is the manner in which compliance is treated. A difficulty arises both from the definition of compliance and the variety of measures of compliance used. Numerous studies fail to provide accurate information about the measurement of compliance. Instead, compliance is sometimes simply mentioned as a dependent variable without elaboration and/or described with insufficient information to understand or replicate the measurement (Sand et al., 1966; Towne & Alexander, 1980). In these cases, the results obtained are seriously limited and comparisons are difficult.

A second problem with compliance measures used in the research reported is the vast array of measures used for compliance itself. Compliance can be subjectively rated by physicians (Kaplan De-Nour & Czaczkes, 1974), nurses (Borkman, 1976) and patients (Cummings, 1980) or objectively measured by blood chemistry and weight gains (Cummings, 1980; Procci, 1978) or specific behaviors (Borkman, 1976). Compliance can also be measured in several different ways within one study (Borkman, 1976; Cummings, 1980; Winokur et al, 1973).

There are occasions (although rare) that different studies use the same measure of compliance. When this occurs, another problem becomes readily apparent. Standards for determining compliance using the same measure of compliance are not the same in different studies. The research of Kaplan De-Nour and Czaczkes (1972) and Procci (1978) can be used as an example of this problem. Among other measures, both of these articles report measuring weight gains between treatment and predialysis potassium levels as measures of compliance. Unfortunately,

the standards imposed to determine compliance in one study are different from the standards in the other. Kaplan De-Nour and Czaczkes (1972) define compliant patients as those who have weight gains between dialysis in the 1.0-1.5kg. range or lower, rarely going up to 2.0kg. and predialysis potassium levels are from 6.0-6.8mEq/liter or lower. In contrast, Procci (1978) defined compliant patients as those patients having mean weight gains of .9kg. or less and mean predialysis potassium level of 5.5mEq/liter or less. Obviously, the standards of Procci (1978) are more difficult for patients to meet than those of Kaplan De-Nour and Czaczkes (1972) and would identify fewer compliant patients. The difficulty that these different standards raise is that even in the rare studies where compliance is assessed using the same measure, because of different standards for determining compliance, patients may be classified as compliant in one study that would have been noncompliant in the other.

There are strengths and limitations to all of the compliance measures used (Cummings, 1980). No single measure of compliance has proven its superiority although blood chemistry and weight gains between treatments remain the most frequently used methods of measuring compliance. In the dialysis literature, an implicit assumption has been made that these measures of compliance are interchangeable, yet no research has specifically addressed this issue. This assumption may not hold true and caution is recommended when comparing compliance rates or conclusions of different studies. Obviously, these different

measures and standards could significantly contribute to the lack of consistency observed in the literature reviewed.

Finally, the author is suggesting that a critical problem in this research area is the lack of an adequate integrative model for directing research questions and conceptualizing the results. While the high frequency of noncompliance among dialysis patients has stimulated research in this area, very little is known about the relationships among the variables studied. Much of the present knowledge about compliance remains disjointed and difficult to interpret.

Statement of the Problem

Examination of simple cause-effect relationships between pairs of variables has resulted in little progress in hemodialysis compliance research. The results obtained are ambiguous for a number of reasons (see Limitations of the Dialysis Research). The major emphasis of this research is to focus on what is believed to be the primary limitation of previous hemodialysis compliance research. It is the author's belief that the model used to conceptualize this research area has been inadequate for the task. Developments in other research areas have demonstrated what appears to be a tendency toward conceptualizing the understanding of human behavior in terms of the relationship between the person and their environment (Endler & Magnusson, 1976; Lipowski, 1973; Rosen, 1972). A model for use in this research which addresses these relationships in health care has been selected and described (Moos, 1979). While this approach was selected because it was judged to be

an improvement over previous models, it is not without limitations. Moos (1979) has only superficially outlined this approach and no application of the approach has been reported. Consequently, this research will be the first application of the social ecological approach for understanding health behaviors. The objectives of this research were as follows:

1) Provide information about the relationship of variables suggested by the social ecological approach. Are environment, person and mediating variables distinct variable groups as suggested by the social ecological approach?
2) Provide information which would clarify measurement of compliance issues. What is the relationship that exists among the different compliance measures? Is compliance a unitary factor or is it multidimensional?
3) Provide information about hemodialysis patient compliance. Can measures of patient compliance be predicted using combinations of measures of environment, person and mediating variables?

CHAPTER II

METHOD

Design

The design of this research was based on the social ecological notion that health behaviors and outcomes can best be understood through knowledge of the personal system, environmental system, and mediating factors. In order to understand the relationships involved in this approach, selected variables from each of these groups must be measured. The Materials section describes how each of these variable groups (individual system, environmental system, mediating factors, and health factors) was tapped (Figure 2). Once these measures were obtained, the social ecological approach and objectives of this research dictate a specific approach to the analysis of the collected data. This included testing the uniqueness of the major variable groups (factor analysis), determining the relationship among the various measures of compliance (factor analysis), and predicting compliance using measures of personal system, environmental system, and mediating factors (multiple regression).

Subjects

A list of kidney disease service facilities and programs was obtained from the Kidney Foundation of Michigan. Using this list, all facilities offering chronic hemodialysis treatment in the Metropolitan Detroit area were contacted and requested to participate in the research. Of those con-

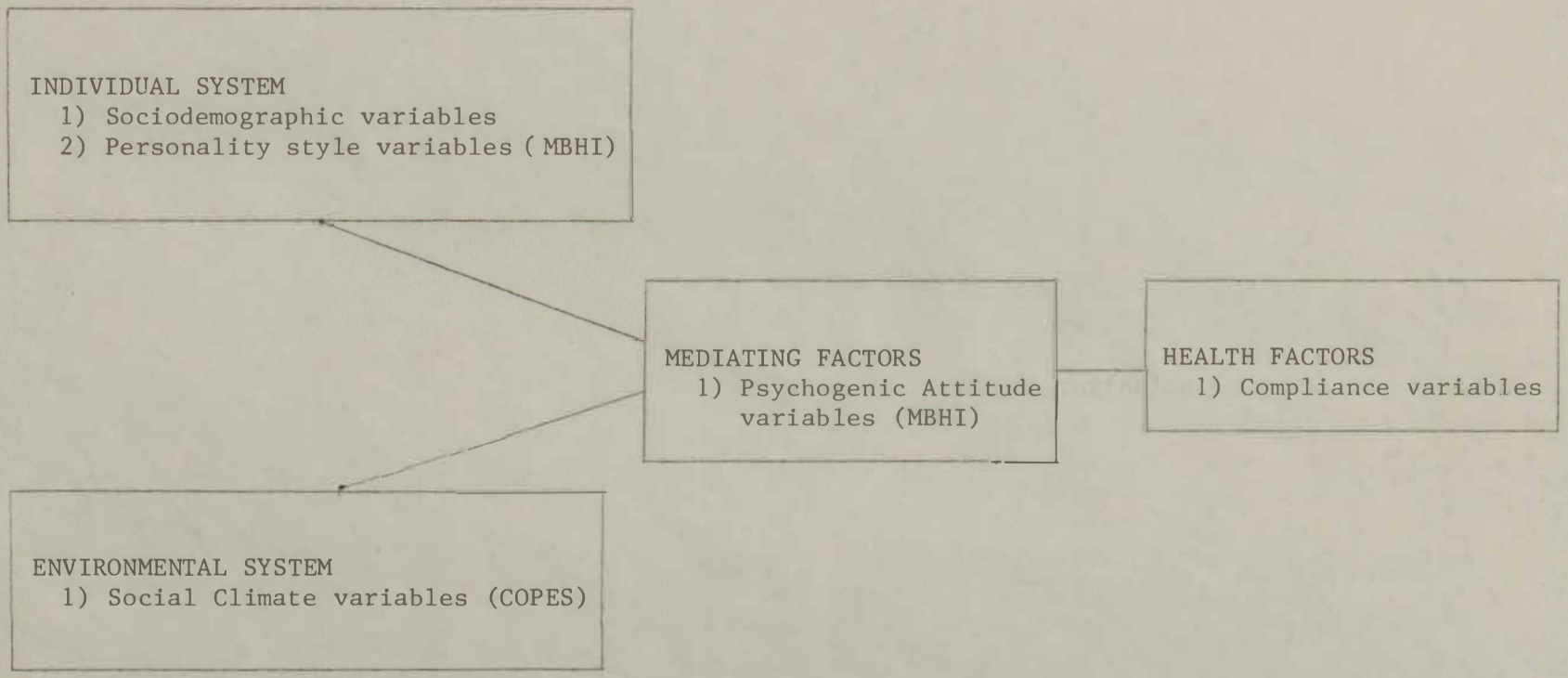

Figure 2. Variables used in the social ecological model of health outcomes.

tacted, exactly one half agreed to participate. Those treatment facilities were: Henry Ford Hospital-Fairlane Center, Henry Ford Hospital-Troy Center, Biomedical Applications of Livonia, St. Clair Renal Center, Mt. Carmel Mercy Renal Center and Grace Hospital Renal Center. Hemodialysis patients at these treatment facilities who were between the ages of 17-75 and who had received hemodialysis for at least three months prior to the research were eligible for inclusion in this research. A total of 180 hemodialysis patients from the six different units completed the entire procedure and thus were included in the final sample. The 83 patients who did not complete both questionaires or did not in some other way qualify (transferred during the research, received a transplant during the research, etc.) were not included in the sample. Seven patients refused to participate in any part of the research.

Materials

This section describes the materials used to obtain measures of the personal system, environmental system, mediating factors and health factors. The materials used in this research were selected on the basis of their measurement of the desired information for this research, content suitability for hemodialysis patients, ease of administration and response and demonstration of prior utility in related research. As mentioned earlier, this research is the first application of the social ecological approach and no materials have been developed which fit all these criteria. Consequently, instruments were selected which most nearly fit these requirements.

Personal System

The personal system variable group was measured using socio-demographic information and personality style scores. Sociodemographic information was obtained from the patients for the following variables; age, sex, race, employment status, education level and length of time receiving hemodialysis (Appendix A).

The patient's personality style was obtained using the Millon Behavioral Health Inventory (MBHI) (Millon, Green & Meagher, 1979a) (Appendix B). The two major reasons for selection of the MBHI for this research are: 1) It provides measures of both the personal system (personality style) and mediating factors (psychogenic attitudes) in a single test thus reducing time and effort requirements on patients. 2) The MBHI is the only test available to assess these variables which has been constructed for use in a variety of medical settings including dialysis units. The MBHI is a 150 item, true-false, self-report inventory. The reliability of the MBHI was determined over a mean time period of 4.5 months. The scales can be divided into three basic groups: personality style scales, psychogenic attitude scales and empirically derived scales. The personality scales have a reported mean test-retest reliability of .82 with a range of .77 to .88. The psychogenic attitude scales have a reported mean test-retest reliability of .85 with a range of .78 to .90, and the empirically derived scales have a reported mean test-retest reliability of .80 with a range of .59 to .83. Internal consistency was obtained for the scales of the MBHI using the Kuder-Richardson Formula 20. The median KR20 coefficients for all scales was .83 with a range

of .66 to .90. Convergent validity data are available in Millon et al. (1979a). The inventories used for this purpose include the MMPI, SCL-90, Rotter's Locus of Control, Beck's Depression Scale, POI, Life Events Survey, Webber-Johansson Temperment Survey and the CPI. Information for the personal system was obtained using the personality style scales of the MBHI. A description of the personality style scales follow as taken from Millon et al. (1979b, p.535).

