A COLLABORATIVE CASE MANAGEMENT MODEL IN AN END STAGE RENAL DISEASE PATIENT POPULATION

by

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To The Loving Memory of My Parents
Robert and Margaret Quinn

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CHAPTER I

INTRODUCTION

Enormous changes in the provision of health care have occurred since the early 1980s. Advances in science and technology, corporatization of institutions, restructuring of payment strategies for health care, reduced lengths of hospital stay, an aging population, increasing numbers of chronically ill persons, and alternative sites of care by multiple providers are some of the factors contributing to dramatic changes within the health care system.

Although some of these changes have been beneficial, there is persistent dissatisfaction with the nation's health care delivery system. Patients and other consumers are challenged by limited access to care, escalating cost, the complexity of the system, and fragmentation of care. Providers are equally challenged by the sharp rise in the acuity and complexity of patient care problems. Health care institutions are pressured by the demands of multiple constituencies who are perceived to have mutually exclusive needs. Concurrently, payers must respond to their constituencies' demands for quality care at a lower cost, as employers and government agencies react to the escalating shares of their dollars that are spent on health care services and benefits (Newell, 1996).

The provision of outcome-oriented, cost-effective health care is no longer a goal of the American health care system--it is a mandate. To accomplish this mandate, the relationship between the costs of care, the desired outcomes of care, and the processes

involved in providing care must be reexamined. The current frustrations stem, in part, from an imbalance of these three factors. The costs, processes, and outcomes of care are interrelated and reciprocal--changes in one aspect (such as reductions in cost) can have a significant effect on the others (such as outcomes of care). Health care delivery must be restructured and refocused to attain an effective balance between costs, desired outcomes, and processes of delivery of care (Bower, 1992).

The shift of emphasis of health care from acute/specialty driven care to primary/chronic condition care is of particular interest under a managed care reimbursement system. The patients, as well as the providers and the payers, will benefit from a comprehensive, individualized approach to care delivery that focuses on prevention of complications at lower overall cost without sacrificing the quality of care delivered. A well designed and implemented collaborative case management program is believed capable of achieving these outcomes.

Most of the literature available on case management within the inpatient setting has been published in the 1980s and 1990s. The majority of the empirical studies have been predominantly focused on nursing and have been descriptive in nature. There is a dearth of research that simultaneously demonstrates the cost and quality outcomes of this model of patient care delivery using experimental or quasi-experimental design. No published studies were found that examine the effect of a nursing/medical collaborative case management model on cost and quality outcomes of patient care. The remainder of this chapter will provide the purpose and specific aims of the proposed investigation, the significance of the problem, and an overview of the proposed conceptual framework.

Purpose and Specific Aims

The primary aim of this pilot study was to determine whether case management offers a cost effective alternative, without sacrificing quality, to the existing practices of care delivery in a chronic patient population, end stage renal disease (ESRD). Previous research on the components of the cost of care for ESRD patients suggests that there is much potential for cost-saving measures that might also improve the outcomes of care (Held et al., 1994).

With an increasing number of individuals requiring treatment for ESRD, particularly those individuals over 65 years of age or with diabetes mellitus, and the continuing rise in the cost of health care, it is likely that health care utilization costs for ESRD will continue to grow. Although the largest component of the outpatient costs relate to chronic dialysis treatment because most reimbursement regulations have focused on reducing expenditures for this segment of care, it is unlikely that substantial additional savings can be achieved in this area. However, data related to hospital costs and an improved understanding of reasons for hospitalization of chronic dialysis patients, suggest that significant savings might be incurred through specific interventions and early identification of problems to avert hospitalization, and to reduce hospital length of stay in those patients who are hospitalized (Smith & Hoffart, 1996).

Case management is an intervention that is expected to decrease fragmentation of services, reduce costs, and improve outcomes in chronic illness (Cohen, 1996). The communication, coordination, collaborative, and continuity functions of case management programs are frequently described in the literature and anecdotally linked to these outcomes. The explicit how and why this intervention seemingly works remain unknown.

The absence of empirical evidence linking these functions to outcomes has contributed to a "black box" phenomenon shrouding the practice and evaluation of case management.

In an effort to shed light on the "black box", an extensive, critical review of the case management literature that identifies the conceptual and methodological challenges to studying this care delivery system was completed. Specifically, the issues related to measuring the quality and cost outcomes associated with a model of collaborative case management (CCM) was explored. In addition, using a structure, process, and outcome approach, a conceptual model for CCM was developed. Components of this conceptual model were selected and empirically tested in an effort to identify the effects of specific aspects of the model on the care delivered to ESRD patients in terms of quality and cost.

Significance of the Study

End stage renal disease (ESRD) represents a stage of kidney failure that requires hemodialysis, peritoneal dialysis, or kidney transplantation to sustain life. The number of new cases per year of ESRD in the United States continues to rise by seven to eight percent per year; the annual rate of increase in Michigan is close to 11 percent. The impact of ESRD in Michigan in 1993 was:

- 2,345 new cases of ESRD
- 39 new cases of pediatric ESRD
- 6,002 ESRD cases receiving dialysis
- 432 kidney disease patients received transplants
- 350 persons who received transplants in 1992 that have functioned for one year
- 2,279 Michigan residents with functioning transplants as of December 31, 1993

• 172 Michigan residents who received transplants in 1988 that were functioning as of December 31, 1993 (Michigan Public Health Institute, 1995).

According to the Health Care Financing Administration (HCFA) (1996), nearly half of the costs for ESRD patients incurred in the fee-for-service sector are for inpatient episodes. Many hospital admissions among the dialysis population are potentially preventable by better care management. One example is hospitalization for mechanical or infectious complications of vascular/prosthetic hemodialysis access devices which may be impacted upon by frequent thorough assessment and early intervention for anomalies (Berkoben & Schwab, 1995; Hawkins, 1995). Patients with ESRD secondary to diabetes mellitus now comprise approximately one-third of new ESRD patients. These patients are far costlier than other ESRD patients, and a large amount of this differential is due to inpatient hospitalizations. The assumption is that better clinical management of these patients will lead to decreased hospitalizations and therefore decreased cost.

A comprehensive case management program that partners with all health care disciplines, and with the patient, across the continuum of care is believed to be a viable response to both the cost and quality of care issues in this chronic patient population (Lewandowski, 1995). Active management of problems associated with ESRD could potentially reduce health services utilization through targeted primary, secondary, and tertiary prevention activities.

A Collaborative Case Management model (CCM) that is patient focused, multidisciplinary in composition, and under the direct coordination of a clinical nurse specialist is proposed to be a specific response to the growing numbers and costs of ESRD patients. A CCM model that links early intervention, acute care, and community-based

services, that increases the access to appropriate levels of service, and that is based on service standards and systematic evaluation is presented as a potentially effective program for these patients. The CCM model, with emphasis on preventative activities, i.e. early detection of complications, counseling, screening, and patient teaching, is a program that offers a comprehensive approach to reduce health services utilization and improve the quality of care to persons with ESRD.

Summary

Case management has taken its appropriate place as a care delivery method only recently as the health care system began to move from a parts-oriented focus to whole-system focus, from fragmented to integrated managed care, and from acute care to primary and chronic care. Simply stated, managing cases instead of visits or procedures makes better sense. Response to treatment, quality of life issues, and clinical outcomes can be documented and adjusted along the way while patients receive personal care. Case management, through the key concepts of communication, coordination, collaboration, and continuity of care, and prevention interventions, focuses on more targeted health outcomes, efficient care delivery, and cost-effectiveness (Newell, 1996). Only when the specific components of case management are identified and measured can this patient care intervention be explicitly linked to quality of care outcomes and health services utilization costs.

In Chapter II an extensive, critical review of the case management literature is presented that identifies the conceptual and methodological challenges of research focused on this delivery model and the specific issues related to measuring the impact of this model on care delivery and cost in a chronic patient population. The five key concepts of case

management- communication, coordination, collaboration, continuity of care, and primary, secondary, and tertiary prevention interventions- are explored for their relevance and application to the systematic study of the phenomenon as a patient care intervention.

Chapter III describes a proposed theoretical framework of case management that can be empirically tested with a chronic patient population. Six overriding research questions that have emerged from the literature review of case management, hypotheses that can be empirically tested, and the assumptions underlying the proposed study are also presented.

In Chapter IV the selected components of the framework that were tested will be discussed. Chapter V describes the statistical analyses that were performed to answer the hypotheses that were generated from the research questions. The final chapter is a discussion of the findings, conclusions, limitations of the study, and implications and recommendations for practice and further investigation.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter is divided into three sections. The first section will review the historical and current models of case management from social services, medicine, and nursing. The second section will contain a review and critical analysis of the empirical research on case management from these disciplines. The third will review the literature on the five case management key concepts -communication, coordination, collaboration, and continuity of care, and primary, secondary, and tertiary preventions interventions.

Models of Case Management

Despite case management's 50 year history, it lacks precise definitions and criteria and is more readily described than defined. This has contributed to the "black box" phenomenon that shrouds the empirical study of case management. The task of defining case management is further complicated by the number of professions and the many settings in which some variation of case management is practiced. Generic definitions of case management are noted below which adequately describe the process whatever the discipline or setting in which the model is applied:

- A system of 1) health assessment; 2) planning; 3) service procurement, delivery, coordination; 4) monitoring to meet the multiple service needs of patients (American Nurses' Association, 1988).

- "A collaborative process which assesses, plans, implements, coordinates, monitors and evaluates options and services to meet an individual's health needs through communication and available resources to promote quality, cost-effective outcomes" (Case Management Society of America, 1994, p. 60).
- A systematic approach to identify high-risk, high-cost patients, assess opportunities to coordinate care, choose treatment options, develop treatment plans to improve quality and efficiency, control costs, and manage a patient's care to ensure maximum outcomes (Desimone, 1988).
- A system designed to optimize the patient's self-care capability, promote efficient use of resources, and stimulate the creation of new services (American Nurses' Association, 1988).

The American Nurses' Association (1988) has identified the goals of case management to include the "provision of quality care along a continuum, decreased fragmentation of care across many settings, enhancement of the quality of life, and cost containment" (p. 1). The core components of any case management patient care delivery system are communication, coordination, collaboration, and continuity of care.

Case management can be divided into external and internal groupings based on practice setting. External case managers are agents of insurance companies and practice from the payer's point of view. Others serve as agents for case management companies or lawyers or are company occupational health nurses. These agents are most readily seen in the social science and medical models of case management. Case managers who operate within provider institutions, such as hospitals, long-term care facilities, health maintenance

organizations (HMOs), and home care agencies, are referred to as internal case managers because they are part of the treatment team (Newell, 1996). This method is most commonly practiced within the nursing model of case management. The models of case management that will be reviewed fall into one of three disciplines: social services, medicine, and nursing.

Social Services Models

Case management was considered a social service that provided settlement relocation for immigrants in the early 1900s with a full range of services (Levine, 1979). These programs were funded by governmental agencies or charitable organizations (Baker & Vischi, 1989). The social services case management model emphasizes comprehensive long-term community care services in an effort to avoid hospitalization (Liebman-Cohen, 1990; Merrill, 1985). Frequently in the descriptive literature the social science model is combined with the medical model. In this review, the models will be examined separately. The social services model of case management will be reviewed in the context of the mental health, gerontological and rehabilitative literature.