> Introversive personality. Keeps to self, quiet, unemotional, not easily excited, rarely gets socially involved, lacks energy, vague about symptoms and passive about self-care.
> Inhibited personality. Shy, socially ill at ease, avoids close relationships, fears rejection, feels lonely, distrustful, is easily hurt, requires sympathetic support.
> Cooperative personality. Soft-hearted, sentimental, reluctant to assert self, submissive with others, lacks initiative, eager to take advice, is compliant, dependent, devalues self confidence.
> Sociable personality. Charming, emotionally expressive, histrionic, talkative, stimulus seeking, attention seeking, unreliable, capricious in affect, easily bored with routine.
> Confident personality. Self-centered, egocentric, narcissistic, acts self-assured, is explotive, takes others for granted, expects special treatment, is benignly arrogant.
> Forceful personality. Domineering, abrasive, intimidates others, blunt, aggressive, strong willed, assumes leadership role, impatient and easily angered.
> Respectful personality. Serious minded, efficient, rule conscious, proper in correcting behavior, emotions constrained, self-disciplined, avoids the unpredictable, is orderly and socially conforming.
> Sensitive personality. Unpredictable, moody, passively aggressive, negativistic, guilt ridden, anticipates disappointments, displeased with self and others.

Environmental System

The second variable group of concern to this research was the environmental system. There are many different ways of measuring environments and Moos (1979) has grouped these measures into four major groups. They are: physical setting, organizational factors, human aggregate, and

social climate. Each of these groups of variables has been described elsewhere in this paper (see Chapter 1). The environmental variables used in this research were from the social climate group. The perceived social climate of the dialysis units was assessed using the Community Oriented Programs Environment Scale (COPES) (Moos, 1974b) (Appendix C). While no social climate scale exists which is specifically designed for hemodialysis settings, social climate as perceived by hemodialysis staff has been measured before (Herranen & Lowe, 1978) using the Ward Atmosphere Scale (WAS) (Moos, 1974). Based on this precedent, the direct parallel between the content and structure of the COPES and WAS (Moos, 1974a) and finally that the COPES is designed for outpatient settings while the WAS is for inpatient settings, the COPES was selected as the appropriate test for measuring social climate in this research.

The normative sample for the COPES was obtained from 54 different programs which included 779 members and 357 staff. Internal consistency using within program item variance for each of the 10 subscales is .62 or better. Intercorrelations of the 10 subscales shows that the highest value is .50 and a majority of the values are below .30 suggesting that although the scales do share some modest correlations, they do appear to measure distinct characteristics of perception of program atmosphere. Test-retest reliability is not available for the COPES; however, since the content and structure of the COPES and WAS (Moos, 1974a) are directly parallel, the results obtained for the WAS may be generalized as applicable to the COPES. Test-retest reliability for a one week period on the WAS yields values ranging from .68 for Practical Orientation to .83 for

Personal Problem Orientation. Construct validity data also are available only for the WAS. Correlations between ten WAS subscales and five Perception of Ward (POW) subscales showed that Inaccessible Staff and Receptive-Involved Staff correlated (R=-.65 & .64) highly with the WAS Support subscale. POW Involvement in Ward Management subscale is correlated with the WAS subscale Autonomy (R=.41) and POW Satisfaction with Ward subscale is correlated with WAS Involvement subscale(R= .57).

The COPES is a 100 question, true-false, self-report, social climate scale designed to describe out-patient treatment settings on three basic dimensions: relationship dimension, treatment dimension and maintenance dimension. These three dimensions are divided into the following ten subscales as taken from Moos (1974b, p.3).

Relationship Dimension

Involvement. Measures how active members are in the day-to-day functioning of their programs, i.e., spending time constructively, being enthusiastic, doing things on their own initiative.
Support. Measures the extent to which members are encouraged to be helpful and supportive towards other members, and how supportive the staff is towards members.
Spontaneity. Measures the extent to which the program encourages members to act openly and express their feelings openly.

Treatment Dimension

Autonomy. Assesses how self-sufficient and independent members are encouraged to be in making their own decisions about their personal affairs(what they wear and where they go) and in their relationships with the staff.
Practical orientation. Assess the extent to which the member's environment orients him towards preparing himself for release from the program. Such things as training for new kinds of jobs, looking to the future, and setting and working towards goals are considered.
Personal problem orientation. Measures the extent to which members are encouraged to be concerned with their personal problems and feelings and to seek to understand them.

Anger and aggression. Measures the extent to which a member is allowed and encouraged to argue with members and staff, to become openly angry and to display other aggressive behavior.

System Maintenance Dimension

Order and organization. Measures how important order and organization is in the program, in terms of members (how do they look) staff (what they do to encourage order) and the setting itself (how well is it kept).

Program clarity. Measures the extent to which the member knows what to expect in the day-to-day routine of his program and how explicit the program rules and procedures are.

Staff control. Assess the extent to which the staff use measures to keep members under necessary controls, i.e., in the formulation of rules, the scheduling of activities and in the relationships between members and staff.

Both patients and staff were requested to complete the COPES. The responses of the staff were elicited to provide an additional measure of the social climate of the unit.

Mediating Factors

The third group from which to select variables for this research was mediating factors. As mentioned earlier, the social ecological approach of Moos (1979) has only provided a brief outline of mediating factors and has not provided for any method of measuring these variables. Consequently, it was necessary to search for a measure of one of Moos' mediating factors. It was the author's judgement that the psychogenic attitude scales as found in the MBHI are examples of the mediating factor appraisal. These scales reflect the patient's current appraisal of their condition and are based on previous research which has shown their effect on health (Millon et al., 1979b). This

decision was based on the apparent similarity of concepts used by Moos (1979) and Millon et al. (1979a). Psychogenic attitudes are described as "personal feelings and perceptions of the patient ... which increase psychosomatic susceptibility or aggrevate the course of a current disease" (Millon et al., 1979a, p.6) The mediating factor appraisal is described by Moos (1979) as a perception of the environment mediating the effects of the environmental and personal systems which has an effect on health outcomes. It seems that both psychogenic attitudes and the mediating factor appriasal appear to be concerned with the individual's perception of a specific immediate condition which has an ultimate effect on that person's health. Because of the apparent equivalence of these two concepts and also due to the ease of obtaining the psychogenic attitude measures from the MBHI, the psychogenic attitude scales were used in this research as measures of the mediating factor appraisal. The following are descriptions of the psychogenic attitude scales taken from Millon et al. (1979b, p.535).

Chronic tension. Is under self-imposed pressure, has difficulty relaxing, constantly on the go, impatient.
Recent stress. Has experienced significant changes in the previous year, life routine has been upset by unanticipated tensions and problems.
Premorbid pessimism. Is disposed to interpret life as a series of misfortunes, complains about past events and relationships.
Future despair. Displays a bleak outlook, anticipates the future as distressing or potentially threatening.
Social alienation. Feels isolated, perceives minimal social and family support.

Somatic anxiety. Is hypochondriacally concerned with bodily functions, fears pain, and illness.

Health Factors

The final variable group used in this research was health factors. Moos (1979) has described five major types of measures of health status and health related behavior (see Chapter I). One of these types of measures, compliance, was chosen for use in this research. While only one type of measure was chosen, several different methods of determining compliance were used. Some of these methods have been used frequently in the dialysis literature(Blood chemistry values and weight gains) while others are unique to this research (leaving dialysis early and completion of the questionaires). The following are descriptions of the techniques used.

Physiological measures. The first measures of compliance were standard medical chart data available for all hemodialysis patients. They were blood phosphorus level, blood potassium level, and weight gains between treatment. Phosphorus and potassium levels are routinely obtained every month at each of the dialysis units. A mean phosphorus and potassium level was determined for each patient by using phosphorus and potassium levels obtained once at the beginning of the research and once at the end. A mean weight gain was calculated for each patient using that patient's weight gains between treatments during the research. These weight gains were obtained 2-3 times per week at each treatment.

Physiological measures were: mean phosphorus level, mean potassium level, and mean weight gain.

Compliant range measures. Each unit was requested to determine what they considered to be compliant ranges for each of their patients. These compliant ranges were established for each of the physiological measures and specify what the staff consider to be minimun and maximum values for determining compliance. Establishing compliant ranges in this manner accomplishes two goals. First, these measures reflect any overall unit differences regarding expectations of staff in determining whether or not a patient is compliant. It is possible that what one unit considers to be a compliant physiological measure, another unit does not. Second, these measures provide an individualized measure of compliance which controls for any extraneous variable which may effect the patient's physiological measures but does not necessarily reflect their compliance. An example of this would be a patient who still has some limited urine output. This patient would likely have very low between treatment weight gains compared to other patients. Their apparent compliance would not necessarily be the result of careful fluid intake but rather due, at least in part, to some physical condition unrelated to compliance (urinary output). Using these ranges, each patient's mean physiological measures were classified as either compliant or non-compliant.

Compliant range measures were: compliant mean phosphorus, compliant mean potassium, and compliant mean weight gain.

Attendance. The next measures of compliance involved attendance at scheduled treatments. The first measure of this type was a total of the number of scheduled appointments not attended. The second measure was a count of the number of times treatment was ended early at the patient's

request. Finally, the third measure was the total number of minutes that the patients left treatment early during the month long period of this research.

Attendance measures were: appointments missed, number of treatments ended early, and number of minutes ended early.

Completion of questionaires. The final measure of compliance was a count of the number of days necessary to complete the questionaires. All patients were encouraged to complete the questionaires on the same day they received them. If unable and/or unwilling to do so they were encouraged to complete and return them as soon as possible. Days were counted beginning the day after the patients initially received the questionaire.

Procedure

The investigator was individually introduced to the eligible patients by a member of the dialysis unit staff after the patients had begun their daily treatment. The investigator was identified by the staff member as a graduate student doing research on hemodialysis and a statement of the purpose of the research was read to the patients (Appendix D). If the patient agreed to participate, they signed a consent form (Appendix E). General identifying information was obtained verbally from the patients and the two questionaires (MBHI & COPES) were presented and explained. Where possible, patients were encouraged to complete the questionaires by themselves, however some patients did require assistance in reading the questionaires which was given by the examiner. Staff members were also approached during the same time and requested to complete the COPES. The

compliance data (except for days necessary to complete the questionaire) were obtained from the patient's chart for the period extending from January 1, 1981 to January 31, 1981.

CHAPTER III

RESULTS

A summary of four demographic variables for the sample obtained is presented in Table 1. These sample values are compared with data obtained by Evans and Bryan (1980) in a nationwide survey of the hemodialysis patient population. Their survey, which includes responses from over 4,500 patients, provides the most up-to-date description of the demographic characteristics of the hemodialysis population in the United States. A comparison of the values from the two studies demonstrate the marked similarities of the two samples. These similarities reflect favorably on the representativeness of the sample obtained for this research and lend confidence to generalizing the results from this research to other hemodialysis patients.

In order to provide additional descriptive data, the sample was separated according to unit in which the patient received treatment. The unit means for the variables included in this research were calculated. Using the data separated by unit, five one-way multivariate analyses of variance (MANOVA's) were conducted using sociodemographic variables, personality variables, psychogenic attitude variables, social climate variables, and compliance variables as dependent measures. The independent variable in each of the analyses was the unit where treatment was received. A summary of the results of these analyses follows.

Table 1

Comparison of Sample Characteristics of the Present Sample with Evans and Bryan (1980)

Variables	Present Sample	Evans and Bryan (1980)
Mean Age (years)	48.82	51.46
Sex		
Male %	46.7	45.6
Female %	53.3	54.4
Race		
White %	57.2	54.4
Black %	41.7	44.1
Other %	1.1	1.5
Education (% high school graduate or less)	77.53	79.70

Analysis of Sociodemographic Data

The MANOVA for the sociodemographic variables (Table 2) is significant, F (35, 822) = 3.65, p = .0001. In order to determine which of the dependent variables differentiate between the units, the univariate analysis of variance F values can be examined. Race of the patient (F=13.49, p=.0001), ability to Read their own Questionaire (F=3.75, p=.003), and the Months of Dialysis treatment received (F=2.84, p=.017) all significantly differentiate between the units. Examination of the unit percentages and means (Table 3) reveals a wide range of racial composition between the samples obtained from the six units. The patient sample in unit 5 was all black while patients in unit 6 were, with the exception of one, all white. More than twice as many patients in unit 5 (61%) required that the questionaire be read to them than in any of the other units. Finally, patients in units 4 and 5 had been receiving hemodialysis for the shortest period of time (19.59 months and 22.11 months respectively) while patients in unit 1 had on the average, been receiving treatment for the longest time (44.33 months).

Analysis of Personality Data

The results of the MANOVA for the personality variables (Table 4) is not significant, F (40,827) =1.14, p=.26. While several of the univariate analyses are significant, the nonsignificant MANOVA indicates no overall differences for the personality data. The unit means for the personality data are in Table 5.

Table 2

Summary Table of Univariate and Multivariate

F Values for Sociodemographic Variables

Variables	F Value	Probability
Age	0.92	.47
Sex	1.18	.32
Race	13.49	.0001
Employment	0.91	.48
Months of Dialysis	2.84	.02
Education Level	1.53	.18
Read Questionaire	3.75	.003
Multivariate F	3.65	.0001

Table 3

Summary Table of Patient Descriptive

Variables by Unit

Variables	Unit 1	2	3	4	5	6
Age	50.52	50.79	46.11	47.52	48.06	44.28
Sex						
Male %	50.0	42.3	42.9	59.1	27.8	64.3
Female %	50.0	57.7	57.1	40.9	72.2	35.7
Race						
White %	56.5	40.4	85.7	86.4	0.0	92.9
Black %	41.3	57.7	14.3	13.6	100.0	7.1
Other %	2.2	1.9	0.0	0.0	0.0	0.0
Employed						
Currently %	24.4	11.5	14.3	9.5	11.1	21.4
In the past %	57.8	67.3	75.0	90.5	61.1	64.3
Never %	17.8	21.2	10.7	0.0	27.8	14.3
Months of Dialysis	44.33	35.33	30.25	19.59	22.11	28.78
Education Level	12.46	10.71	10.71	11.14	10.33	9.50
Read Own Questionaire						
Yes %	80.4	84.6	71.4	77.3	38.9	78.6
No %	19.6	15.4	28.6	22.7	61.1	21.4
Size of Unit (# of patients)	80	100	50	35	50	33
Size of Sample	46	52	28	22	18	14

Table 4

Summary Table of Univariate and Multivariate

F Values for Personality Variables

Variables	*F* Value	Probability
Introversive	3.46	.005
Inhibited	1.68	.14
Cooperative	2.22	.05
Sociable	1.52	.18
Confident	0.16	.97
Forceful	2.72	.02
Respectful	0.51	.77
Sensitive	3.39	.006
Multivariate *F*	1.14	.26

Table 5

Summary Table of Unit Means

for Personality Scales

	Unit					
Scales	1	2	3	4	5	6
Introversive [1]	20.04	18.17	18.11	17.27	16.50	15.28
Inhibited	10.06	13.00	11.57	11.27	13.67	13.21
Cooperative	19.41	17.77	19.93	17.86	17.17	18.21
Sociable	22.13	20.10	20.61	20.00	18.22	19.93
Confident	20.85	20.31	20.25	20.91	20.33	21.00
Forceful	13.09	14.98	12.61	14.95	15.67	15.50
Respectful	29.67	28.62	29.57	29.73	30.50	30.21
Sensitive	11.87	15.62	14.11	15.73	18.28	17.86

1 Higher numbers indicate higher scores on these scales.

Analysis of Psychogenic Attitude Data

The MANOVA for the Psychogenic Attitude scales (Table 6) is significant, F (30,837) =1.80, p=.0055. Examination of the univariate results show that all of the variables except Social Alienation significantly differentiate between the units (Somatic Anxiety, F=4.88, p=.0004; Chronic Tension, F=4.40, p = .0009; Recent Stress, F = 4.20, p = .001; Premorbid Pessimism, F = 2.98, p = .013; Future Despair, F = 2.62, p = .026). The unit means for these scales (Table 7) demonstrate a consistent pattern. In each case, patients from unit 5 and 6 have the highest mean scores for Somatic Anxiety, Chronic Tension, Recent Stress, Premorbid Pessimism, and Future Despair while patients from unit 1 have the lowest mean score for the same variables.

Analysis of the COPES Data

The MANOVA for the COPES scales (Table 8) is significant, F (50, 817) = 1.78, p = .0009. Examination of the univariate results show that Involvement (F = 2.91, p = .026), Spontaniety (F = 2.94, p =.014), and Staff Control (F = 2.91, p = .015) significantly differentiate between the units. The unit means for these scales (Table 9) reveal that patients in unit 5 have the highest mean scores for Involvement, Spontaneity, and Staff Control. The lowest mean scores on Involvement and Staff Control were from patients on unit 6 while the lowest mean scores for Spontaneity were from unit 2.

Analysis of Compliance Data

The MANOVA for the compliance data (Table 10) is significant, F (35,

Table 6

Summary Table of Univariate and Multivariate

F Values for Psychogenic Attitude Variables

Variables	*F* Value	Probability
Chronic Tension	4.40	.0009
Recent Stress	4.20	.001
Premorbid Pessimism	2.98	.01
Future Despair	2.62	.02
Social Alienation	1.06	.38
Somatic Anxiety	4.88	.0004
Multivariate *F*	1.80	.006

Table 7

Summary Table of Unit Means for

Psychogenic Attitude Scales

	Unit					
Scales	1	2	3	4	5	6
Chronic Tension	11.17	13.67	11.61	13.73	15.89	14.28
Recent Stress	5.93	7.36	6.89	7.82	10.17	8.21
Premorbid Pessimism	10.56	13.50	12.28	13.77	16.28	16.57
Future Despair	10.46	13.00	11.54	13.54	14.67	15.64
Social Alienation	7.56	9.63	7.89	7.91	9.78	8.86
Somatic Anxiety	12.15	14.58	14.07	16.32	16.44	18.86

Table 8

Summary Table of Univariate and Multivariate

F Values for the COPES

Variables	F Value	Probability
Involvement	2.62	.02
Support	1.42	.22
Spontaneity	2.94	.01
Autonomy	0.68	.64
Staff Control	2.91	.02
Program Clarity	0.09	.99
Order & Organization	1.44	.21
Anger & Aggression	1.60	.16
Personal Problem Orientation	1.63	.15
Practical Orientation	2.00	.08
Multivariate F	1.78	.0009

Table 9

Summary Table of Unit Means

for Copes Scales

	Unit					
Scales	1	2	3	4	5	6
Involvement [1]	6.41	5.77	5.28	5.11	6.83	4.86
Support	7.74	7.27	6.68	7.54	8.06	6.86
Spontaneity	6.20	4.96	5.11	6.00	6.39	5.21
Autonomy	5.24	4.73	4.86	4.91	4.83	4.57
Staff Control	4.04	4.12	4.96	4.14	5.22	3.86
Program Clarity	7.72	7.65	7.46	7.59	7.72	7.64
Order & Organization	8.28	8.13	8.14	8.00	8.44	7.00
Anger & Aggression	2.11	2.75	2.28	2.95	2.44	3.43
Personal Problem Orientation	4.15	3.33	2.86	3.77	3.61	3.21
Practical Orientation	4.91	5.75	4.96	5.82	5.06	4.36

1 Higher numbers indicate higher scores on these scales.

Table 10

Summary Table of Univariate and Multivariate

F Values for Compliance Data

Variables	F Value	Probability
Mean Phosphorus	1.86	.10
Mean Potassium	5.59	.0001
Mean Weight Gain	5.83	.0001
No Shows	3.71	.003
Treatments Left Early	13.48	.0001
Minutes Left Early	10.02	.0001
Days to Complete Questionaire	2.51	.03
Multivariate F	4.96	.0001

832) = 4.96, p = .0001. Examination of the univariate results show that Average Potassium Level (F = 5.59, p = .0001), Average Weight Gain (F = 5.83, p = .0001), No Shows (F = 3.71, p = .003), Number of Treatments Left Early (F = 10.02, p = .0001), Days to Complete the Questionaire (F = 2.51, p = .03), and Number of Minutes Early (F = 10.02, p = .0001) significantly differentiate between the units. The unit means for these measures (Table 11) reveal generally higher means for all measures for patients from units 1 and 2. Low mean scores were obtained from units 3 and 4 for Average Phosphorus Level, 5 and 4 for Average Potassium Level, 5 and 6 for Average Weight Gain, 1, 3, 5, and 6 for No Shows, 5 and 6 for Number of Treatments Left Early, 6 and 5 for Minutes Early and 5 and 2 for Days to Complete the Questionaire. Although no absolute pattern exists for low mean scores, it does appear that patients from unit 5 and to a lesser degree unit 6 have lower mean scores on the compliance measures than patients from other units.

The results of these MANOVA's indicate that the samples from the different dialysis units do differ along several of the dimensions measured. This is not an unexpected finding because these dialysis units were spread throughout the metropolitan Detroit and Windsor region which encompasses a wide geographic as well as socioeconomic area. This is consistent with Moos' initial interest in social climates (Moos, 1974) which demonstrated that different settings do have different social climates and that these social climates affect the

Table 11

Summary Table of Unit Means

for Compliance Measures

	Unit					
Measures	1	2	3	4	5	6
Mean Phosphorus	5.66	5.88	4.86	4.90	5.07	5.85
Mean Potassium	5.24	5.33	5.54	4.95	4.73	5.08
Mean Weight Gain	2.47	2.94	2.18	2.31	1.77	1.81
No Shows	0.00	0.25	0.00	0.04	0.00	0.00
Number of Treatments Ended Early	0.83	1.83	0.14	0.36	0.06	0.07
Number of Minutes Ended Early	12.93	29.33	2.32	8.27	0.56	0.36
Days to Complete Questionaire	3.06	1.13	2.11	4.27	0.00	1.21

the behavior of participants within that environment. This discovery also supports the later developments in the social ecological approach (Moos, 1979) in that changes in one group of variables (environmental variables) are expected to interact with other variable groups (individual variables and mediating variables) and finally have differential interactions with health outcomes. Thus, different perceptions of the environment, different levels of compliance, etc. can be expected to occur due to varying combinations of conditions that exist within each unit. As a result of this finding, that units do differ significantly along several dimensions, it will be necessary to include the variable "Unit" in calculations intending to account for health outcomes.

Analysis of Relationships Among Variables

The first objective of this research was to determine the relationships among environmental system variables, personal system variables and mediating factors. The statistical technique used to accomplish this objective was factor analysis. Factor analysis is capable of examining a large number of variables, determining whether there are any underlying relationships and reducing the data to a smaller set of factors. The implications of this method are crucial to this study. The production of factors gives clues as to the relationships among the variables. If a set of variables has high correlations with a particular factor and low correlations with the other factors, it can be assumed that the set of variables forms an independent factor.

Since a major interest of this study is to determine what the relationships are between different sets of variables, it is very important to find out if certain groups of variables form relatively independent factors or if the variables correlate highly with more than one factor. In this research an important underlying assumption derived from the social ecological approach is that environmental system, personal system, and mediating factors are separate but interactive systems and not simply an alternative way of measuring the same information. Therefore, according to the social ecological approach, these three variable groups would be expected to form three separate factors.

In order to address this issue, factor analysis was conducted using measurements of the personal system, environmnetal system and mediating factors. The entire sample was factor analyzed as one group rather than performing separate analyses for each unit. This decision was made based primarily on the nature of the question being addressed. The question was not to determine the relationship among these variables at any particular dialysis unit or to account for specific health outcomes which would both require division of the sample by unit. Rather, the purpose was to determine if the variable groups proposed by the model are in fact unique measurements in all settings. If they do form independent factors, this suggests that these variable groupings do provide information independent of one another and deserve continued independent evaluation. In addition, the characteristics of this sample which can be compared with the latest national hemodialysis population survey (Evans & Bryan, 1980) suggest that this sample is very similar to the national population (see Table 1).

This lends support to treating this sample without division by unit and also supports generalizing the results to the broader dialysis population. Table 12 shows the Varimax rotated factor pattern and the resulting five factors which were obtained. The five factors are described below using variables with the highest loadings on that factor.