Mental Health. With newly-discovered psychiatric medications in the 1950s, a large number of formerly institutionalized persons were able to live outside mental hospitals. Many were in need of some type of community assistance. Lamb (1980) reported that the services available to them were not only uncoordinated and fragmented, but often unresponsive as well because of the societal view of mental illness. A number of national groups studied the effects of deinstitutionalization and recommended that it was necessary to develop professionals who were able to provide service referral and coordination as well as follow-up to these individuals (Intagliata, 1981; Lamb, 1980).

The term case management first appeared in the social welfare literature in the early 1970s. The passage of the Community Mental Health Centers Act of 1963 (P.L. 94-63) formalized the federal government's commitment to the mentally ill with the development of a community support system to coordinate benefits and maximize access to deinstitutionalized patients (Souder, 1989). The need for case management was not seen as a means of controlling patients or improving the efficiency of providers but rather assisting patients to overcome federal bureaucracy and maximizing their access to care (Spitz & Abramson, 1987).

Professionals and para-professionals, including physicians, registered nurses, nurse practitioners, licenced practical nurses, and social workers, are involved in providing these services (Souder, 1989). These programs continue today in community health centers to assist these individuals and their families to avoid fragmentation of health care services (Cohen & Cesta, 1993; Crosby, 1987; Miller, 1983; Pittman, 1989).

Gerontological. Following the experience in the mental health field, case management services for the elderly surfaced in the early 1970s. By the mid-1970s, much of the gerontological literature commonly referred to case management, and many long-term care programs included a case management component. These programs of "coordinated, client centered care" were designed to deliver comprehensive services at the local level. Such programs were free standing agencies or units in a planning agency, information and referral agency, direct service agency, or institution (Steinberg & Carter, 1983).

During this time a number of demonstration activities for providing care to the elderly were introduced. These included Triage in Connecticut, the Philadelphia

Corporation on Aging, and ACCESS in the private sector; the National Long Term Care Demonstration Project (also known as the Channeling Demonstration) and the Aging Administration in the public sector; and the Robert Wood Johnson Foundation grant to Erie County in the voluntary sector. All sectors attempted to test the provision of case managed community-based services to meet the long-term care needs of the frail elderly in one way or another (Souder, 1989).

The key factor in case management of community-based care for the elderly remains coordination of services versus control of access. Case management activities in these programs like in mental health, are performed by a variety of personnel, both professional and para-professional (Souder, 1989).

Rehabilitative. In 1908 federal legislation was passed guaranteeing federal workers certain benefits for work related injuries. States followed suit in the 1910s and 1920s (Starr, 1982). As states, employers, and third party payers began providing catastrophic care to these work-injured employees, the importance to take the long-term view of the injured client's needs was recognized (Souder, 1989).

It was not until 1970 that rehabilitation case management became commercialized when International Rehabilitation Associates (IRA) (a subsidiary of Insurance Company of North American (INA) became the first national-based company to provide these services. (INA merged with Connecticut General to become CIGNA, and IRA became Incracorp, Inc. in 1984) (Souder, 1989).

Originally initiated for injured workers, the concepts of rehabilitation case management have been adopted by other programs of catastrophic and chronic case management such as those involved in acquired immunodeficiency syndrome (AIDS),

renal disease, and some cancer diagnoses (Lamb, 1995; Smith & Hoffart, 1996; Sowell, 1990). Registered nurses and social workers provide most of the case management services to these clients. The rehabilitation philosophy of encouraging client/family self-care and self-responsibility, minimizing disability via a variety of adaptive techniques, and training the family in a supportive role (Newell, 1996) is something that all case management programs could learn and benefit from in the delivery of health care services across the continuum.

Medical Models

Medical case management is focused on long term-care of individuals at risk for hospitalization. The combination of available resource utilization with additional services to maintain individuals in their home or community most distinguishes the medical model from the social services model.

Although competition, capitation and case management have been the dominant public sector themes of the 1980s and 1990s, until recently their involvement with any form of managed care has remained relatively low. Medicaid has been more active than Medicare in utilizing health maintenance organizations (HMOs) as an alternate delivery system (Spitz & Abramson, 1987). For example, by the end of 1997, only about 5 percent of the 242,943 Medicare patients receiving dialysis care were in enrolled HMOs. The largest number of enrollees are in California (18%) with Michigan having the fewest enrollees (1%). It its believed that for these relatively low numbers stems from the renal organizations fight against Congress to lift the barrier that would allow ESRD patients to join HMOs. The reason most frequently cited for this opposition is that little data are

available to show how well chronically ill patients do under capitated reimbursement programs (Neumann, 1998).

HMOs are sometimes referred to as "gatekeeper" plans where the focus is on limiting access and cost containment via control (Souder, 1989, p. 7). The predominant traditional paradigm of the medical model of case management is found in the private sector. These models will be reviewed in two groups, traditional and managed care.

Traditional. Virtually all large insurance companies and many employers use medical case management services; most employers contract externally for the service. This approach is an outgrowth of the rehabilitative approach under the social services model (Souder, 1989).

The goals of private sector case management include: utilizing alternative health care delivery methods, promoting self-care, independence, comfort and safety; reducing inappropriate utilization through prevention of complications; and addressing the psychosocial needs of clients and families (Henderson & Wallack, 1987). Other goals have been identified to ensure that each client/family receives the best care and treatment and is supported through their decisions, and to promote cost savings while not compromising the quality of care (Tonsfeldt, 1986).

The process of private sector case management is described as involving four major components: case identification; screening and assessment; developing an individualized treatment plan; and monitoring for effectiveness and appropriateness. Like other models of case management, private sector medical case management employs professionals, primarily registered nurses, and para-professionals (Newell, 1996; Souder, 1989).

Managed Care. Another approach to medical case management is emerging. This model of case management is seen in the delivery of managed care services by physician groups under capitated contracts with HMO plans. These groups include medical group practices and independent practice associations. This approach is termed the managed care model of case management (Kerr et al., 1995).

An example of this model is practiced in California. These physician groups typically contract with HMO plans to deliver care in what has been described as a three-tier arrangement (the HMO, the physician group, and the member physicians). The focus of control lies internally with the physician group and its physicians, not with the HMOs. This is an important distinction from earlier externally controlled medical models. Physicians in these groups share the financial risk and benefits. These arrangements are called medical services organizations or physician services organizations (MSOs/PSOs). Members will profit from patients enrolled in an HMO only if the cost to the group for use of services is lower than capitated payments (Hillman, Welch & Pauly, 1992; Welch, Hillman & Pauly, 1990).

In these arrangements, although the HMOs require that the groups perform basic utilization management functions, most decisions about the utilization management process are left to the physicians themselves. Accordingly, the financial risk associated with capitation has challenged physicians to develop effective ways to manage their own utilization and costs while maintaining quality of care for capitated patients (Kerr et al., 1995).

This approach is in contrast to the traditional method in which utilization management strategies have previously been imposed on physicians by external parties,

such as third-party payers and health plans, in the form of prospective, concurrent, or retrospective utilization management techniques (Wickizer, 1990; Gray & Field, 1989). Capitated physician groups are adopting many of these same formal management strategies to control their own utilization. These utilization management methods are initiated by physicians in response to capitation as "internally imposed utilization management" (Kerr et al., 1995, p. 501).

Kerr and colleagues (1995) found that capitation at the group level has influenced physicians to design their own management systems to contain costs. Groups have implemented utilization management strategies such as gatekeeping, preauthorization, profiling, education, and practice guidelines. Most groups asked primary care physicians and specialists to obtain pre-authorization for many speciality referrals, procedures, and tests; patients were limited in self-referrals to specialists. Groups devoted a substantial amount of physician and personnel time to performing utilization management functions. Non-physician personnel included registered nurses and clerical assistants.

Internally imposed utilization management is fundamentally changing physician practice patterns. The growth of capitation may give physicians greater control over utilization management policies and result in less reliance on externally imposed management. Such a transition may have positive consequences on practice if physicians have an incentive to exert greater control over decision making and have confidence in the validity of the utilization management strategies. Internally imposed utilization management represents a physician-driven approach for practicing medicine when physicians, in addition to being responsible for caring for an enrolled patient population, also have fiscal control (Kerr et al., 1995).

Nursing Models

The changing nature of health care economics has forced hospitals to look at case management as an alternative to the delivery of direct patient care services. McIntosh (1987) and Henderson and Collard (1988) reported several advantages of hospital-based case management. First, the hospital setting offers a wide range of specialized skills that can be made available to both the provider and recipient of case management services. Second, since the majority of the resources needed for patient care are centralized within the acute care setting, early assessment of patient needs, coordination of care delivery, and evaluation of alternative systems is enhanced. Third, since facility and overhead costs are traditionally factored into hospital-based care, the management of the expenditures associated with high cost patients is minimized. Fourth, systems for monitoring and measuring the cost-effectiveness of case management arrangements are present within the hospital setting.

Many hospital-based case management systems have engaged registered nurses as case managers (McIntosh, 1987; Henderson & Wallack, 1987; Henderson & Collard, 1988; Newell, 1996). Nursing involvement in case management provides an opportunity for nurses to influence and direct the delivery and quality of patient care; it allows for more control, visibility, and recognition for services delivered; it offers more consistent outcome attainment, and differentiates effective nursing staff contributions to patient care (Zander, 1988b).

Case management as a delivery method of nursing care, is a powerful and challenging response to the need to balance costs, processes and outcomes of care. The notion of the case as an organizer of nursing care delivery is both old and new. It has been

most commonly used in practice environments that are person centered rather than disease centered. For example, management of the case is no stranger to public health nurses, psychiatric nurses in private practice, and occupational health nurses who monitor the health of employees (Donnelly as cited in Newell, 1996).

Although case management was originally applied in the field of mental health within the social services model, nursing can lay claim to generic case management; service coordination has been the cornerstone of public health nursing since the 1800s (Faherty, 1990). The concept "continuum of care" became popular after World War II to describe the extended community services necessary to care for discharged psychiatric patients. It was recommended that a program coordinator or "system agent" pull services together at the delivery level to ensure accessibility, availability, and responsiveness. This role is similar to today's case manager (Grau, 1984, p. 372).

Following the implementation of the prospective payment system (PPS) of reimbursement for Medicare and Medicaid patients in 1983, case management as a nursing delivery system began to emerge in acute care settings. Although currently there are hundreds of hospital-based case management models in existence, each designed to meet the needs of their unique setting, they all share one common denominator: a single health care professional who oversees, manages, and accounts for the total health care of a given group of patients over time (Rodgers, Riordan, & Swindle, 1991). Because of nursing's central role in patient care, the health care professional of choice is the registered nurse (Newell, 1996). Since the focus of the proposed study is on case management in the acute care setting, models from this setting will be discussed with only a brief reference to one community based program.

Although there is significant overlap, most hospital nursing case management systems fall into one of three models: primary nursing care, managed care/case management, and differentiated practice (Stiller & Brown, 1996). The primary nursing methodology uses critical/clinical pathways to monitor patient progress; the managed care/case management approach sets criteria for the selection of high-risk patients in each clinical area across the continuum of care; and the differentiated practice model integrates the structural design and organization of three acute care delivery systems- differentiated practice, primary nursing care, and shared governance. The three models described below, New England Medical Center Hospitals, Carondelet St. Mary's Hospital and the Tucson Medical Center Model, have been selected as contemporary examples of these applications in the acute care setting.