Factor 1. This factor has its highest loadings on Inhibited (.91); Sensitive (.86); Premorbid Pessimism (.94); Future Despair (.92); negative loading is also present for Sociable (-.88). This factor can best be described as one of serious emotional difficulties. This pattern typically involves withdrawal from anticipated problems, viewing the world in a negative manner, a sense of planlessness, feelings of a lack of social support and considerable preoccupation with physical condition. Significant by its absence is the lack of any loading on measures of the environment. Instead, this factor is determined both by measures of Person (Inhibited, Sensitive, and Sociable) and by measures of Mediating Factors (Premorbid Pessimism, Future Despair, Social Alienation and Somatic Anxiety).

Factor 2. This factor has its highest loadings on Support (.74); Practical Orientation (.69); Autonomy (.68); Program Clarity (.65). In contrast to the first factor, Factor 2 is conspicuous by the absence of loadings on measures of Person and Mediating Factors. This factor is determined by all but three of the measures of environment. It appears to represent an evaluation of the unit that excludes personal problems or conflicts that might arise between patients and the staff.

Factor 3. This factor has its highest loadings on Forceful (.93); Confident (.61); Chronic Tension (.67); Recent Stress(.41); Staff Control

Table 12

Varimax Rotated Factor Pattern for Environment, Person, and Mediating Variables

Variables	Factors 1	2	3	4	5
Environmental variables					
Involvement	-.09	.62	-.06	.44	.15
Support	-.06	.74	-.08	.24	.23
Spontaneity	-.23	.61	-.06	.08	.36
Autonomy	-.15	.68	.04	-.16	-.02
Staff Control	.03	.03	.38	.53	.06
Program Clarity	-.04	.65	-.16	-.17	-.29
Order & Organization	.02	.64	-.27	.33	-.22
Anger & Aggression	.23	-.16	.13	-.13	.68
Personal Problem Orientation	.03	.32	-.03	.25	.68
Practical Orientation	-.02	.69	.10	.10	.04
Person variables					
Introversive	-.51	-.09	-.48	.26	-.36
Inhibited	.91	-.20	-.02	-.12	-.06
Cooperative	-.16	.19	-.86	-.00	.10
Sociable	-.88	.14	.08	-.24	.07
Confident	-.62	.10	.61	.27	.08
Forceful	.15	-.10	.93	.00	.07
Respectful	-.08	.18	-.06	.81	-.01
Sensitive	.86	-.06	.33	-.17	.19
Mediating variables					
Chronic Tension	.56	-.01	.67	.14	.15
Recent Stress	.64	.12	.41	-.10	.18
Premorbid Pessimism	.94	-.05	.18	-.02	.11
Future Despair	.92	-.10	.06	-.05	.05
Social Alienation	.82	-.25	.09	-.07	-.10
Somatic Anxiety	.83	.03	.13	.10	.22
Percent of Variance Explained	33	15	12	6	5
Eigen values	7.98	3.61	2.91	1.38	1.20

(.38). A significant negative loading is also present for Cooperative (-.86) and Introversive (-.48). This factor describes the perception of the world in a dog-eat-dog manner. Life must be aggressively pursued which can lead to a high amount of experienced pressure. This factor describes a sensitivity to environmental restrictions which exist on the dialysis unit and are enforced by the staff because they interfere with patient freedom. This is the first factor that has even minor overlap between measures of environment and person.

Factor 4. This factor has its highest loadings on Respectful (.81); Staff Control (.53); Involvement (.44) and Order and Organization (.33). This factor reflects a responsible and conforming outlook which includes responding well to rules and established procedures. This factor describes a typically cooperative and enthusiastic outlook but one which tends to deny problems. This factor also demonstrates overlap between measures of environment and person.

Factor 5. This factor has its highest loading on Anger and Aggression (.68); Personal Problem Orientation (.68); Spontaneity (.36). A modest negative loading is also present for Introversive (-.36). This factor describes an environment as encouraging ventilation of frustrations and anger. The negative loading on Introversive suggests a willingness to express these feelings and to speak out. This last factor also demonstrates a modest overlap between measures of environment and person.

The social ecological assumption that environmental system and personal system variables comprise separate but interactive systems was supported by the results of the factor analysis. The first two factors derived clearly demonstrated the primary separation of the two variable groups, person and

environment, while the remaining three factors demonstrate a secondary overlap for some measures of person and environment. This finding highlights the basic independence of these measures of person and environment. The overlap of person and environment variables found in Factors 3-5 suggests that despite their obvious unique qualities, there are some secondary interactions between these variable groups.

While supportive of person-environment differences, this factor analysis did not support the independence of person and mediating factors. Factor 1 loads more or less equally on both of these variable groups. It should be noted however that personality and mediating factor measures are not completely independent since they do share some common items, resulting in built-in correlation with each other which confounded this testing of independence. Consequently, while this factor analysis did not support the independence of measures of person and mediating factors, it may not have been a fair test of their relationship and further examination of this issue seems warrented using different measures.

Analysis of Relationships Among Compliance Measures

Another objective of this study was to determine the relationship that exists among the different measures of compliance. Compliance has often been discussed as a unitary factor which can be measured equally well in several different ways. In order to assess the relationship among different measures of compliance and to determine whether or not it is a unitary factor, a second factor analysis was conducted with the compliance measures used in this research. Table 13 shows the varimax rotated factor pattern and the

Table 13

Varimax Rotated Factor Pattern

for Compliance Measures

	Factors			
Compliance Measures	1	2	3	4
Mean Phosphorus Level	.13	.11	.80	.06
Mean Potassium Level	.14	.83	.07	.03
Mean Weight Gain	.36	.19	.09	.77
Compliance with Phosphorus Standards	-.01	-.09	.85	.02
Compliance with Potassium Standards	-.16	.80	-.04	.05
Compliance with Weight Gain Standards	.18	-.04	.22	.78
No Shows	-.17	-.06	-.16	.38
Number of Treatments Left Early	.94	.01	.10	.00
Number of Minutes Left Early	.94	-.03	.05	-.02
Days to Complete Questionaire	.16	-.05	-.01	-.32
Percent of Variance Explained	24	15	13	12
Eigenvalues	2.39	1.52	1.30	1.16

resulting four factors which were obtained. The four factors are outlined below.

Factor 1. Leaving Treatment Early. Two variables load heavily on this factor. They are number of times Leaving Treatment Early (.94) and number of Minutes Leaving Treatment Early (.94). A secondary loading on the Average Weight Gain (.36) suggest that there is a tendency for weight gains to be higher for patients who leave treatment early.

Factor 2. Potassium Levels. Two variables load highly on this factor, Average Potassium Value (.83) and Average Compliance with Potassium Standards (.80). There are no other variables which load on this factor reflecting its independence from the other measures.

Factor 3. Phosphorus Levels. Two variables load on this factor, Average Phosphorus Level (.80) and Average Compliance with Phosphorus Standards (.85). No other variables load with this factor, again indicating its independence from the other variables.

Factor 4. Weight Gains. Two variables load heavily on this factor, Average Weight Gains between Treatment (.77) and Average Compliance with Weight Gain Standards (.78). There are two secondary loadings on this factor for number of No Shows for treatment (.38) and Days to Complete the Questionaire (-.32).

The factor analysis of the compliance data produced four distinct factors; Leaving Treatment Early, Potassium Levels, Phosphorus Levels, and Weight Gains. These factors showed very little overlap with each other and illustrated the unique qualities of the four types of measures. This finding indicates that compliance is not a unitary factor but rather, in this re-

search, was comprised of four separate factors. Consequently, future discussion of compliance should provide specification of the type of compliance being measured. These findings should not be misinterpreted to mean that compliance in general is composed of four factors. While this relationship holds true for this data, inclusion of other compliance measures might change the factor structure in other research. Consequently, this process should be repeated in future research in order to assess the type of compliance being measured.

Prediction of Compliance Factors

The final objective of the research can be divided in two questions; 1) Is it possible to predict compliance using the variables outlined in the social ecological approach? and 2) Are the different variable groups equally predictive of compliance? In order to address these questions, multiple regressions[1] were conducted for the four compliance factors derived from the factor analysis. The results of the multiple regressions for the individual measures of compliance can be found in the Appendicies F-L. Multiple regressions using ten predictor variable models were calculated using a Stepwise Maximum R^2 technique. A decision was made to limit models to ten variables after finding that models which contained additional

[1] Difference scores for Staff-Patient COPES scores were originally planned to be included in the multiple regressions as an additional measure of the environment. However, correlation coefficients for patient COPES and Staff-Patient COPES scores were so high (see diagonal on Table 14) that inclusion of both measures would be redundant and serve no useful purpose. Consequently, the Staff-Patient COPES scores were omitted from the remaining analyses and patient COPES scores were used as the environmental measure.

Table 14

Correlation Coefficients for Patient and Patient-Staff Difference Scores for the COPES

	Patient-Staff COPES									
Patient COPES	1	2	3	4	5	6	7	8	9	10
1) Involvement	-.98	-.60	-.44	-.32	-.24	-.25	-.46	.11	-.30	-.51
2) Support	-.60	-.97	-.55	-.35	-.15	-.34	-.47	.08	-.37	-.45
3) Spontaneity	-.40	-.54	-.97	-.41	-.03	-.29	-.34	.08	-.33	-.32
4) Autonomy	-.30	-.32	-.39	-.98	.08	-.33	-.29	.06	-.14	-.36
5) Staff Control	-.18	-.11	.06	.12	-.93	.05	.02	-.08	-.17	-.18
6) Program Clarity	-.18	-.33	-.28	-.37	.01	-.83	-.31	.18	-.03	-.31
7) Order & Organization	-.47	-.49	-.29	-.31	-.05	-.31	-.71	.25	-.16	-.31
8) Anger & Aggression	.05	.03	.01	.02	-.06	.16	.19	-.97	-.24	.06
9) Personal Problem Orientation	-.32	-.40	-.39	-.19	-.19	-.10	-.23	-.16	-.96	-.24
10) Practical Orientation	-.52	-.41	-.31	-.34	-.13	-.18	-.16	.04	-.23	-.95

variables became cumbersome to interpret and accounted for only minute amounts of additional variance.

The first multiple regression (Table 15) accounted for 30% of the variance for the compliance factor, Leaving Treatment Early. The variables selected for this model which are most significant ($p<.05$) are receiving treatment in either Unit 1 or 2, Recent Stress, Order & Organization, and Involvement. These findings suggest that Leaving Treatment Early is highest at Units 1 and 2, for patients who report a high amount of Recent Stress, experience their unit as emphasizing Order & Organization , while deemphasizing patient Involvement. The presence of the variable Unit in this and the other multiple regression equations suggests that in addition to the measures made of the environment for this research some other quality of the environment of that specific unit remains unidentified which accounts for a significant amount of variance in the dependent measure.

The second multiple regression (Table 16) accounted for 23% of the variance for the compliance factor Potassium Level. The variables selected for this model which are most significant ($p< .05$) are receiving treatment in unit 3, Employment status, Race, Sociable personality, and Support. These findings suggest that potassium level is highest for patients at unit 3, for patients who are currently working, for white patients, for patients who score low on the Sociable personality scale, and for patients who rate their unit as providing high amounts of Support.

The third multiple regression (Table 17) accounted for 26% of the variance for the compliance factor Phosphorus Level. The variables selected for this model which are most significant ($p< .05$) are receiving treatment

Table 15

Summary Table of Stepwise Multiple Regression for

Compliance Factor 1 (Leaving Treatment Early)

Variables	Estimated Regression Coefficients	Probability
Sex	2.38	.14
Read	2.24	.26
Unit 1	8.33	.0002
Unit 2	15.21	.0001
Unit 4	4.50	.09
Chronic Tension	-.30	.18
Recent Stress	.70	.01
Involvement	-.89	.03
Order & Organization	1.24	.02
Anger & Aggression	.64	.16

Percent of Variance Explained = .30

Overall Probability = .0001

Table 16

Summary Table of Stepwise Multiple Regression

for Compliance Factor 2 (Potassium Levels)

Variables	Estimated Regression Coefficients	Probability
Race	-.29	.008
Employed	-.26	.006
Unit 3	.53	.0003
Unit 4	-.24	.15
Inhibited	-.02	.07
Sociable	-.03	.04
Chronic Tension	.03	.05
Somatic Anxiety	-.02	.10
Support	.06	.04
Practical Orientation	-.05	.06

Percent of Variance Explained = .23

Overall Probability = .0001

Table 17

Summary Table of Stepwise Multiple Regression

for Compliance Factor 3 (Phosphorus Levels)

Variables	Estimated Regression Coefficients	Probability
Sex	-.48	.05
Unit 2	-1.30	.0001
Unit 4	-.41	.27
Unit 6	.84	.06
Confident	-.08	.02
Chronic Tension	.06	.05
Social Alienation	-.09	.004
Involvement	.16	.008
Order & Organization	-.12	.13
Personal Problem Orientation	-.09	.13

Percent of Variance Explained = .26

Overall Probability = .0001

at unit 2, Social Alienation, Involvement, and Confident personality. These findings suggest that Phosphorus Level is highest for patients at units other than unit 2, for patients who report a low level of Social Alienation, a high level of Involvement, and who score low on the Confident personality scale.

The final multiple regression (Table 18) accounted for 24% of the variance for the compliance factor Weight Gains. The variables selected for this model which are most significant ($p < .05$) are Size of the unit, Somatic Anxiety, receiving treatment in unit 4, Sensitive personality, and Anger & Aggression. These findings suggest that weight gains are highest for patients from smaller units, for those who have low reported Somatic Anxiety, for those who receive treatment in units other than unit 4, for those who score highly on the Sensitive personality scale, and for those who report a low level of Anger & Agression on their unit.

The first objective of this analysis was to determine the ability to predict compliance measures using variables selected for this research which were generated by the social ecological approach. The results of these multiple regressions support the notion that it is possible to predict measures of compliance using measures of the personal system, environmental system, and mediating factors. The predictive ability of these regressions is significant although moderate ($R^2 = .23$ to $R^2 = .30$). Consequently, although one can be confident of the significance of these results, it must also be noted that the obtained results leave a great deal of variance unaccounted for. In addition, a significant amount of variance

Table 18

Summary Table of Stepwise Multiple Regression

for Compliance Factor 4 (Weight Gains)

Variables	Estimated Regression Coefficients	Probability
Sex	-.92	.02
Size	-.14	.0001
Unit 4	-1.82	.007
Inhibited	-.15	.02
Sociable	-.15	.02
Sensitive	.17	.003
Somatic Anxiety	-.23	.0005
Support	.23	.03
Order & Organization	-.28	.04
Anger & Aggression	-.28	.01

Percent of Variance Explained = .24

Overall Probability = .0001

in each of the multiple regressions was accounted for by one of the unit variables. Inclusion of a unit variable in the multiple regression indicates that knowledge of whether or not the patient received treatment in that particular unit is more predictive of the compliance factor than other variables entered later in the equation or variables not included at all. This finding suggests that there is some unidentified source of variance unique to that unit which cannot be explained using variables included in this research.

The second question addressed, regarding the importance of the different variable groups, can also be responded to positively. It is clear that no single variable group (environmental system, personal system and mediating factors) is by itself responsible for accounting for a majority of the variance in the measures of compliance. Clearly all of these variable groups are represented in each of the regression models. Since multiple regressions select variables that account for unique sources of variance in the dependent measure, it can be assumed that these three variable groups do contribute independently to the understanding of the compliance factors. This finding also supports the social ecological notion that no one group of variables is sufficient to understand human behavior.

CHAPTER IV

DISCUSSION

The three major objectives of this research were as follows:

1) Provide information about the relationship of variables suggested by the social ecological approach. Are environment, person and mediating variables distinct variable groups as suggested by the social ecological approach?
2) Provide information which would clarify measurement of compliance issues. What is the relationship that exists among the different compliance measures? Is compliance a unitary factor or is it multidimensional?
3) Provide information about hemodialysis patient compliance. Can measures of patient compliance be predicted using combinations of measures of environment, person and mediating variables?

The developing social ecological model (Moos, 1979) is representative of a growing concern of several researchers (Lipowski, 1975; Endler & Magnusson, 1976; Rosen, 1972) in understanding person-environment relationships. These various models share a common lack of interest in the study of personal or environmental variables by themselves and instead suggest that behavior can best be understood via knowledge of both the person and the environment in which behavior

takes place. The unique contribution of these models therefore, is not that they necessarily identify new variables to be studied, but rather the manner in which the models propose that these variables be examined.

This research was designed using the social ecological model which was applied to study compliance with hemodialysis treatment. This research is the first reported application of this approach and also the first application to hemodialysis research of a model which simultaneously examined both personal and environmental variables. This research was exploratory both in terms of the social ecological approach and also its application to hemodialysis treatment. Undertaking this exploratory research had its advantages and disadvantages. The advantages of such research include testing of a recently proposed and previously untested model,examination of a research area (hemodialysis compliance) from a unique perspective and identifying and encouraging new directions for future research. The primary disadvantage of such research is that there is no specific existing literature with which to connect the results of this study. Consequently, this research could be conceptualized as hypothesis seeking rather than hypothesis testing and the results primarily address new areas of research rather than confirm or dispute the results of previous research.

Relationship Among Social Ecological Variables

Moos (1979) suggests that there are distinct groups of variables about which information is necessary in order to understand a health

factor such as compliance. The three variable groups are environment, person and mediating factors. The assumption of this approach is that if one does not have information from each of these variable groups, important data are missing and understanding of health outcomes is limited. This point of view stands in marked contrast to the current research available on compliance (see p.24). Typical research on compliance has examined a particular patient characteristic(s) to determine its relationship to compliance. Information emerges about variables such as age, sex, education and coping style and the relationship of each of these variables to compliance measures. However, we have no idea what kind of relationship exists among these variables. Also since most compliance research has been conducted in the absence of a comprehensive paradigm, no clear idea emerges concerning direction of future research. The first objective of this research addresses these problems by examining the relationship among the different variables and assessing the relative independence of these groups.

In order to examine the relationship between these three variable groups, data from all of the groups combined were factor analyzed (p.67). Since factor analysis enables one to determine whether single or multiple factors can summarize the information contained in a set of dependent variables, it is a technique that suits this objective well. The results of this factor analysis produced five separate factors. The loadings of the factors, particularly the first two, show a clear division between measures of person and environment and therefore support the conceptualization of these two variable groups as being inde-

pendent. A similar case cannot be made for the mediating factors used in this research which while distinct from environment variables are highly related with measures of the person. Admittedly, this research may not have provided a fair test of the relationship between person and mediating factors chosen for this research due to the construction of the MBHI (Millon et al., 1979b) from which these measures were obtained. It is also possible that different person and mediating factors could be selected which would demonstrate the suggested relationship. Further research will be needed to resolve this issue and recommendations for such research can be found in the Recommendations for Future Research section.

The empirical support of separate person and environment variable groups as hypothesized by the social ecological approach is an important finding for several reasons. First of all, it suggests a structure for examining and organizing compliance research. Rather than being faced with a rapidly growing group of miscellaneous correlates of compliance, this approach provides for a method of organizing these variables. In addition, it demonstrates that it is important to have information about both of these groups of variables in order to understand compliance. A review of the dialysis literature indicates that little has been done with environmental variables while a great deal of information regarding personal characteristics and their relationship to compliance is available. The identification of separate groups of variables highlights the obvious research needs for more careful examination of environmental variables as well as continued examination of the relationships between

these variable groups. Finally, from a broader perspective, demonstration of separate groups of variables for person and environment and their ability to account for unique portions of variance in dependent measures is supportive of the ideas and research of Bem and Allen (1974), Endler and Magnusson (1976), Lipowski (1975) and Rosen (1972) who have all emphasized the importance of examining person-environment relationships for understanding behavior.

Relationships Among Measures of Compliance

In the existing literature on compliance for hemodialysis patients, there are numerous methods for determining compliance(see p.32). There appears to be no one accepted technique of measuring compliance and no set standards for the techniques that are commonly used. Of the compliance measures used, perhaps the most common is a measure of certain blood chemical values and weight gains between treatment (Cummings, 1980; Procci, 1978; Winokur et al., 1973). However, the manner in which these "objective" values are subsequently used again varies a great deal from study to study. Some researchers may use the values themselves (Cummings, 1980) others may rate patients on a compliance scale based on general criteria for these values (Winokur et al., 1973), while still others may use absolute cutoffs for determining compliant vs. non-compliant patients (Procci, 1978).

The existance of such varied approaches to measuring compliance poses an obvious issue regarding the relationship among these different

measures. However, such is the state of the current literature and this issue has not been explored in any depth and generally is not even raised in compliance research. One recent exception is Cummings (1980) who reported finding low correlations among different compliance measures. He suggested that the possible reason for obtaining such low correlations was that "the different methods are tapping different constructs (perhaps different dimensions of compliance behavior)" (p. 140). If, in fact, it is the case that compliance is not a unitary factor but instead made up of several different dimensions, then this finding will by necessity change the approach to studying hemodialysis patients' compliance to treatment regimen and raise serious questions about the generalizability of past hemodialysis compliance research. Determining the relationship among several different compliance measures was the second objective of this research.

In order to assess the nature of the relationship between the various measures of compliance, a second factor analysis was conducted. The findings of this factor analysis demonstrate the existence of four factors in the compliance measures obtained. Consequently, for this research, compliance cannot be described as a unitary concept but rather is best described in terms of the four factors: 1) Leaving treatment early, 2)Phosphorus levels, 3)Potassium levels and 4) Weight gains. The uniqueness of these four factors is further supported in the results of multiple regressions using factor scores as criterion variables where different patterns of predictive variables account for each of these factors.

These results have important implications for future hemodialysis compliance research. Most importantly, the concept of compliance by itself may no longer be a useful one and instead it may be more useful to identify for example "compliance to fluid restrictions" or "compliance to dialysis time requirements." By doing so, recognition is being given to the findings of this research that compliance to one standard does not necessarily result in compliance to another standard. This in turn will perhaps lead to a better understanding of the reasons for compliance for each of these different factors. As a result of these findings, currently existing research will need to be sorted in a manner reflecting the type of compliance measure(s) used and research undertaken in the future will need to carefully identify the type(s) of compliance being used. While this research has identified four compliance factors, in no way should this be taken as a claim that compliance is made up of only four factors. There are other measures of compliance that have been used in the dialysis literature which were not included in this research (see p. 32). These measures may truly be separate compliance factors and they may change the number and understanding of the currently identified compliance factors. However, the identification of these four factors does serve to emphasize the necessity of treating compliance not as a unitary factor, but rather as a general concept made up of several different factors.

One additional finding of this research regards the nature of the compliance factors identified. There appear to be two

types of factors: behavioral and physiological. In this research the behavioral factor (Leaving treatment early) is the first factor and accounts for the greatest amount of total variance (R^2=.24) while the other three factors (Phosphorus levels, Potassium levels and Weight gains) account for substantially smaller amounts of variance respectively (R^2 =.15, .13, .12). This supports speculation based on research findings in the general medical compliance literature regarding different types of compliance measures. Kirscht and Rosenstock (1979), based on their review of compliance research, have classified measures of compliance as either measures of behavior or measures of outcome. They speculate that measures of behavior (taking medication, attendance, eating certain foods, etc.) are generally stronger measures of compliance than are outcome measures(weight gains, blood levels, etc.) simply because behavior measures are direct while outcome measures must assume that some behavior lead to that outcome. The findings of this research provide support for this speculation that behavioral measures are a stronger and more direct method of measurement of compliance than are outcome measures. The implication of this finding for hemodialysis compliance research must be that if all else is equal, compliance measures of direct patient behavior are preferable over measures of outcome. Of course, consideration of feasibility of obtaining direct measures, financial restrictions, issues of privacy, etc. must also be considered before deciding on which compliance measures to use in future research.