New England Medical Center Hospitals Model. The major and first formal acknowledgment of time and resource limitations in nursing care delivery were derived from the nursing department at New England Medical Center Hospitals (NEMCH) in Boston in 1985. The model was developed from a 13-year history of primary nursing and a two-year investigation of nursing and physician practice related to clinical outcomes of care (Zander, 1988a).

In this environment, Zander (1991) operationally defined case management as follows: A delivery model at the clinician-provider level in acute care for the:

1) achievement of clinical and financial outcomes within designated intervals;

2) accomplished by the care giver as case manager;

3) working in a collaborative practice group;

4) giving the patients and families more participation and satisfaction in the health care system. (p. 41)

According to Zander (1991) the hospital and nursing leadership at NEMCH "began to identify the patient care production processes per case-type, along with an in-depth analysis of opportunities to:

1) decrease length of stay, with consistent quality outcomes; or

2) decrease length of stay, increasing quality outcomes; or

3) maintain the same length of stay, increasing quality outcomes. (p. 40)

Using this analysis as a guide, a balance was sought between cost, quality outcomes, and processes in a mutidisciplinary manner.

Using this strategy, nurse managers recorded all three, cost, quality, and process, in detailed documents, called Case Management Plans -subsequently shortened to Critical Paths. These tools describe common practice by all disciplines for 75 percent or more patients within a case-type. Outcomes and processes to achieve them were standardized, time-lined, and sequenced. This method allowed the highly interdependent work of acute care to be monitored and written for all to see, understand, use and revise (Zander, 1991).

The outcomes of the NEMCH model have been cited in the nursing literature to include positive quantitative results in terms of LOS and utilization of resources (Zander, 1991). Some important qualitative outcomes related to staff satisfaction have also been reported (Zander, 1988a). The NEMCH model has attracted much attention since its implementation in 1985. This model has been the prototype from which other models of nursing case management have emerged.

Carondelet St. Mary Hospital Model. The nursing case management (NCM) program at Carondelet St. Mary Hospital was initiated in 1985. The goal was to offer direct nursing services to vulnerable and high-risk individuals across hospital and community settings (Newman, Lamb, & Michaels, 1991). The philosophical underpinning of the NCM practice is as follows: emphasis on the whole, with caring and commitment to service inherent in the purpose. Case management is viewed as a vehicle for practicing professional nursing. It exemplifies the essence of nursing that was always at Carondelet but diminished at times by response to external demands. The nurse case managers function in a nonhierarchical model of group practice. The work of the group is defined by the group and carried out by each member of the group (Newman et al., 1991).

The most important component of the NCM model is the relationship formed with the client. It is characterized by compassion, continuity, and respect for the client's choice. The focus is on process: the process of the client-environment interaction and the process of the nurse-client relationship. The dimensions of the nurse-client relationships described by the model parallel the characteristics of nursing and the nurse-client relationship described in Newman's (1986) theory of health as expanding consciousness. The NCM practice is not an intended application of the theory but a manifestation of the theory (Newman et al., 1991).

The Carondelet NCM has evolved into the Community Nursing Network (CNN). The CNN is an integrated system of nursing care that spans the health care continuum. The CNN seeks to improve the quality and cost-effectiveness of care by strengthening nurses as professionals and enabling nurses to contribute the full range of their expertise in promoting health. Within the CNN, nurses are accountable for the quality of nursing care,

the cost-effectiveness of care and access to health care (Ethridge & Lamb, 1989; Lamb, 1994). Initial evaluation of this program suggest that integrating services at the community level may achieve substantial cost savings (Burns, Lamb, & Wholey, 1996).

Tucson Medical Center Model. The Tucson Medical Center (TMC) has developed a managed care/case management model that integrates the structural design and organization of three acute care delivery systems: differentiated practice, primary nursing care, and shared governance. Comprehensive system outcomes have been identified for the patient, the hospital system, and the care providers. The model focuses on the patient's entire episode of illness from pre-admission to post-discharge (Del Togno-Armanasco, Olivas, & Harter, 1989).

Key components adapted from the NEMCH model include: (1) staff nurses to coordinate and monitor a specific case-type and case load of patients; (2) modification of the case management plans (collaborative case management plans) and critical pathways (multidisciplinary action plans) to assist in collaboratively identifying the multidisciplinary plan of care; (3) analysis of variance documentation to provide frequent feedback to assure implementation of appropriate interventions (Del Togno-Armanasco et al., 1989; Zander, 1988a).

From the differentiated practice model, aspects of role differentiation were incorporated. This approach is structured on a nursing theoretical framework and facilitates nurse empowerment by providing roles compatible with the educational level (associate degree, baccalaureate, etc.) and practice goals of the individual nurse (Del Togno-Armanasco, Hopkin & Harter, 1993). The major components of this framework include provision of care (technical skills), management of care (leadership

skills), and communication (interpersonal skills). Role focus provides nurses with the challenge to practice to the full extent of their education and experience. The TMC model recognizes and values the knowledge, skills, and abilities of nurses initially prepared at different educational levels. The model strives to create a professional work environment which promotes job enrichment and satisfaction (Del Togno-Armanasco et al., 1989).

Tenets of primary nursing care, fused with the concept of shared governance have also been integrated into the TMC model. The merging of accountability, coordination, continuity of care, and empowerment has resulted in the following definition:

> Case management care delivery is a multidisciplinary care delivery process method which aims by case-type, to achieve a purposeful and controlled connection between the quality of care and the costs of that care...
>
> (Del Togno-Armanasco et al., 1989, p. 27).

The methods identified to accomplish these goals include the components of case management. These components are coordination, collaboration, continuity of care, and accountability to provide total patient care outcomes. Like the NEMCH model, the TMC model includes the elements of satisfaction and job enrichment for care givers, and patient and physician satisfaction with care delivery (Olivas, Del Togno-Armanasco, Erickson, & Hater, 1989). Unlike the NEMCH model, TMC's model can be adapted to any existing care delivery system (team, functional, or primary), and to any care-giver mix (registered nurse, license practical nurse, and/or nursing assistant) (Del Togno-Armanasco et al., 1989).

Application of the TMC utilizes the Orem Self-Care Deficit Theory of Nursing to promote patient participation in their care. Within this framework, patients have the

opportunity to become active members of their care team, and better prepared for their care needs in the home environment (Orem, 1991). An additional goal is to avoid readmissions to the hospital. These self-care requirements are included on the patient's Collaborative Case Management Plan (CCMP) and Multidisciplinary Action Plan (MAP) (Olivas et al., 1989).

TMC employed a unique research-based approach to operationalize steps to achieve control of resource utilization. Rhea's (1986) six steps to control variability were adapted for this use. The steps include: (1) accurate compilation of resources; (2) development of a resource utilization standard; (3) controlling variation; (4) analysis of variation; (5) prioritization of cases; (6) performance of research and experimentation.

The evaluation of the TMC model showed encouraging results. Positive outcomes attributed to the program included decrease in LOS and cost per case for patients with open heart procedures including, diagnostic related groups (DRGs) 105, 106, and 107, and increase in patient, physician, and nurse satisfaction
(Del Togno-Armanasco et al., 1993).

Review and Critical Analysis of Research

This section will present a critical review and analysis of case management research from the social sciences, medicine, and nursing literature from 1986 through 1997. This review sheds light on the methodological and conceptual issues that contribute to the "black box" phenomenon of the study of case management. Case management has been practiced by numerous professions for over 30 years with a variety of target populations. These populations include individuals with chronic mental or physical illnesses, technology-dependent children and adults, and persons with catastrophic

illnesses like cancer and AIDS (Lamb, 1995; Souder, 1989; Sowell, 1990). Most of the published studies on case management address the impact of the intervention on health service use and costs, especially the use of hospitals and emergency services and their associated costs. There has been little exploration of the effect of case management on health care costs across the full-continuum of care (Markschke & Nolan, 1993). The lack of outcome indicators sensitive to case management interventions and integrated information systems that enable investigators to track outcomes across settings have limited the scope of outcome research in case management (Lamb, 1992). No studies were found that explored case management from a nursing/medical collaborative framework.

Social Sciences

The critical review and analysis of case management research from the social sciences literature will be presented in the context of mental health, gerontological and rehabilitative domains. The review will encompass studies from 1987 to 1992.

Mental Health. Chamberlain and Rapp (1991) searched the mental health literature of the late 1970s and 1980s to answer two central questions: "In what ways is case management currently defined? What do we know about the benefit of this service to the recipients?" (p.172)

Six studies met the defined criteria. These studies included: two implementations of the Program of Assertive Community Treatment (PACT) Model of case management (Bond, Miller, Krumweid, & Ward, 1988; Borland, McRae, & Lycan, 1989); one implementation of the Generalist Model (Franklin, Solovitz, Mason, Clemons, & Miller, 1987); two studies of the Rehabilitative Model (Goering, Farkas, Wasylenski, Lancee, &

Ballantyne, 1988; Goering, Wasylenski, Farkas, Lancee, & Ballantyne, 1988); and one study of the implementation of the Strengths Model (Modrcin, Rapp, & Poertner, 1988).

These studies were compared and analyzed in terms of the independent variables, research subjects, research design, attrition, dependent variables, and findings (Chamberlain & Rapp, 1991). The most interesting finding was the lack of outcome research on case management. When added to the lack of comparability of these studies related to intervention, purpose, subjects, and outcomes, their conclusions must be viewed tentatively.

The term case management was found to be used to describe a diverse array of interventions that generate differing client outcomes. The models differed conceptually and/or programmatically on several dimensions such as assessment procedures, definition of resource system, client authority, and primary goal for service. Only three studies employed a true experimental design. The single greatest need identified was a systematic effort devoted to the conceptualization and measurement of the relevant dependent variables (Chamberlain & Rapp, 1991).

Gerontological. Numerous authors in this domain have asserted that the lack of attention to identifying the special features of case management research has contributed to the development of a body of research with ambiguous findings (Kemper, 1988; Kemper, Applebaum, & Harrigan, 1987; Weissert, 1988; MacAdam et al., 1989). One of the most important methodological problems for case management research lies in sampling techniques. The sample should consist of a homogenous group of individuals most likely to benefit from the case management intervention. Factors such as source of referral (Warrick, Netting, Christianson & Williams, 1992) and site of care (Abrahams,

Capitman, Leutz, & Macko, 1989; Fleishman, Mor, & Piette, 1991) may inadvertently contribute to substantial variability within samples. These factors lead to the inability to show consistent quality and costs savings from these projects (Lamb, 1995).

Rehabilitative. The recent interest in the subacute setting -environments that provide services for patients whom acute hospitalization is no longer appropriate- (Flannery, 1995) has hastened the need for case management research directed at the rehabilitative patient population. Flannery notes that more third party payers than ever before cover subacute services, requiring close coordination between facility teams and external case management programs.

The literature shows that studies that address case management and rehabilitative services suffers from methodological issues similar to those cited above. These include lack of definition, poor sampling techniques, variations in site of care, inability to operationalize study variables, and lack of a theoretical framework (Fleishman, Mor, & Piette, 1991; Souder, 1989; Swartzbaugh, 1987).

A study of 70 employees of the Honeywell Corporation with diverse medical conditions showed that the program actually cost the company money (Swartzbaugh, 1987). The model was intended to identify potential variables which could predict net costs savings: demographic characteristics and specific case characteristics (time from onset of injury or referral; time the case open; type of case -surgical, medical, chemical, mental, neonatal; acute or chronic condition; method of notification; corporate or field; and status of the patient). The findings point to the need for researchers to identify those attributes of the process of case management which save money so that case management providers can better target cases which will achieve savings.

Medicine

A review of the research literature on the medical model of case management focuses on the private sector, traditional and managed care programs, discussed above. Most medical case management successes are described primarily through anecdotal, rather than empirical, evidence. While a review of the literature found no empirical evaluations of traditional private sector case management and only one for managed care, some useful information was identified.

Traditional. Numerous articles in the business literature described anecdotally the merits of a number of characteristics of the traditional medical case management approach. They include the potential to achieve cost savings, the advantages of timely referral, and the need for benefits exceptions to enhance access to services. In addition, the capabilities and qualifications of case managers to effect patient and system outcomes are frequently cited (Souder, 1989).

Cost savings following the implementation of medical case management has been documented by Zeldis (1987), Eshelman (1986), Sandrick (1987), and Jacobs (1988). Fewer references were made to the costs of operating these programs (Henderson, Souder, & Bergman, 1987; Hoffman, 1988; Zeldis, 1987).

Timeliness of referral was the single most important characteristic cited in the private sector case management literature to maximize the chances of favorable intervention in terms of saving money (Delany & Aquiline, 1987; Diblase, 1987). Garner (1987) noted that early action is not only critical from a cost perspective, but from a treatment standpoint as well.

Case manager capability in these models is infrequently described in the literature. When they are discussed, the qualifications and credentials are vague and general. Hoffman (1988) and Tonsfeldt (1986) discuss the role of the registered nurse as the most qualified individual to achieve both costs and patient care outcomes. Hoffman attributes this observation to the "holistic" nature of the educational preparation of the registered nurse in the fields of behavior and medicine. Diblase (1987) and Tonsfeldt claim that registered nurses with speciality training achieve optimal outcomes. Diblase also recognizes the role of the physician as consultant as valuable on the case management team. No empirical evidence was offered to support these observations.

The need for flexibility in the benefits package and the inclusion of home care was cited in studies of Chrysler and Honeywell (Califano, 1986; Garner, 1987). Despite the inconclusive and conflicting findings of a 1982 General Accounting Office (GAO) report on the cost-effectiveness of home care, expensive institutional care is replaced with less expensive home care in many case management programs. Many large insurance carriers including Blue Cross/Blue Shield, Aetna, and the Visiting Nurse Association report savings for home care (Cabin, 1985). Neither the conditions under which these cost savings were achieved, nor the processes responsible for them, were identified.

Managed Care. Kerr et al. (1995) reported findings from a study of managed care services provided by physician groups under capitated HMO plans. They concluded that physicians are responding to capitation by using utilization management techniques previously used only by the insurers. This physician-driven management approach represents a fundamental transformation in the practice of medicine. As managed care expands, future studies are needed to examine the influence of this growing trend in

medical practice on quality of care, costs, health outcomes, and physician and patient satisfaction.

Nursing

Lamb (1995) completed an extensive literature review on nursing case management research that includes studies conducted in this domain from 1988-1994. Much of the following review and critical analysis were abstracted from this work.

The evolution of current models of case management can be traced from roots in community health nursing, primary nursing in acute care settings, and from clinical nurse specialist interventions across clinical services. Similarities between the present practice of case managers and public health nursing in the early 1900s has been noted by many authors (Donnelly as cited in Newell, 1996; Erkel, 1993; Knollmueller, 1989; Mundinger, 1984; Zander, 1988b).

Considerable confusion is reflected in the literature about the purpose, scope, and functions of nursing case management practice (Lyon, 1993). Consequently, this confusion is reflected in the research on nursing case management (Lamb, 1994; 1995). The research on nursing case management has been characterized by the non-existence of operational definitions, lack of studies that control for the effects of extraneous variables, and a notable absence of nursing-sensitive (interventions) outcomes (Lamb, 1992).

Lamb (1995) notes researchers studying nursing case management have neglected the role of nursing or social science theory in their rush to document outcomes. A few scholars have explored the applicability of various nursing theories to case management practice (Forchuk, Beaton, Crawford, Ide, & Voorberg, 1989; Newman et al., 1991;

Wadas, 1993). However, theoretical frameworks have yet to be used as the foundation for studies of nursing case management (Lamb, 1995).

Zander (1988b), Ethridge and Lamb (1989), and Rogers et al. (1991) are among many who have described the work of nursing case management. This body of literature is substantially anecdotal in its description of quantitative outcomes embedded in case studies detailing client characteristics, their nursing problems and needs, and their response to nursing case management interventions (Lamb, 1995).

Although qualitative descriptions point to common themes across all nursing case management models, this approach has not been used extensively. Themes of coordination, integration, and advocacy figure prominently in many anecdotal reports in the absence of theoretical frameworks. Qualitative research designs may be useful to define operationally the interventions that are implemented in nursing case management (Lamb, 1995).

According to Lamb (1995), the areas of substantive interest in nursing case management research would include the structure, process, and outcomes of the practice. However, the focus on outcomes dominates the current literature. In representative studies of both hospital-based and continuum-based nursing case management models, the emphasis has been on the use and costs of acute care services. There has been little attention to the systematic study of either structure or process or the relationships among structure, process, and outcomes. In the following sections, a review of the current literature in each of these areas is discussed.

Structure. Studies related to structural issues include preparation for practice, work-group composition, caseload size, reporting relationships, and administrative

support. No investigations examining the influence of educational preparation or types of nursing experience on either process or outcomes of nursing case management practice were found in the literature. Several studies suggested educational content necessary for case management practice (Bower, 1992; Redford, 1992; Wahlstedt & Blaser, 1987). Although there appears to be a growing movement toward preparation of case managers at the graduate level in nursing, no empirical support for this preparation has been found in the literature (Lamb, 1995).

Kemper (1988), Warrick, Chistianson, Williams, and Netting (1990), and Eggert, Zimmer, Hall, and Friedman (1991) studied work-group or team composition of case management programs. The personnel used in these programs varied considerably from study to study. Although it seems logical that patient population characteristics would determine team assignments and composition, only Eggert and colleagues examined the relationship between patient assignment criteria, case mix, and outcomes of care using an experimental design.

Several authors have speculated about the appropriate caseload size. Ethridge and Lamb (1989) reported that in a continuum-based model a case manager typically follows 80 to 90 clients, with approximately one half requiring direct contact. Eggert et al. (1991) recommended a smaller caseload for a team case management model over an individual model practiced in the home. All of these authors agree that a complex set of interrelated variables may determine appropriate caseload size, including patient acuity, team composition, and site of care. No published empirical support linking caseload size and characteristics to outcomes was found. In addition, no published instruments that index patient acuity for case management practice were discovered (Lamb, 1995).

The successful implementation of nursing case management has been associated with a number of organizational characteristics (Williams, Warrick, Christianson, & Netting, 1993). Shared governance, credentialing systems, professional practice committees, and integrated-collaborative methods have been cited as particularly relevant to the development of nursing case management programs (Del Togno-Armanasco et al., 1989; Ethridge, 1991; McKenzie, Torkelson, & Holt, 1989).

One study was found that examined the effects of case management on the context of nursing practice. The authors found a significant positive difference in several aspects of perceived quality of care for both staff nurses and case managers. The specific findings related to nurse perceived ability to develop relationships with patients, ability to be therapeutic, and support for good care from the institutional structure and administration (Lynn & Kelley, 1997).

Process. The literature on the process of nursing case management is reflective of three concepts: consistent use of the nursing process; the role of long-term caring relationships; and professional nursing functions of monitoring, pattern recognition, teaching, coordination, and advocacy. However, the authors of these anecdotal descriptive works had not operationalized these central concepts nor attempted to monitor their implementation (Lamb, 1995).

As noted previously, there has been little research to link nursing case management interventions to nursing or social science theory (Lamb, 1995). Newman et al. (1991) and Lamb and Stempel (1994) studied nursing case managers practicing in a continuum-based model in Arizona. Newman's (1986) nursing model of health as expanding consciousness was used in the 1991 Newman and colleagues' study of 14 case

managers. The most important aspect about nursing case management was found to be the nurse-client relationship. Themes identified were pattern recognition, rhythm and timing, opening to self, mutual growth, client choices, and beginning and ending the service. The findings suggested that Newman's model may have implications for future concept and hypothesis development in case management research.

Lamb and Stempel (1994) applied grounded theory techniques in their study of 16 nurses from the same Arizona practice. They attempted to develop a model to link the process and outcomes of nursing case management from the client's perspective using the techniques of grounded theory. The nurse-client relationship was viewed as the conduit through which clients are able to reframe their experience, think differently about their health problems and choices, and then change their self-care behaviors accordingly.

Two central features emerged from this study: the nurse as clinical expert in the management of complex illnesses and the nurse as a caring and accessible partner in the client health experience. Both were essential to the achievement of quality and cost outcomes (Lamb & Stempel, 1994). This study suggested that current nursing and social science theories in the areas of mastery, self-care, caring, and cognition are relevant to nursing case management practice and may be used to operationalize the intervention, and predict and explain its outcomes (Lamb, 1995).

Outcomes. There were few empirical studies of outcomes of nursing case management found in the literature. Most of these studies explored the impact of nursing case management on health service use and costs, particularly the use of hospitals and emergency departments and their associated costs (Lamb, 1995). For this reason, these studies will be reviewed in a separate section. Lamb also noted that there has been little

study of other relevant outcomes, such as nurse satisfaction, patient/client satisfaction, self-care, or functionality. In addition, there has been minimal investigation of the impact of case management on health care costs across the full continuum of health care services (Marschke & Nolan, 1993).

Outcome research generated from service settings is primarily concerned with two case management practice models: hospital-based models in which nurse case managers coordinate care for high-risk individuals across patient care units using guidelines, such as critical paths; and continuum-based models in which nurse case managers work with clients and coordinate care across multiple settings. Most studies have used pre-experimental designs using individuals receiving the case management intervention as their own controls or comparing them with a non-randomly selected control group (Lamb, 1995). These designs are not sufficient for permitting strong tests of causal hypotheses because they fail to rule out a number of plausible alternative interpretations and therefore have limited applicability in expanding the knowledge of the phenomena of study (Cook & Campbell, 1979)

Health Services Use and Costs. The focus on acute care service use and costs is consistent with the experience and goals of the authors of most nursing case management studies. Most of the work was completed by administrators and clinicians in acute care settings who have conducted evaluative projects to support newly developed programs. It is only recently that nurse scientists have begun to systematically study nursing case management. These findings have just begun to appear in the literature. Additionally, the lack of outcome indicators sensitive to nursing case management interventions and

integrated information systems that enable investigators to monitor outcomes across settings have limited the scope of outcomes research (Lamb, 1992).