Prediction of Compliance Measures

The final major objective of this research was to determine if, and to what extent, compliance measures could be predicted. The results of the multiple regressions indicate that it is possible to predict a significant although modest amount of variance for the four compliance factors. In addition, each of the final multiple regressions contained variables from the three variable groups (person, environment and mediating factors). The presence of variables from each of these groups reflects the importance of these groups. When a variable was selected to remain in the multiple regression equation, this indicated that the variable accounted for more additional variance in the dependent variable than did any other variable which could have been selected. Removal of any of these groups therefore would result in the lowering of the predictive ability of the regression model. The ability to predict compliance measures in this research provides support for the social ecological approach and its application to compliance with hemodialysis treatment. Since only a small portion of variables identified by the social ecological approach were chosen for this research, many remain to be examined(see p.12). It is likely that future research will identify additional variables suggested by this approach which will increase the ability with which we can predict compliance.

Another important aspect of identifying variables which are predictive of compliance measures is the possibility of using this information to increase patient compliance. The results of the multiple

regressions identify numerous possibilities in this regard. For Compliance Factor 1 (Leaving Treatment Early) (Table 15), the most important information is whether the patients are being treated in Units 1 or 2. Examination of unit means for compliance measures (Table 11) gives further information why these two variables are selected. For some reason (which was not addressed in this research) patients from Units 1 and 2 leave treatment early more often and for a longer period of time than do patients in the other units. While this information is the most significant in this regression, further research is necessary to identify what is unique about these two units, which in turn could be used to make changes in these units to lower the frequency and amount of time patients leave treatment early. Other variables which are significant predictors of Leaving Treatment Early are Recent Stress, Order & Organization and Involvement. Interventions could be designed and tested for each of these findings in order to increase compliance. These interventions could be directed at reducing the amount of experienced Recent Stress, reducing the emphasis in the unit on Order & Organization and/or increasing the Involvement of the patient in unit activities. Individual dialysis units may determine what goals they might like to achieve and using their data, design interventions. Caution must be taken to note that it appears that improvement in one compliance factor may result in lessening in another. An example of this problem being the COPES scale Order & Organization. While increased Order & Organization appears to improve compliance to Weight Gain Standards (Table 18) it has just the opposite effect for Leaving Treatment Early (Table 15). Consequently, interventions cannot be designed

effectively to increase "compliance" in general but rather may have to be geared toward modifying a specific type of compliance.

It is typically the custom in the discussion section to relate the findings of this research to findings of previous research. However, there are several reasons, some of which should be obvious by this point, why this is not possible, nor perhaps even desirable. The most important reason for not making such comparisons is the discovery that "compliance" is not a unitary factor as has been implicitly assumed in dialysis research. The identification of four compliance factors via factor analysis in this research and the possibility of the existence of other compliance factors made up of measures not included in this research (p. 32) clearly suggests that "compliance" by itself may no longer be a useful concept. Instead, in the future it will be necessary to specify compliance to a specific standard or behavior. This finding obviously limits the comparisons that can be made in the compliance literature. Only results of studies using the same measure of compliance can be directly compared with each other. Consequently, careful attention must be paid to the definition and measurement of compliance in research being eveluated.

A second problem which limits comparison of these findings with previous research is also due to the assumption of previous research that compliance is a unitary factor. Since this assumption was so widely accepted, researchers seemed to select measures of compliance for their research based on convenience rather than attempt to duplicate previously used measures. The result of this practice is that every reported compliance finding is based on measures that differ in various degrees

either in type or standards used (p. 32). Consequently, because of their unique measures or standards, it is not even possible to make comparisons between different studies at this time even when controlling for type of compliance measure used.

Finally, the methodology used in this research for predicting compliance (multiple regression) was not intended to identify every variable that is significantly related to each specific measure of compliance. Instead, it identifies which variables have the most significant, independent, predictive ability for the compliance factor. The advantage of this approach, particularly in exploratory research, is that only the most important variables are identified while redundant variables are eliminated. This contrasts with earlier research which has sought to identify any and all variables which might have a relationship to compliance. The methodology of this research, combined with the other two serious limitations of previous research, clearly prohibit any meaningful comparison of the findings of this research with previous research findings.

Limitations of the Research

One important limitation of this research is the inevitable consequence of its design. Research such as this, that is designed to be exploratory and examine a model which includes a large number of variables cannot be expected to also test specific hypotheses. This research has examined relationships among diverse groups of variables in a natural setting and has identified potentially rewarding areas for future research. It remains for future research to test these relationships in a more

controlled manner in order to draw more confident conclusions about compliance.

A second general category of limitations for this research is limitations of the measurements made. While the intent of this research was to apply the approach of Moos (1979) to hemodialysis compliance research, this approach has not reached a stage of development where specific measures or instruments are available to assess the various variable groups recommended. Consequently, it was necessary to use scales which provided the closest "fit" to the social ecological variable groups. In this research, two tests were used to assess person, environment and mediating factors (Figure 2). Measurement of person and mediating factors were limited (see Results) by their partial overlap on the MBHI. Consequently, the assumption of the social ecological approach, that these are unique groups of variables, was not supported but may not have been fairly assessed. Further research will be necessary to assess this relationship.

Measurement of the social climate through the use of the COPES is limited in a different way. While the MBHI was designed specifically for use with medical populations, the COPES was not. The COPES was designed for use with a wide range of outpatient psychiatric settings. It was selected for use in this research based on the precedent of Herranen and Lowe (1978) who reported no associated difficulties and the lack of any other measure even remotely similar conceptually which would fit this particular population. The basic problem presented by selection of the COPES for use in this research was that the content of the questionaire

occasionally did not fit with dialysis patient problems and concerns. An example of this problem follows to illustrate this point. Question #14 of the COPES states, "Members can leave here anytime without saying where they are going." Since it is impossible for dialysis patients to leave treatment until they are disconnected from their machine, this question only applies to events which take place after treatment is finished. In this case the question, which is part of the Autonomy subscale, losses some of its meaning as patients typically can leave after treatment is completed without any inquires if there are no medical complications. In this case it might be more appropriate to question whether patients may terminate their treatment early or possibly develop a different question which would assess the patients perceived autonomy. Future research in this area might seek to resolve this problem of "fit" by adapting the content of these scales to specifically address dialysis patient and staff concerns.

Recommendations for Future Research

This research was designed to be exploratory or hypothesis seeking rather than hypothesis testing. It was exploratory in that it was the first application of the social ecological approach and it also was the first time a model using measures of person and environment was applied to dialysis compliance research. Exploration in these two areas has provided substantial information both for the social ecological approach and for dialysis research. At the same time, this research has identified several potential directions for new research. The following are reco-

mmendations for future research suggested by the findings of this research.

The first, and perhaps most general recommendation arising from this research, is to encourage continued study of the relationships between the person and environment. The possibilities for future research seem almost limitless within this area of research because so little work has been done (Bem & Funder, 1978). While this research has used a social ecological approach to guide the selection of variables for study, other models are available which could also be used (Lipowski, 1975; Rosen, 1972). Regardless of the model used for this research, the goal of such research should be to identify relationships between the person and their environment.

To illustrate the benefit of understanding such relationships in general, an example will be given from the present research. The social ecological approach as defined by Moos (1979) involves examination of person, environment and mediating variables for understanding health outcomes. The results of this research supported the conceptualization of person and environment as separate factors but not mediating variables. Limitations in the measurement have been described elsewhere (p. 69) and the role of mediating factors suggested by this model remains unclear. Whether to continue examining mediating factors or to remove them from the model is a crucial issue that future research could address.

The possibilities for exploring mediating variables are great. This is the least developed area of the social ecological approach and certainly

deserves further attention. Research could be designed to explore measures of appraisal different from ones examined in this research. These in turn could be compared with measures of person and environment to determine if they are independent measures. Another possibility would be to measure arousal and adaptation, two mediating factors identified by Moos (1979), which were not included in this research. Again, these measures could be compared with measures of person and environment to determine their relationship with each other. There has recently been a growing interest in identifying specific coping strategies. Several researchers (Haan, 1977; Lipowski, 1970; Weisman & Worden, 1977) have identified coping strategies which could be incorporated into the social ecological approach as measures of adaptation. Two such coping strategies as identified by Lipowski (1970) are minimization and vigilant focussing. Research could be designed to determine if use of one or the other of these strategies is more effective for compliance to certain dialysis standards than the other.

Another area for potential research regarding the social ecological approach is the clarification of relationships among the various measures of environment. Moos (1979) believes that perceptions of social climate, "tend to be more important then do physical environmental or organizational variables" for understanding human behavior (p. 542). He has based his work on social climates on this premise, yet no direct evidence of the relative importance of these variables is available. Different measures of environment could be simultaneously obtained in order to demonstrate what effect they might have on some selected behavior. If, as Moos suggests

perceptions of social climate are the most important measure of the environment, measures of social climate should account for significantly more variance in prediction of the selected behavior than other measures of the environment (architectural, organizational, etc.).

Finally, future research is recommended to address specific problems in dialysis. Professionals working in this field are daily attempting to improve the treatment and compliance of the patients receiving dialysis. The results of this research tenatively suggest some variables which might be examined to aid such practical issues. This type of research could involve the patients perception of recent stress. This variable has been shown to be a significant predictor of the compliance factor Leaving Treatment Early (p. 74). Patients with higher levels of perceived Recent Stress tend to leave treatment earlier than those who have lower levels of perceived stress. An intervention could be designed to test the hypothesis: Patients who participate in a stress reduction workshop leave treatment early less often than those who do not. Patients could be taught specific stress reduction strategies (Davis, Eshelman & McKay, 1980) and their compliance with staying in treatment measured before and after the intervention and/or compared with a control group. If reduction of stress is indeed an important factor for the compliance factor Leaving Treatment Early, and the intervention does lead to less perceived stress, the result should be a reduction in Leaving Treatment Early.

Two important measurement problems were encountered in this research. One of the major problems in dialysis research is the measurement of

compliance. As previously discussed, the results of this research which identified four separate compliance factors, raises serious questions about the past treatment of compliance and the results of previous research. Obviously, more attention is needed for this issue. Research which continues to generate results based on measures of compliance used due to convenience is not helping further our knowledge in this area. Research which replicates measures used by others and reports measures of compliance clearly enough to be replicated is desparately needed. Ideally, uniform standards and measures could be agreed upon for use in such research, thereby reducing the problems faced given the current state of measurement of compliance (p. 32). Measures such as weight gains and blood values could be used as basic measures of compliance but only if they are not treated as dichotomous variables using unique standards as is the case in most research using these measures (Kaplan De-Nour & Czaczkes, 1972; Procci, 1978)

A problem encountered in measuring social climate of the dialysis unit could be addressed in future research. Although earlier research did not mention any such problems (Herranen & Lowe, 1978) there appear to be occasional questions on the COPES which do not address issues specifically relevant to dialysis populations. The first step in attempting to correct this problem would involve reviewing the questions (with the assistance of dialysis staff, patients, or both) to identify problem questions. Revisions of these questions are initially recommended to be minor and only those necessary to adjust the content of the question to

dialysis settings. Following this procedure, which is the same procedure used for developing the COPES from the WAS (Moos, 1974a) would preserve the internal structure of the scale. This revised test could then be given to patients and staff in different units and both profiles and comments about the test could be evaluated. If the adaptation is successful, the next objective might be to determine if all ten subscales are useful for research in dialysis or if additional subscales might be useful.