Numerous studies that examine health service use and costs in hospital-based models of nursing case management are available. McKenzie, Torkelson, and Holt (1989) described the implementation of a nursing case management program for coronary artery bypass surgery patients. They defined case management as a "set of logical steps and a process of interaction with service networks" (p. 30). The study centered around analysis of critical path compliance and variation. The critical path is an multidisciplinary map of key processes and outcomes to be accomplished within a specified time frame and has become a common tool of many case management programs (Zander, 1988b).

In this comparison study of 106 case-managed patients with 84 who did not receive nursing case management, the case-managed patients demonstrated a shorter hospital stay and lower pharmacy, laboratory, radiology, and overall charges. The differences between groups were attributed to the nursing case management program. However, insufficient information about the evaluation design is provided to determine the extent to which the outcomes may be associated with the nursing case management intervention. In addition, limited information is provided about the satisfaction surveys and quality audits that were conducted on these patients (Lamb, 1995).

Mahn (1993) also studied coronary artery bypass patients in a similar nursing case management program. As in the previous study, the nurse case manager coordinated all of the pre-admission phase, monitored patient progress with a critical path, and participated in discharge planning. In a matched-pair group design, 25 case-managed patients were compared with 25 non-case-managed patients. The case-managed patients had fewer

hospital days, lower laboratory costs, and fewer hospital readmissions. However, the design is characterized by a small sample size, poorly defined method for measuring the effect of the intervention on the dependent variables and no statistical analysis of outcomes. Similar to the McKenzie et al. (1989) study, limited information is provided about the satisfaction surveys and quality audits that were reportedly conducted.

Cohen (1991) and (Liebman-Cohen, 1990) used a quasi-experimental design to compare hospital costs between women undergoing cesarean sections on experimental and control hospital units. The case management intervention used a team nursing approach that consisted of the implementation of a critical path with consistent integration of early patient teaching and discharge planning. The results showed a decrease in LOS, an increase in patient turnover, and potential savings and revenues of more than $1 million generated for the hospital in the case-managed group.

In addition, analysis of nursing activities on the two units indicated that nursing staff spent more time in direct nursing care, particularly during the initial days of hospitalization. Liebman-Cohen (1990) suggested that the initial increase in direct nursing care hours contributed to reduced LOS and associated cost savings for the hospital. This dissertation research not only brought more sophisticated cost-accounting methods to the study of nursing case management, it also provided a good example of the potential for applying techniques of cross-level modeling and analysis to enhance nursing case management outcome research (Lamb, 1995). The results would have been more meaningful had the case management intervention been operationally defined, and had the experimental and control groups been comparable.

Cross-level research is concerned with phenomena that occur at different levels across the organization, and its methodology requires specific attention to shifts in units of measurement and analysis for accurate interpretation of outcomes (Rousseau, 1985; Verran, Mark, & Lamb, 1992). For example, in Liebman-Cohen's (1990) study the nursing case management intervention was implemented at the unit level, yet outcomes are measured and analyzed at the individual level, indicating that the theoretical framework was a downward cross-level model. Because much of case management research may involve shifting units of intervention, measurement, and analysis, the application of knowledge in cross-level research may be extremely useful in designing and interpreting case management studies (Lamb, 1995).

Continuum-based nursing case management models have been studied by Ethridge and Lamb (1989), and Rogers et al. (1991). Ethridge and Lamb described the development of an integrated system of nursing services across the care continuum in which nurse case managers provided continuity of care for high-risk adults with acute and chronic illnesses. They used case studies and limited comparisons of case managed and non-case-managed patients to suggest that nursing case management may reduce LOS through different mechanisms for patients with acute and chronic illness.

In a related study, comparisons of case-managed and non-case-managed patients with various diagnoses were used to propose that nursing case management may reduce hospital costs though different mechanisms for patients with acute and chronic illness. For patients with acute illness episodes like total hip replacement, Ethridge and Lamb (1989) hypothesized that nurse case managers may reduce LOS at the end of hospitalization through facilitating earlier discharge. For patients with chronic, exacerbating illnesses, like

chronic lung disease, they proposed that nurse case managers may reduce utilization of high-cost and high-intensity days that occur at the beginning of hospitalization by facilitating access to care when medical intervention is indicated. Incomplete information about the research design was provided to assess the adequacy of support for their hypotheses, such as how "facilitating earlier discharge" and "facilitating access to care" was actually accomplished. However, these authors raise important questions about how nurse case managers contribute to changes in inpatient health service use in different patient populations (Lamb, 1995).

Rogers et al. (1991) described the implementation of a similar continuum-based model of nursing case management. Thirty-eight case managed patients served as their own controls in a pretest-posttest design. The findings showed reduced hospital LOS and admissions, and increased net reimbursement following the case management intervention. Again, the case management program was not specifically operationally defined and control for extraneous variables that may have contributed to the study results were not identified.

Patient Satisfaction. Growing interest in consumer responses to nursing case management has recently emerged. Collard, Bergman, and Henderson (1990) in their article on quality assessment of case management programs, suggested that measurement of patient satisfaction is essential to any evaluation plan. Although the literature is replete with anecdotal reports that indicate consistently high patient satisfaction with nursing case management, nurse scientists have questioned whether current patient satisfaction instruments adequately capture the domain of satisfaction with case management as a

nursing intervention (Lamb, 1992; Van Dongen & Jambunathan, 1992). However, neither author suggests recommendations or approaches to address this deficiency.

In their study, Van Dongen and Jambunathan (1992) surveyed the level of client satisfaction with psychiatric nurse case managers. The importance of the client-nurse relationship was again supported in these findings. Similarities between Lamb and Stempel's (1994) study included findings that clients stressed their caring and supportive relationship with the nurse as an important component of their care, with nurses described as being genuine, caring, supportive, accessible, and clinically competent. Clients identified in both studies listening, counseling, problem solving, and teaching as essential nursing case management interventions. However, they did not describe how listening, counseling, and so forth as interventions practiced by a nurse case manager differ from those of any other nursing role, i.e. staff nurse, primary nurse, or nurse educator.

Van Dongen and Jambunathan (1992) attempted to describe several items on instruments they developed to specifically measure client, nurse, and physician satisfaction with nursing case management. Attributes of case managers were addressed in the client instrument and included caring and availability, as well as nursing interventions. However, the sample size (n = 24) was too small to permit any quantitative psychometric evaluation of the tool. In the future, it will be important to compare and contrast systematically the dimensions of satisfaction in these instruments and their relationship to other nursing case management outcome indicators (Lamb, 1995).

Key Concepts

Case management is an interdisciplinary, interprofessional approach to delivery of care. The goals of case management include those outlined by the American Nurses'

Association (1988): the provision of quality health care, decreased fragmentation of care across many settings, enhancement of the patient's quality of life, and cost containment. In addition to the goals, case management as an intervention is characterized by five interrelated key concepts: communication, coordination, collaboration, continuity of care, and primary, secondary, and tertiary prevention interventions. To operationally define and measure these concepts, a review of the literature was conducted.

Communication

The dictionary definition of communicate is: to make known; to impart; to transmit; to share or convey information; to have an interchange of ideas; to have mutual understanding; and to be connected or form a connecting passage (The Tormont Webster's Dictionary , 1990). It follows that the act or process of communicating is communication.

Communication is believed to be the fundamental key concept of case management. Explicitly, the ability to effectively exchange information and receive feedback in the process of meeting patient care needs is believed to be the critical process underlying the case management intervention. Communication is viewed as a managerial practice and organizational process that is required in interventions to improve patient outcomes (Shortell, Rousseau, Gillies, Devers, and Simons, 1991).

In a 1986 study of 13 intensive care units (ICUs), Knaus, Draper, Wagner, and Zimmerman evaluated patient outcomes in relation to organizational processes. They found that although all hospitals had similar technical capabilities in their units, they differed in organization, staffing, commitment to teaching, research, and education. Their findings supported the hypothesis that the degree of coordination -namely, interaction

and communication within a hospital's ICU staff directly influenced patient outcomes and that this impact could be measured.

Teams of researchers have published several articles from a national study of 42 ICUs. Data were collected from 176,440 patients and were risk-adjusted using the APACHE III methodology. Concurrently, data were collected from all physicians, nurses, and ward clerks associated with the unit using a standardized organizational assessment questionnaire. Data relevant to the unit's overall structure, utilization, budget, staffing ratios, technologic capability, and patient care policies and practices were also collected. The study found that what the investigators call "caregiver interaction", as measured by culture, leadership, communication, coordination, and problem solving abilities of unit members, was associated with greater efficiency of utilization, as measured by a lower risk-adjusted LOS, and with higher perceived technical quality of care (Shortell et al., 1991; Shortell et al., 1992; Shortell et al., 1994; Zimmerman, 1989; Zimmerman et al., 1993).

The current focus on patient outcomes as a result of rising health care costs and the concomitant need to question the results of treatment to promote the health of the population has led to extensive efforts to assess the effectiveness of medical treatment (Hegyvary, 1991). As more is learned about the differences in patient outcomes and medical care practices, demand grows for research to explain these differences. With such understanding, interventions can be designed to improve medical care practices and, ultimately, patient outcomes. Normalizing for differences in patient illness severity, variations in outcomes can be generally ascribed to differences in provider skills, functioning of health care teams, or the structure and processes of the larger system in

which care is provided. The more complex the treatment process, the greater the likelihood that the individual practitioner, the health care team, and the larger system, organization or unit will all require interventions. These interventions go beyond improvement in clinical skills and include managerial practices and organizational attributes that promote effective execution of more complex treatment regimes. Developing reliable and valid measures of managerial practices and organizational processes is necessary to supplement the work being done in assessing clinical skills, patient outcomes, and patient satisfaction (Brook & Lohr, 1985; Cleary & McNeil, 1988; Lohr, 1989).

In a review of the health services research literature, Shortell et al. (1991) identified a number of managerial practices and organizational processes necessary to complete the work being done in assessing clinical skills, patient outcomes, and patient satisfaction as measures of the quality and efficiency of care provided to patients. Communication, coordination, organizational culture, leadership, and problem-solving/conflict management emerged as the most important of these practices and processes. They argued that in complex organizations such as hospitals and subunits such as ICUs great demand is placed on caregivers and support staff to effectively work together:

> A team-oriented, achievement-oriented culture and leaders who set high standards and provide necessary support are hypothesized to provide more open, accurate, and timely communication, effective coordination with other units, and more open collaborative problem-solving approaches. These, in turn, produce greater

cohesiveness among team members resulting in the delivery of more effective patient care. (p. 710)

Shortell and colleagues (1991) described and established the reliability and validity of a set of comprehensive measures related to leadership, organizational culture, communication, coordination, problem-solving/conflict management and team cohesiveness. Communication was measured along a number of dimensions including openness, accuracy, timeliness, understanding and satisfaction. Openness was measured by four, five-point Likert scale items, involving the extent to which nurses and physicians are able to say what they mean when speaking to one another without fear of repercussions or misunderstanding (Roberts & O'Reilly, 1974).

Accuracy, an eight-item scale, referred to the degree to which nurses and physicians believe in the accuracy of the information conveyed to them by other individuals (Roberts & O'Reilly, 1974). Timeliness, measured by these items, involved the degree to which patient care information is relayed promptly to the people who need to be informed. Understanding, an eight-item scale, involved the extent to which nurses and physicians believe communication on the unit is comprehensive and effective. In addition, two separate items were also used to measure the effectiveness of nurse-physician communication between shifts. Satisfaction with communication, a three-item scale for nurses and four items for physicians, was defined as the degree of satisfaction with nurse (physician) communication with patients, patients' families, and other nurses (physicians).

In a subsequent study of nine of the 42 ICUs, Shortell et al. (1992) prepared an assessment tool to find that timely, accurate, and open communication was key to the ability of physicians, nurses, and other caregivers to coordinate patient activities. In the

better performing units, communication not only took place internally (within the unit) but also externally with other hospital units. More importantly, communication took place upward in the organization with hospital administration. This is in contrast to the flow of information in traditional hierarchical systems where the communication is generally downward (Stillwaggon, 1989).

Using the same sample of 42 ICUs, Shortell et al (1994) specifically studied the relationship between the performance of these units and management processes. They found that managerial process variables related to the quality of caregiver interactions-culture, leadership, communication, coordination, problem-solving/conflict management, was the strongest correlate of unit efficiency, evaluated technical quality of care, the ability to meet family needs, and nursing turnover. This finding supports the idea that increased communication among caregivers can result in improved system outcomes of efficiency as well as patient outcomes in terms of increased quality and need attainment.

Coordination

Coordination of services was the forerunner of case management. Initially the focus was on community services, however the notion of coordination patient care is applicable across the continuum of care. Coordination can be defined as the overall guide for the acquisition and provision of health care services, in a systematic integrated fashion. Bower (1992) describes coordination as follows:

> Although case management may be directed to other goals, and although the primary purpose for instituting a case management system may vary among programs...coordination of care is the basic component of all models and modalities of case management. (p.3)

It is through coordination that the CCM model addresses a wide variety of health care issues and needs by:

1) Minimizing fragmentation of care and services.

2) Facilitating patient/client/family movement through the health care system.

3) Maximizing the contributions of all disciplines within the health care team.

4) Merging clinical and financial outcomes of care (Bower, 1992).

With increasing focus on the continuum of care, effective coordination is crucial. The linkages between providers is now more critical than the unilateral skills of any one provider; there is no one paramount provider, no individual whose skill base encompasses all others. There is only a team of providers with a variety of skills all somehow directed to meeting the needs of those individuals they serve (Cohen, 1996).

Empirically, the concept of coordination as an internal environmental factor influencing the efficiency and effectiveness of outcome performance indicators has been investigated in ICUs. Shortell et al. (1994) referred to coordination in the previously cited national study of 42 ICUs as:

> ...the extent to which functions and activities both within the unit and between units are brought together in a way that promotes cost-effective continuous care (Longest & Klingingsmith, 1994, as cited in Shortell et al., p. 512).

As one of the measures of caregiver interaction in Shortell's et al. (1994) work, coordination was measured by a four item scale relating to the ICUs ability to coordinate its work with other units such as the operating room, emergency room, step-down units and patient care units. Again, the findings supported that coordination along with communication, culture, leadership, and problem-solving/conflict management was

positively related to unit efficiency, evaluated technical quality of care, ability to meet family needs, and nursing turnover.

Collaboration

Collaboration is not easily defined or explained. Shortridge, McLain, and Gilliss (1986) states that collaboration is:

> ...a reciprocal relationship wherein the [providers] assume the greatest responsibilities for patient care within the framework of their respective fields. Although there are areas of overlap...the majority of the services provided...are complementary....A collaborative practice emphasizes joint responsibility in patient care management, with a bilateral process of decision making based on each practitioner's education and ability. (pp. 129-130)

Although this definition is one of the best, it does not convey the rich diversity and complexity of collaboration in health care (National Joint Practice Commission, 1977). Few definitions are comprehensive, and most quite narrowly describe a certain type of practice, rather than the concepts that underlie all practice. It is unlikely that any single definition can adequately explain collaboration in all of its permutations.

One explanation for this void, is that the term "collaboration" itself has not been used extensively in organizational management theory. As Schrage (1990) points out, while many leading management scholars stress "the need for effective communication in the workplace, collaboration seems to be a conceptual afterthought." (p.57)

For the purposes of an interdisciplinary case management model, the definition above is written in the context of collegial relationships between practitioners to be used as a general frame of reference for collaboration. According to Stetler and Charns (1995):

> ...implicit within the definition are components that can make a qualitative difference in the depth of a collaborative relationship –that is, progressing from merely working in parallel and communicating only when one individual feels the need for assistance to being cooperative on common issues, recognizing and appreciating the critical relationship of interdependence to goal achievement, and establishing an explicit, mutually agreed-on partnership with well-identified outcomes as the driving force. (p.4)

To further clarify the meaning of collaboration within this context, the concept is viewed as a means to achieving a set of outcomes, facilitated by a set of supporting factors. In case management, those factors include three major levels: the individual; the group; and the organization. These levels are described as follows: individual –the mindset of the individuals with which they approach the collaborative effort; group –characteristics of the work groups, i.e. how they handle conflict, set goals, and invite participation; organization –senior leadership's ability to demonstrate committed leadership, credible measurement systems in terms of information, and providing adequate resource allocation to ensure success (Liedtka & Whitten, 1997).

There are many models of case management that do not rely on the concept of collaboration to meet their goals. There were examples of this approach found in the social services, medicine, and nursing literature reviewed. In most cases these non-collaborative models are focused on accomplishing tasks using criteria or protocols to guide decision making. It is possible that some of these models began in a collaborative

fashion to develop the processes to achieve their desired outcomes, then transformed into very focused, task-related, discipline specific responsibilities to achieve their outcomes.

The social services model of case management typically falls into this category where the focus is on long-term community care services in an effort to avoid hospitalization (Liebman-Cohen, 1990; Merrill, 1985). However, the CCM model that was developed for an ESRD patient population relied extensively on the skills of collaboration at all levels to achieve the desired outcomes. This collaboration seeks to achieve what Mindell (1989) calls "deep democracy," where all voices are listened to and valued. This was most readily observed during the model development, but remains an implicit part of day-to-day decision making, unlike the task oriented functions related to the care and services provided to patients. To illustrate, a task such as phlebotomy for laboratory testing may not appear to require "collaboration" to perform, most likely this is a protocol driven function defined in model development. However, the decision to arrange for home care after discharge from the hospital may be determined through discussions during weekly interdisciplinary discharge planning rounds, an example of ongoing collaborative efforts among team members. Because of this emphasis on interdisciplinary decision making within the case management model developed for the ESRD patient population, the term "collaborative" has been incorporated into the title of the model –Collaborative Case Management.

Siegler and Whitney (1994) state effective collaborative practices must fulfill three criteria:

1) They must be composed of skilled individuals with differing areas of expertise who can work together in a fluid, reciprocal fashion.

2) Team members must be both assertive and cooperative.

3) The team must provide a kind of care whose uniqueness results from the combination of perspectives and skills offered by each member of the team. (p.8)

The American Nurses' Association (1980) describes collaboration as a:

...true partnership, in which the power on both sides is valued by both, with recognition and acceptance of separate and combined spheres of activity and responsibility mutual safeguarding of the legitimate interests of each party, and a commonality of goals that is recognized by both parties. (p.7)

This characterization suggests that collaboration can be analyzed and assessed through four overlapping indicators: 1) power-control; 2) practice spheres; 3) mutual concerns; and 4) common goals.

Few investigators have undertaken the task to evaluate the effectiveness of collaborative practice. There is lack of agreement, not on the potential value of collaborative relationships but about the substance of the behaviors required to produce them and the beneficial outcomes that they can expect. However, collaboration research, although complex, is possible (Giardino & Jones, 1994).

Even though collaboration between nurse and physician is difficult both to practice and study, there are valid and reliable instruments that have been developed to evaluate its components. The measurement of each collaborative component presents its own unique challenges, and to date, researchers have analyzed power-control and mutual interests most frequently. These challenges include those related to direct observation and self-report methods, medical-legal issues concerning patient confidentiality, and the difficulty

of investigating nurse-physician collaboration in those where the professional relationship is strained (Giardino & Jones, 1994).

Patient-specific outcomes particularly relevant to the study of collaboration include functional status, family functioning, and improved medical control of specific chronic disease states (Schmitt, Farrell, & Heinemann, 1988; Ware & Sherbourne, 1992). A more population based approach to collaborative practice interventions might assess variables that are generic across the continuum of care, such as LOS at different levels of care, cost per day, or number of transfers within the hospital (Ellwood, 1988).

One can measure nurse, physician, and patient satisfaction as a subjective outcome variable used when evaluating the collaborative process. Although researchers have explored many aspects of patient satisfaction with health care, these dimensions seem to be most important in assessing satisfaction as an outcome of collaborative practice: 1) interpersonal relationships; 2) art and technique of care; and 3) education of the patient. Investigators should consider including these dimensions in any outcome measure of patient satisfaction when attempting to evaluate the collaborative process (Giradino & Jones, 1994).

Siegler, Whitney, and Schmitt (1994) caution that in designing a study to measure outcomes of collaboration, the investigator must carefully choose the collaborative structure, patient population, methodology, and outcomes. Sources of bias must be identified and demonstration that collaboration is responsible for the measured outcomes must be attempted.

Continuity of Care

Shortell (1976) defines continuity as follows:

> ...the extent to which medical care services are received as a coordinated and uninterrupted succession of events consistent with the medical care needs of patients. (p.378)

The above definition implies the following characteristics of continuity of care:

1) A consistent provider is seen on the first and subsequent visits.

2) Broken appointments are minimized.

3) Duplication of care/treatment is minimized.

4) Appropriate follow-up care is maximized.

5) Single location delivery of medical care.

Using the above traits as a guide, Shortell (1976) operationalized the concept of continuity with two indicators. The first measure proposed is the number of different sources of care seen by an individual for a given episode of illness consistent with quality of care standards for that episode. The assumption is that for a given illness, the fewer the number of sources of care a patient sees, the greater the likelihood that that individual will experience continuity of care. The second measure conceptually related to the traits is the means by which patients come into contact with their primary provider of care. The referral from a physician is believed to result in greater continuity of care than self-referral or referral from relatives, friends, or institutions. A lack of continuity of care among various practitioners for individual renal patients was cited as an issue of concern by the 1991 Institute of Medicine study committee (Rettig & Levinsky, 1991).

In 1980 Manthey described continuity of care as nursing care delivered in an acute care setting that uses one care planner from admission to discharge and a minimum number of care givers. With the notion of the continuum of care having a greater

presence in the 1990s, the importance of the continuity within and across environments of care can not be overlooked.