A final observation about the methodology of this research and its potential impact on future research seems warranted at this point. The existing dialysis research has produced results which identify variables having a relationship to compliance. The effect of this approach has been an accumulation of variables identified as having a relationship to compliance without any knowledge regarding the relationships that exist among these variables. Continuation of this data gathering procedure contributes to our knowledge of what variables are statistically related to compliance, but provides no indication about which of these variables are more important for understanding compliance and which are redundant. Obviously, by itself, this is not seen as a productive research strategy. Instead, it is recommended that future research incorporate methodology such as used in this research which would identify variables that contribute independently and significantly to the understanding of compliance. By combining these two procedures, information would be available on which variables do have a relationship to compliance and how valuable this information is relative to knowledge of other var-

iables for understanding compliance. This type of information would certainly be helpful for professionals who daily try to intervene with noncompliant dialysis patients.

Obviously, a great deal remains to be understood specifically about compliance with treatment standards and in general about the relationship between man and his environment and the effect of that relationship on behavior. Hopefully, this research has provided some specific information about the former and in some way has encouraged increased examination of the latter.

CHAPTER V

SUMMARY

The social ecological approach of Moos (1979) was applied to the study of compliance with treatment regimen by hemodialysis patients. A total of 180 hemodialysis patients from six dialysis units in the Metropolitan Detroit, Michigan area participated in this research. These patients responded to two questionaires and provided background information about themselves. This information provided data on three variable groups as designated by the social ecological approach; person, environment and mediating variables. Compliance data, the fourth variable group used in this research was obtained from patient medical charts. The objectives if this research were as follows:

1) Provide information about the relationship of variables suggested by the social ecological approach. Are environment, person mediating variables distinct variable groups as suggested by the social ecological approach?
2) Provide information which would clarify measurement of compliance issues. What is the relationship that exists among the different compliance measures? Is compliance a unitary factor or is it multidimensional?
3) Provide information about hemodialysis patient compliance. Can measures of patient compliance be predicted using combinations of neasures of environment, person and mediating variables?

The results of this research provide support for the social ecological approach and its grouping of variables with only some limitations. While the results do support examination of both person and environment variables in order to understand health outcomes, there is no support for the proposed separation of mediating variables from person variables. Limitations of the measurements used which may have effected this outcome have been described elsewhere (p. 69). Identifying that person and environment variables are independent measures provides the first empirical support of this proposed approach of Moos (1979). This finding also lends support to the developments in other related fields (i.e. Public health, ecological psychology, psychosomatic medicine, etc.) which were discussed earlier, that have also proposed examination of both person and environment for understanding haman beahvior.

The results of this research demonstrate a serious deficiency in previous dialysis research dealing with compliance. Compliance has traditionally been treated as a unitary factor although measurements used in various studies differed greatly. Several of these compliance measures were used in this research in order to examine the relationships among them. The findings indicate that compliance is not a unitary factor and to treat it as such ignores evidence to the contrary. This finding is obviously an important reason why hemodialysis patient compliance research has often produced inconsistent and contradictory results.

Finally, the findings of this research demonstrate the ability of the variables suggested by the social ecological approach to predict

patient compliance. A highly significant although modest amount of variance (R = .23-.30) for the four compliance factors can be accounted for by the variables used. In addition, variables from each of the three groups were found to contribute to the prediction of the compliance factors. These results all support the continued application of the social ecological approach to patient compliance. Based on this finding, it is clear that future research which only explores person or environment variables will be limited in the amount of behavior it can account for.

APPENDIX A

PATIENT INFORMATION

PATIENT INFORMATION

Unit:

Time:

Date:

Patient number:

Patient name:

Date of birth:

Sex:

Race:

Date began dialysis:

Occupation

Last grade of school completed:

Days of dialysis:

Date COPES completed:

Date MBHI completed:

APPENDIX B

MILLON BEHAVIORAL HEALTH

INVENTORY (MBHI)

MILLON BEHAVIORAL HEALTH INVENTORY

DIRECTIONS: This inventory consists of a number of statements which people use to describe themselves. Read each statement, decide whether or not it applies to you, and then mark your choice on the special answer sheet. (Make no marks on this form.) *Please use a pencil* to mark the answer sheet.

If you agree with a statement or decide that it describes you, pencil in completely between the dotted lines under T (TRUE) on the answer sheet. If you disagree with a statement or decide it does not describe you, pencil in completely between the dotted lines under F (FALSE) on the answer sheet. If you have some doubt about the truth of a statement as it applies to you, pencil under F (FALSE). In making your choices on the answer sheet, be sure that the number of the statement you have just read is the same number you are marking on the answer sheet. *Erase completely* any answer you may wish to change. Below are two examples to acquaint you with the procedure you are to use in answering the questions:

		T	F
1. I am a human being.	1.	▬	····

This statement would be true of you, so you would pencil *completely* between the lines in the column headed T, as marked above.

		T	F
2. I am over ten feet tall.	2.	····	▬

This statement would be untrue of you, so you would pencil *completely* between the lines in the column headed F, as marked above.

Try to pencil in an answer for every statement, even if you are not absolutely sure of your choice. Even though on some statements it will be difficult for you to make a decision, still pencil in under either T (TRUE) or F (FALSE). It is better to answer a statement than to leave it blank. There is no time limit for completing the inventory, but it is best to work as rapidly as is comfortable for you. You may now begin with the first item below.

1. I have always been able to overcome the problems I've had.
2. Lately, life has been going along as usual, with no special things happening.
3. When I was a young child, my parents felt very proud of me.
4. I have almost never been sick.
5. I have friends who will listen to any problems I have.
6. I like to be the one in authority to take charge of things.
7. If I were very sick, I'm sure that everything would work out well.
8. I always take the medicine a doctor tells me to even if I don't think it is working.
9. I am very pleased with all the things I have done up to now.
10. I almost never feel pressure in the work I do.
11. I get very frightened when I think of being all alone in the world.
12. I am ready to attack anyone who tries to say terrible things about me.
13. I have a feeling that things in my life just go from bad to worse.
14. All my life I have to "blow up" every now and then.
15. This year I was successful at something that was very important to me.
16. I am in better health than most of my friends.
17. A quiet hobby is more fun for me than a party.
18. Most people wouldn't care much if I were very sick.
19. I often say things that I regret having said.
20. I have lots of plans of what I'd like to be doing ten years from now.
21. I have a lot of faith that doctors can cure any sickness.

22. People can influence me quite easily.
23. I often find time to take it easy and do nothing.
24. Even in difficult times, I always try to be cheerful.
25. I don't mind that other people are not interested in my friendship.
26. I've had serious money problems this past year.
27. I almost always have medical problems.
28. I often feel that others do not want to be friendly to me.
29. If I became ill, I wouldn't have much help from my family.
30. In many ways I feel very superior to most people.
31. If I ever got a serious illness, I think it would be the end of me.
32. No matter what, seeing a doctor can make me feel better.
33. So little of what I have done has been appreciated by others.
34. Keeping to a time schedule is not important to me.
35. I've done most things in my life very well.
36. When I think about the past, I remember mostly the good things.
37. I make nasty remarks to people if they deserve it.
38. I have had more than my share of troubles in the past year.
39. It is good to have a regular way of doing things to avoid mistakes.
40. Many people have been spying into my private life for years.
41. I almost never worry about my health.
42. If I thought I had a serious sickness, I would quickly talk it over with my family.
43. There are always a number of reasons why most problems can't be solved.
44. I look forward to the future with lots of hope.
45. I do my best to get along with others by being pleasant and agreeable.
46. All doctors care about is my money, not me.
47. I get upset when things I don't expect happen to me.
48. I often get angry with people who do things slowly.
49. I don't depend much on other people for friendship.
50. I feel pretty upset about most things in my life.
51. It is very difficult for me to stop feelings from coming out.
52. My family has had really bad problems in the past year.
53. I can stand a lot of pain.
54. I like to flirt a lot.
55. In time of trouble there are several friends that I can depend on.
56. Most people can be trusted to be kind and thoughtful.
57. Even if I were very sick, I'd keep fighting and never give up.
58. I sometimes feel I am in this world all alone.
59. I feel that the doctors I have seen are not interested in my problems.
60. I am a dramatic and showy sort of person.
61. I can't stand people who are late for appointments.
62. I do my best to stop anyone from trying to boss me.
63. I often think about unhappy things that have happened to me.
64. I often do things for no reason other than it might be fun.
65. During the past year, someone close to me has been very ill.
66. I guess I'm a complainer who expects the worst to happen.
67. It is not unusual to feel lonely and unwanted.
68. I worry a lot about my health.

69. Lots of people would care about me if I became very sick.
70. I would much rather follow someone than be the leader.
71. If I had a very serious sickness, I think I would fall apart mentally.
72. To get ahead in this world I'm willing to push people who get in my way.
73. Doctors have always been helpful to me.
74. I find it hard to feel sorry for people who are always worried about things.
75. I seem to fit in right away with any group of people I meet.
76. I like being in a crowd just to be with lots of people.
77. Most of my problems just go on and on.
78. I guess I depend too much on others to be helpful to me.
79. I moved during the past year.
80. I have always felt some kind of problem between me and the opposite sex.
81. I get frightened when I think I have a medical problem.
82. Punishment never stopped me from doing whatever I wanted.
83. I would have lots of visitors if I were in the hospital.
84. Among the most important things a person can have are a strong will and the drive to get ahead.
85. I would never let a serious sickness stop me from working toward the future.
86. I often feel so angry that I want to throw and break things.
87. I dislike going to doctors, and do so only after trying everything myself.
88. I really hate to have my work pile up.
89. I find it hard to take my mind off my work even when I'm supposed to be relaxing.
90. I have not seen a car in the last ten years.
91. I very often think I am not wanted by others in a group.
92. Even when things seem to be going well, I expect that they'll soon get worse.
93. I would rather be direct with people than avoid telling them something they don't like.
94. Many important things have happened in my life this past year.
95. What this country really needs are more serious and devoted citizens.
96. At no time in my life have I had any hair on my head or my body.
97. T.V. programs about illness make me very upset.
98. Ever since I was a child I have been losing touch with the real world.
99. I cannot depend on my family when I need them.
100. I like to tell others about the things I have done well.
101. I'd rather be dead than have a very serious sickness.
102. I usually let other people have their own way.
103. I usually won't take any medicines, even if a doctor tells me to.
104. I wish the people around me would move faster and get more things done.
105. I often feel that there is nothing I can do to make my life easier.
106. I have very few close personal ties with others.
107. This past year has been one of the most difficult ones in my life.
108. If I thought I were getting sick, I would quickly call a doctor.
109. I have a strong desire to win any game I play with others.
110. Nobody really cares about my state of health.
111. I have faith that human nature is good.
112. I haven't thought much about what I'll be doing a year from now.
113. All my life I have had the feeling that I have done something terribly wrong or evil.
114. When someone hurts me, I try to forget it.
115. Hospitals are frightening and lonely places to be in.

116. My work makes me tense almost all the time.
117. I have flown across the Atlantic 30 times last year.
118. In this world you either push or get shoved.
119. If I were young again, I would do things very differently.
120. It is very important that children learn to obey their elders.
121. I've had a lot of shocks and disappointments this past year.
122. Rather than demand things, people can get what they want by being gentle and thoughtful.
123. I get very upset when I feel pain in any part of my body.
124. I can see more sides of a problem better than others can.
125. If I were getting sick, I wouldn't waste my time telling anyone in my family.
126. I am more worried about finishing things that I start than most people.
127. For me, the future looks like it will be full of trouble and problems.
128. I do my best not to hurt people's feelings.
129. I have never felt much life in me.
130. I would rather be in pain than take any medicines.
131. I often doubt whether people are really interested in what I am saying to them.
132. It is very easy for me to relax and slow down.
133. I don't know what I want out of life.
134. Life has never gone well for me.
135. I've been touchy or tearful about everything most of my life.
136. I am very uneasy when I have to tell people what to do.
137. I am too rushed and busy to take the vacations I should.
138. There has recently been an important change in my job.
139. I like to follow instructions and do what others expect of me.
140. I often think that I have a serious illness.
141. I am a quiet and cooperative person.
142. I'd be a pretty lonely person if I ever were hospitalized.
143. I become very excited or upset once a week or more.
144. I always try to do what is proper.
145. I don't think I would want to go on living if my body was marked up a lot in a serious operation
146. I get so touchy that I can't talk about certain things.
147. From things I hear about them, I don't trust the people who work in hospitals.
148. I have a strong need to feel like an important person.
149. My day is filled with pressures and responsibilities.
150. I like to arrange things down to the last detail.