Primary, Secondary, and Tertiary Prevention Interventions Traditionally in health care, prevention meant inhibiting the development of disease or injury before it occurs (Ignatavicius, 1995). Matzen (1993) defines three levels of prevention:

> •Primary prevention: The prevention of the occurrence of a disease, condition, or injury. Example: the use of polio or measles vaccine; the control of pollution or exposures that would result in morbidity.
>
> •Secondary prevention: The early detection of the potential for the development of a disease or condition or the existence of a disease while asymptomatic to allow positive interference to prevent, postpone, or attenuate the symptomatic clinical state. Example: the prophylactic use of INH in tuberculosis in a person recently converted to a tuberculin-positive state.
>
> •Tertiary prevention: The treatment of an existing symptomatic disease process or condition to ameliorate its effects, delay or prevent its progress, and prevent complications of the underlying process. Example: the close control of diabetes to prevent its complications. (p. 5)

However, in chronic illness a broader definition would include thinking about prevention of dysfunction or disability due to a disease process, rather than prevention of the disease itself. Prevention in chronic illness focuses on treatment and rehabilitation of individuals who are disabled and have decreased levels of functioning. Therefore interventions need to be targeted at what is causing the disability and dysfunctioning and

can be considered using the three levels of prevention: primary, secondary, and tertiary (Macnee & Goeppinger, 1993).

To identify activities that link early intervention, acute care, and community-based services in a chronic patient population it is helpful to consider the World Health Organization's (WHO) classification of impairments, disabilities, and handicaps. Four progressive stages of disease consequences are described starting with the disease itself and progressing to impairment, disability, and handicap. Traditional levels of prevention for each stage are shown in Figure 1 (Macnee & Goeppinger, 1993).

The third and fourth stages of disease consequences identify the areas for prevention that are unique to people with chronic disease. Whereas traditional tertiary prevention is targeted at preventing disabilities, as well as promoting recovery from illness or injury, it is more helpful to think about prevention for individuals with chronic disease as prevention of progression from one stage of disease consequences to another (Figure 2). Thus, primary and secondary prevention for individuals with chronic disease is directed at keeping impairments from becoming disabilities and targeting early changes in function secondary to impairments so that they may be impacted. Tertiary prevention is aimed at keeping disabilities from becoming handicaps (Macnee & Goeppinger, 1993).

In chronic disease, primary prevention interventions include clinical therapies, as well as patient/family teaching and counseling in efforts to slow the disease progression, and to halt or limit complications and co-morbidities. Secondary interventions involve the implementation of specific treatment protocols, medications, and nutritional support, as well as the acquisition of appropriate services to sustain the patient's functional status

The World Health Organization's Classification of Impairments, Disabilities, and Handicaps

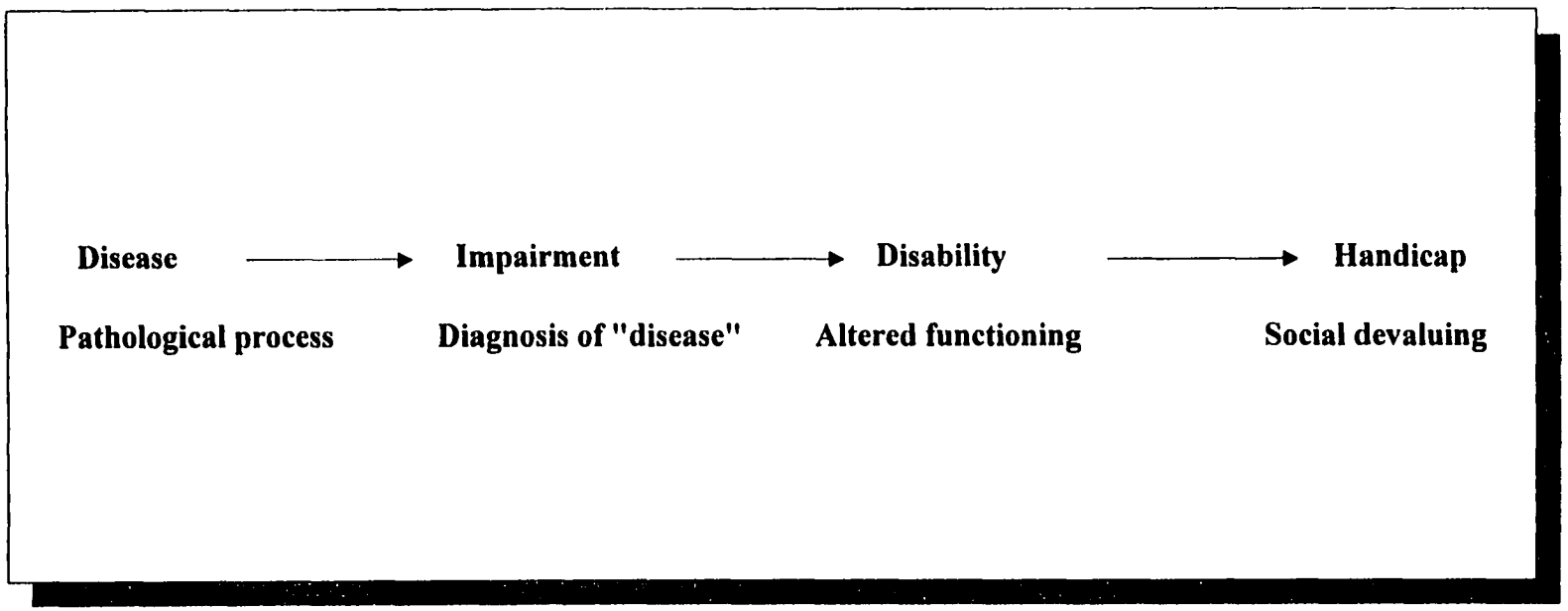


Figure 1.

The World Health Organization's Classification of Impairments, Disabilities, and Handicaps

(Macnee & Goeppinger, 1993, p. 65)

Points for Prevention in the WHO Classification of Stages of Impairments, Disability, Handicaps

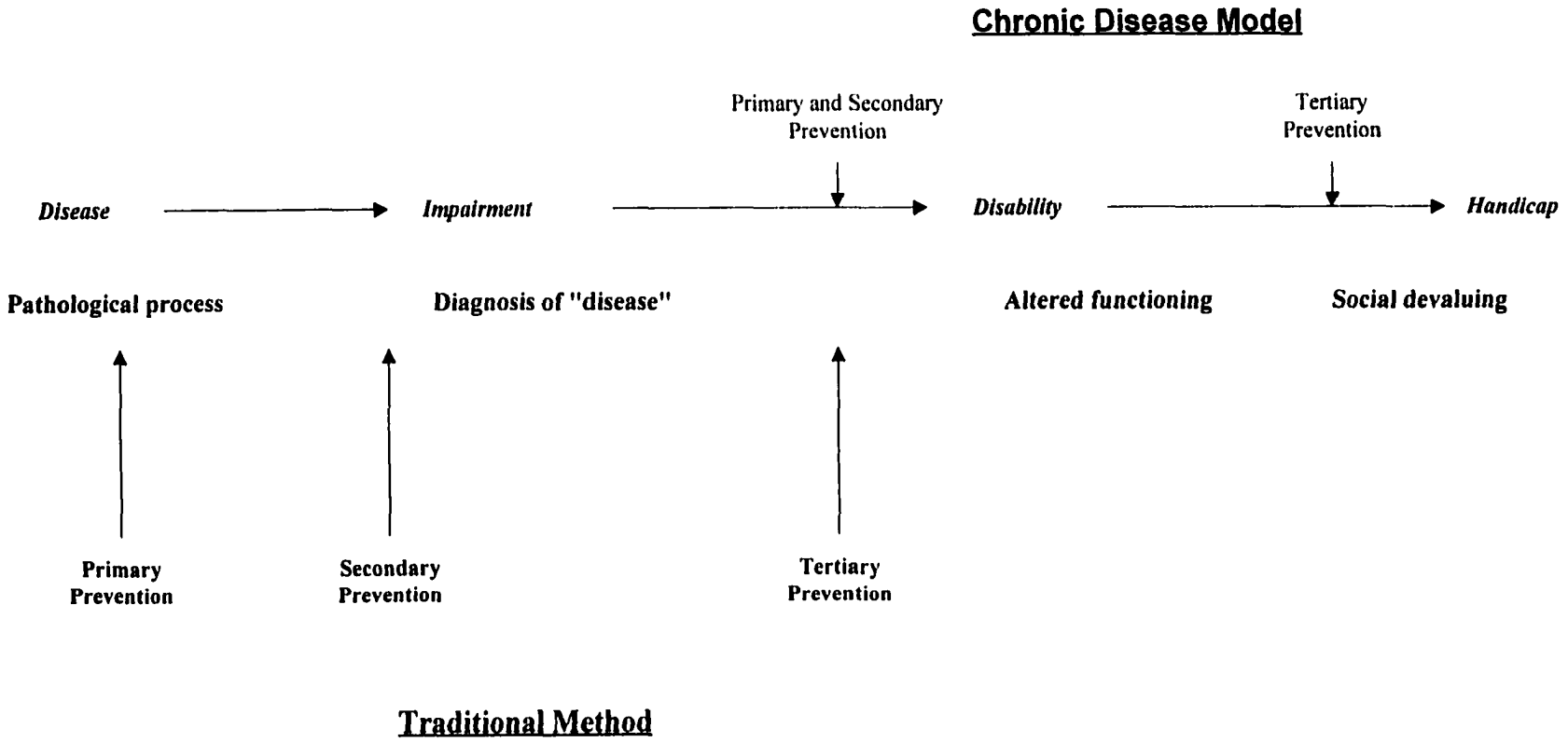


Figure 2.

Points for Prevention in the WHO Classification of Stages of Impairments, Disability, Handicaps (Macnee & Goeppinger, 1993, p. 66)

through various and often recurrent illness episodes. Tertiary interventions would include interventions aimed at preventing movement from impairment to disability stages within the WHO classification and therefore represent a form of primary and secondary prevention. These interventions include life style changes and social support programs that often involve the family as well as the community (Macnee & Goeppinger, 1993).

In an interdisciplinary case management model each level of intervention may be performed by a number of caregivers with overlapping roles and functions while others are specifically designated to a single practitioner. For example, patient teaching is everyone's responsibility, whereas the clinical decision to continue or discontinue therapy belongs to the physician member of the team.

Summary

Development of a cumulative body of scientific knowledge on case management has been limited by conceptual and methodological issues. These issues include: absence of a theoretical framework; the omission of operational definitions of case management; lack of clear specification and measurement of sample selection criteria; the frequent use of weak pre-post designs; and the use of unstandardized instruments (Chamberlain & Rapp, 1991; Kemper, et al., 1987; Lamb, 1992; 1994; 1995; Weissert, 1988).

Regardless of the model, the discipline or the setting, case management is both patient/client centered and health care system centered. It serves to assist those who have been identified as needing services across the continuum of health care to access necessary resources in a time efficient manner. The key concepts of any case management patient/family care delivery system are: communication, coordination, collaboration, and continuity of care, and specific patient interventions. These interventions include primary,

secondary, and tertiary prevention activities. This patient care delivery approach is believed to support achievement of patient care outcomes while simultaneously working toward economic and efficient lengths of stay and proper allocation of resources throughout their health encounter (Newell, 1996; Stetler & Dezell, 1987), but has never been empirically determined.

In efforts to more clearly understand the phenomenon of case management, five interrelated key concepts have been identified: communication, coordination, collaboration, continuity of care, and primary, secondary, and tertiary prevention interventions. This process has been both beneficial and problematic. Beneficial in a sense that exploration of the notion of case management as a patient care intervention through the definition and measuring of its key concepts is a step in the systematic process of understanding the phenomenon and expanding its knowledge base. Problematic from the position that these key concepts are why case management remains a scientific enigma. These concepts are difficult to define, and behaviors required to produce expected outcomes are not easily identified or measured. However, there is a body of literature that presents systematically the exploration of these concepts that can be useful in studying of case management.