APPENDIX C

COMMUNITY ORIENTED PROGRAMS ENVIRONMENT SCALE (COPES)

1. Members put a lot of energy into what they do around here.
2. The healthier members here help take care of the less healthy ones.
3. Members tend to hide their feelings from one another.
4. There is no membership government in this program.
5. This program emphasizes training for new kinds of jobs.
6. Members hardly ever discuss their sexual lives.
7. It's hard to get people to argue around here.
8. Members' activities are carefully planned.
9. If a member breaks a rule, he knows what the consequences will be.
10. Once a schedule is arranged for a member, the member must follow it.
11. This is a lively place.
12. Staff have relatively little time to encourage members.
13. Members say anything they want to the staff.
14. Members can leave here anytime without saying where they are going.
15. There is relatively little emphasis on teaching members solutions to practical problems.
16. Personal problems are openly talked about.
17. Members often criticize or joke about the staff.
18. This is a very well organized program.
19. If a member's program is changed, staff always tell him why.
20. The staff very rarely punish members by taking away their privileges.
21. The members are proud of this program.
22. Members seldom help each other.
23. It is hard to tell how members are feeling here.
24. Members are expected to take leadership here.
25. Members are expected to make detailed, specific plans for the future.
26. Members are rarely asked personal questions by the staff.
27. Members here rarely argue.
28. The staff make sure that this place is always neat.
29. Staff rarely give members a detailed explanation of what the program is about.
30. Members who break the rules are punished for it.
31. There is very little group spirit in this program.
32. Staff are very interested in following up members once they leave the program.
33. Members are careful about what they say when staff are around.
34. The staff tend to discourage criticism from members.
35. There is relatively little discussion about exactly what members will be doing after they leave the program.
36. Members are expected to share their personal problems with each other.
37. Staff sometimes argue openly with each other.
38. This place usually looks a little messy.
39. The program rules are clearly understood by the members.
40. If a member fights with another member, he will get into real trouble with the staff.
41. Very few members ever volunteer around here.
42. Staff always compliment a member who does something well.
43. Members are strongly encouraged to express themselves freely here.
44. Members can leave the program whenever they want to.
45. There is relatively little emphasis on making specific plans for leaving this program.
46. Members talk relatively little about their past.
47. Members sometimes play practical jokes on each other.
48. Members here follow a regular schedule every day.
49. Members never know when staff will ask to see them.
50. Staff don't order the members around.
51. A lot of members just seem to be passing time here.
52. The staff know what the members want.
53. Members spontaneously set up their own activities here.
54. Members can wear whatever they want.
55. Most members are more concerned with the past than with the future.
56. Members tell each other about their intimate personal problems.
57. Staff encourage members to express their anger openly here.
58. Some members look messy.
59. The members always know when the staff will be around.
60. It is important to carefully follow the program rules here.
61. This program has very few social activities.
62. Staff sometimes don't show up for their appointments with members.
63. When members disagree with each other, they keep it to themselves.
64. The staff almost always act on members' suggestions.
65. Members here are expected to demonstrate continued concrete progress toward their goals.
66. Staff are mainly interested in learning about members' feelings.
67. Staff here never start arguments.
68. Things are sometimes very disorganized around here.
69. Everyone knows who's in charge here.
70. Members can call staff by their first names.
71. Members are pretty busy all of the time.
72. There is relatively little sharing among the members.
73. Members can generally do whatever they feel like here.

(Continued)

74. Very few members have any responsibility for the program here.

75. Members are taught specific new skills in this program.

76. The members rarely talk with each other about their personal problems.

77. Members often gripe.

78. The dayroom or living room is often untidy.

79. People are always changing their minds here.

80. Members may interrupt staff when they are talking.

81. Discussions are very interesting here.

82. Members are given a great deal of individual attention here.

83. Members tend to hide their feelings from the staff.

84. Members here are very strongly encouraged to be independent.

85. Staff care more about how members feel than about their practical problems.

86. Members are rarely encouraged to discuss their personal problems here.

87. Staff here think it is a healthy thing to argue.

88. Members are rarely kept waiting when they have appointments with staff.

89. Members never quite know when they will be considered ready to leave this program.

90. Members will be transferred or discharged from this program if they don't obey the rules.

91. Members often do things together on weekends.

92. The staff go out of their way to help new members get acquainted here.

93. Members are strongly encouraged to express their feelings.

94. Staff rarely give in to pressure from members.

95. Members must make detailed plans before leaving this program.

96. Staff strongly encourage members to talk about their pasts.

97. Members here rarely become angry.

98. The staff strongly encourages members to be neat and orderly here.

99. There are often changes in the rules here.

100. The staff make and enforce all the rules here.

COMMUNITY ORIENTED PROGRAMS ENVIRONMENT SCALE

FORM R

RUDOLF H. MOOS, PH.D.

COPES

INSTRUCTIONS

There are 100 short statements in this booklet. There are statements about programs. Please decide which statements are true of your program and which are not. On the separate answer sheet, mark under T (True) when you think the statement is true or mostly true of your program; mark under F (False) when you think the statement is false or mostly false. Please be sure to answer every statement and to fill in your name and the other information requested.

Do not make any marks on this booklet.

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APPENDIX D

DESCRIPTION OF THE RESEARCH:

STATEMENT TO PATIENTS

STATEMENT TO PATIENTS

My name is Allan Schmidt. I am a graduate student from the University of Windsor and I'm doing research in several different dialysis units in this area. The purpose of this research is to gain a better understanding of the problems involved in hemodialysis. Hopefully, this research will identify factors which will lead to improved treatment for hemodialysis patients. In order to accomplish this goal, I am asking both patients and staff to participate in the research. If you agree to participate you will be required to complete two questionnaires, provide some background information about yourself and give me permission to examine your medical chart for a month. You will not be requested to complete any additional questionnaires, be involved in any experimental procedures, or in any way alter your treatment. Of course if you do participate, all your responses and records will be kept confidential. Do you have any questions?

APPENDIX E

PATIENT CONSENT

FORMS

CONSENT FORM

Protocol Title: An evaluation of kidney dialysis units

Patients Name: _____

1. I have been asked to participate in a research study which will involve completing two questionaires and providing background information about myself. In addition, I understand that my medical chart will be examined for additional information necessary to this research.

2. I have discussed this project with Allan Schmidt, M.A. and he has offered to answer my questions regarding the procedures involved.

3. In giving my consent, I acknowledge that my participation in this research study is voluntary and that I may withdraw from it at any time without predjudice to me.

_____ _____

Date Signature of patient

_____ _____

Investigator Witness not associated with research study but present during explanation to the patient.

APPENDIX F

STEPWISE MULTIPLE REGRESSION FOR MEAN PHOSPHORUS LEVEL

Summary Table of Stepwise Multiple Regression

for Mean Phosphorus Level

Variables	Estimated Regression Coefficients	Probability
Age	-0.01	.09
Employ	-0.36	.09
Read	0.64	.02
Unit 1	1.10	.0004
Unit 2	0.88	.003
Unit 6	0.90	.05
Cooperative	0.06	.03
Somatic Anxiety	0.06	.02
Clarity	-0.12	.08
Practical Orientation	0.15	.01

Percent of Variance Explained = .18

Overall Probility = .0003

APPENDIX G

STEPWISE MULTIPLE REGRESSION FOR MEAN POTASSIUM LEVEL

Summary Table of Stepwise Multiple Regression

for Mean Potassium Level

Variables	Estimated Regression Coefficients	Probability
Sex	0.14	.11
Race	-0.38	.0001
Size	0.01	.0001
Unit 3	0.54	.0001
Inhibited	-0.02	.10
Sensitive	-0.06	.0004
Chronic Tension	0.04	.006
Recent Stress	0.03	.07
Future Despair	0.05	.003
Practical Orientation	-0.04	.04

Percent of Variance Explained = .27

Overall Probability = .0001

APPENDIX H

STEPWISE MULTIPLE REGRESSION FOR MEAN WEIGHT GAINS

Summary Table of Stepwise Multiple Regression

for Mean Weight Gains

Variables	Estimated Regression Coefficients	Probability
Age	-0.02	.0001
Size	0.02	.0001
Education	-0.11	.0003
Unit 4	0.47	.07
Unit 5	-0.48	.06
Respect	-0.02	.10
Chronic Tension	0.05	.0006
Somatic Anxiety	-0.03	.04
Clarity	0.06	.11
Personal Problem Orientation	0.05	.12

Percent of Variance Explained = .30

Overall Probability = .0001

APPENDIX I

STEPWISE MULTIPLE REGRESSION FOR NUMBER OF NO SHOWS

Summary Table of Stepwise Multiple Regression

for Number of No Shows

Variables	Estimated Regression Coefficients	Probability
Size	-0.00	.16
Employ	0.09	.06
Unit 2	0.31	.0007
Introversive	0.02	.04
Sociable	0.02	.0004
Sensitive	0.02	.14
Premorbid Pessimism	0.02	.10
Future Despair	0.01	.27
Somatic Anxiety	-0.03	.006
Support	0.02	.03

Percent of Variance Explained = .21

Overall Probability = .0001

APPENDIX J

STEPWISE MULTIPLE REGRESSION FOR LEAVING TREATMENT EARLY

Summary Table of Stepwise Multiple Regression

for Leaving Treatment Early

Variables	Estimated Regression Coefficients	Probability
Sex	0.34	.05
Size	0.04	.0001
Unit 4	0.73	.03
Unit 6	0.51	.19
Recent Stress	0.05	.14
Premorbid Pessimism	-0.05	.08
Somatic Anxiety	0.07	.02
Involvement	-0.09	.04
Order & Organization	0.13	.02
Anger & Aggression	0.09	.08

Percent of Variance Explained = .36

Overall Probability = .0001

APPENDIX K

STEPWISE MULTIPLE REGRESSION FOR NUMBER OF MINUTES LEFT EARLY

Summary Table of Stepwise Multiple Regression

for Number of Minutes Left Early

Variables	Estimated Regression Coefficients	Probability
Sex	4.61	.15
Read	4.73	.23
Unit 1	15.88	.0003
Unit 2	29.81	.0001
Unit 4	8.29	.12
Chronic Tension	-0.61	.18
Recent Stress	1.39	.01
Involvement	-1.75	.03
Order & Organization	2.42	.03
Anger & Aggression	1.16	.20

Percent of Variance Explained = .30

Overall Probability = .0001

APPENDIX L

STEPWISE MULTIPLE REGRESSION FOR DAYS TO COMPLETE QUESTIONAIRE

Summary Table of Stepwise Multiple Regression

for Days to Complete Questionaire

Variables	Estimated Regression Coefficients	Probability
Months of Dialysis	0.02	.12
Unit 1	2.44	.005
Unit 4	3.76	.001
Inhibited	0.37	.01
Sociable	0.22	.04
Sensitive	-0.35	.003
Premorbid Pessimism	0.44	.003
Social Alienation	-0.39	.008
Anger & Aggression	0.47	.03
Personal Problem Orientation	-0.34	.05

Percent of Variance Explained = .19

Overall Probability = .0001

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VITA AUCTORIS

Allan Schmidt was born on August 15, 1953 in Kansas City, Missouri. In May, 1971 he graduated from Center High School, Kansas City, Missouri. In September, 1971 he enrolled at the University of Tulsa. He graduated with the Bachelor of Science degree in June, 1975. In September, 1975 he enrolled in the University of Windsor graduate program in psychology. He completed his Master of Arts degree in June, 1977 and is currently enrolled in the Ph.D. program.