In the next chapter a conceptual framework for a Collaborative Case Management model with an end stage renal disease patient population will be presented. It is proposed that the structure and process of the model will have a positive impact on patient and health system outcomes.

CHAPTER III

CONCEPTUAL FRAMEWORK

This chapter proposes a conceptual framework for a Collaborative Case Management model (CCM) with an end stage renal disease (ESRD) patient population. Renal disease is a progressive, continuous process that requires a continuum of care. Each case of renal disease progresses in a different manner; each patient and family have to experience the disease process in their own way (Michigan Public Health Institute, 1995). An interdisciplinary team of health care professionals with expertise in renal disease is required to meet the multiple needs of these chronically ill patients. Nurses, with their strong preparation in health promotion and their focus on the individual within the context of the family, can enhance the patient's strengths and capabilities as well as maximize the family role in care (Smith & Hoffart, 1996).

The conceptual framework for the CCM model believed to provide a template of suggested actions for patients, families and health care practitioners working together to manage ESRD is shown in Figure 3. Using a structure, process, and outcome approach, the CCM model can be viewed across the continuum of care as an integrative function of the patient experience. The patient experience is defined as the care an individual receives at each level of intensity of care, dialysis center, emergency department, hospital, or at home over time.

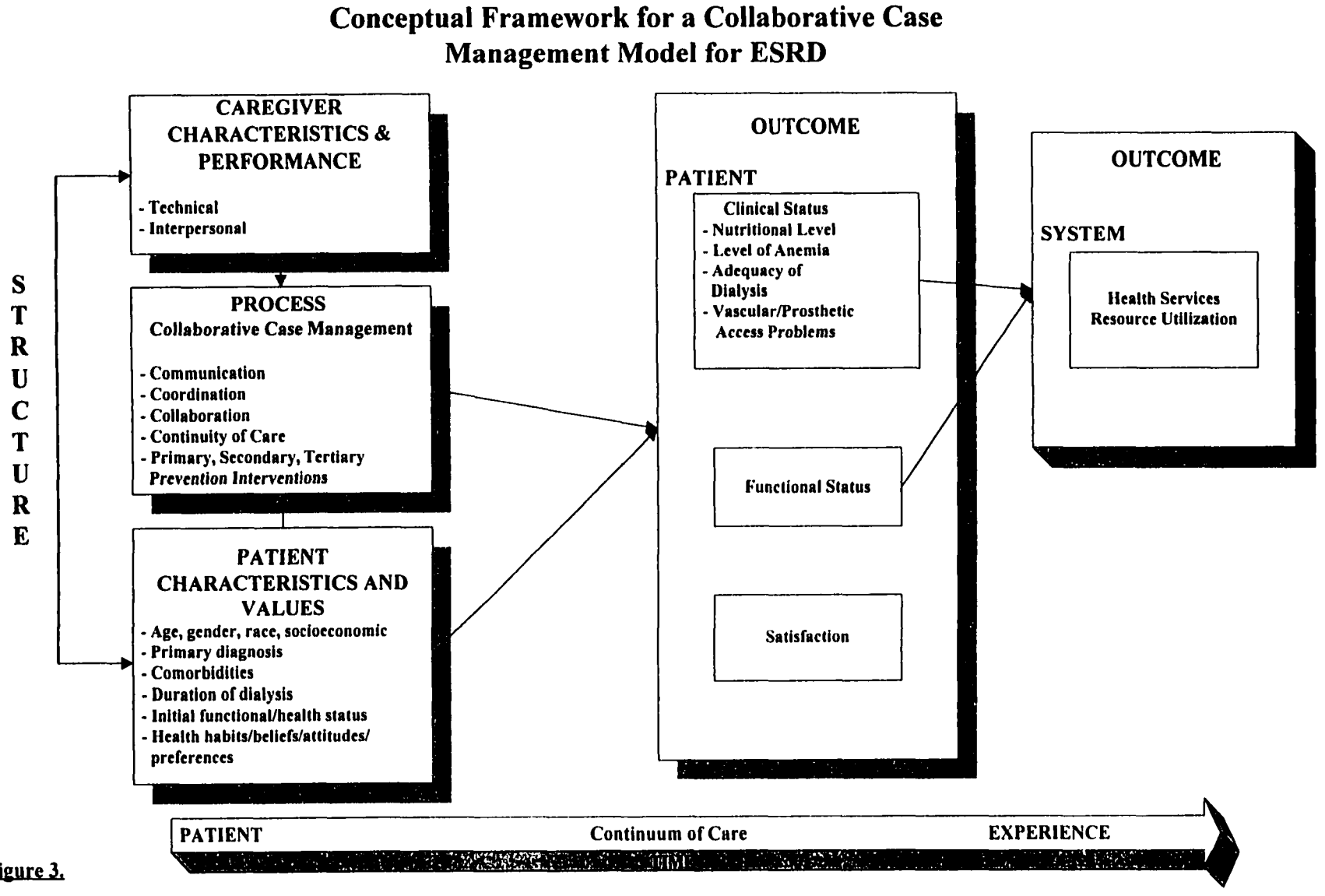


Figure 3.

Conceptual Framework for a Collaborative Case Management for ESRD

A Conceptual Framework for A Collaborative Case Management Model

The CCM model espouses an interdisciplinary, interprofessional approach to delivery of care. The goals of the program include those outlined by the American Nurses' Association (1988): the provision of quality health care, decreased fragmentation of care across many settings, enhancement of the patient's quality of life, and cost containment. The global definition of case management inherent in the CCM model is: a model of care delivery encompassing 1) health assessment; 2) planning; 3) service procurement, delivery, coordination; 4) monitoring to meet the multiple service needs of patients. Case management is being used in this high-risk, high-cost patient population to assess opportunities to coordinate care, choose treatment options, develop treatment plans to improve quality and efficiency, control costs, and manage the patient's care to ensure maximum outcomes (Desimone, 1988).

Case management is believed to be an important aspect of a fully integrated, comprehensive, multidisciplinary continuum of services for an ESRD patient population. Case managers who follow patients through some or all settings in which ESRD patients receive care, and coordinate care for acute, chronic, clinical, and social needs of patients is the pivotal role within the model (HCFA, 1996). The model of case management for the proposed study is defined as follows:

> A care delivery system for ESRD patients that uses a renal CNS as case manager of an interdisciplinary team. Through the processes of communication, coordination, collaboration, continuity of care, and primary, secondary, and tertiary prevention interventions the team provides care and services for patients to include the basic functions of initial screening, assessment, care planning, patient

education, counseling, service provision and/or referral, monitoring, and reassessment as guided by clinical protocols.

The CCM model is believed to be an approach to quality, as well as efficient, health care delivery for ESRD patients. To describe the components of the CCM model and their relationships, a brief review of Donabedian's (1988) threefold approach to the assessment of quality is helpful. Each element in Donabedian's classification focuses on a separate, yet overlapping approach to studying the assessment of quality of health care. The purpose of the assessment is to pass judgment on the quality of care itself, regardless of whether the care was offered by practitioners or institutions, implemented by patients, or used by the community. Hence, a judgment can be made directly by examining the attributes of care itself (process) or indirectly by examining the characteristics of the environments in which the care is provided (structure) and the effects of care on the health and welfare of the individuals or populations of interest (outcomes).

According to Donabedian (1988):

> Three approaches to the assessment of quality are possible because, and only because, specified structural characteristics increase the probability of providing specified kinds of care, and because specified properties of the process of care improve the probability of obtaining specified changes in the health and well-being of individuals and populations. All assessments of quality are based, therefore, on hypotheses concerning the interrelationship among structure, process, and outcome; the assessments are valid only to the extent the hypotheses are verifiable. (p. 177)

Using Donabedian's approach as a guide, the CCM model can be examined from a structure, process, and outcome perspective.

Structure

Structure provides the "environment" in which the CCM model functions that focuses on the qualifications, certification, and similar attributes of the resources used in providing care (Wyszewianski, 1988). The structural components of CCM model that are believed to bear a relationship to the processes and outcomes of care in an ESRD patient population include caregiver characteristics and performance, and patient characteristics and values.

Caregiver Characteristics and Performance. Case management as the independent variable in the CCM model, is viewed as a nursing intervention with strong participation and support from the medical staff as well as allied health professionals. Therefore, the two primary practitioners in the CCM model are the nurse and the physician. Allied health care practitioners, based on their qualifications and skills have an important but lesser role in the model and include social workers, dieticians, pharmacists, and physician assistants.

In the proposed conceptual framework, case management is viewed as a nursing intervention, therefore the role of nursing, specifically that of the clinical nurse specialist (CNS), will be discussed in detail. These interventions can be examined within the primary, secondary, and tertiary levels of prevention for chronic illness within the CCM model. Areas of clinical decision making, monitoring and reassessment, patient/family teaching and counseling in addition to issues related to mastery, self-care, caring, and cognition are among these interventions (Lamb & Stempel, 1994).

The educational preparation of the CNS in areas of health promotion, disease prevention, and the focus of the individual in the context of the family render this practitioner the most qualified person to serve in the role as "case manager." The beneficial effects of CNS interventions on patient outcomes with a variety of patient populations is well documented. Pozen and colleagues (1977) found an increase in the number of experimental subjects that returned to work following myocardial infarction (MI) when a CNS supplemented the routine nursing and medical care provided to hospitalized patients. Burgess et al. (1987) also studied cardiac patients and found reduced stress levels in experimental subjects three months following an MI when psychosocial rehabilitation was provided by a CNS.

McCorkle and others (1989) studied lung cancer patients and the impact of the CNS on patient outcomes. Less symptom distress, greater independence and fewer hospital admissions for symptoms and complications associated with the malignancy were found in patients who received home care from an oncological CNS than those who received no home care, or home care from a home health care nurse.

The effectiveness of a comprehensive discharge planning protocol implemented by a gerontological CNS for hospitalized elderly was examined by Neidlinger, Scroggins, and Kennedy (1987). Findings included reduced LOS, and increased average time between hospital discharge and readmission for the experimental group.

Naylor and colleagues (1994) also examined the effects of comprehensive discharge planning on elderly cardiac patients and their primary caregivers as coordinated by a gerontological CNS. The intervention consisted of hospital visits at least every 48 hours during hospitalization, availability of CNS by telephone during hospitalization and

for two weeks after discharge. In addition, the CNSs initiated at least two telephone contacts to patients and their caregivers during the first two weeks after discharge. During the first six weeks post-discharge outcomes from the intervention group included fewer readmissions, fewer total days rehospitalized, lower readmission charges, and lower total charges for health care services.

Lipman (1986) found that newly diagnosed diabetic children who received education by a CNS in addition to staff nurses, were discharged earlier from the hospital than those taught only by staff nurses. In another study of pediatric patients, Alexander, Younger, Cohen, and Crawford (1988) demonstrated that the involvement of a CNS resulted in a significant increase in the knowledge base of asthmatic children and their families, and decrease in emergency room visits for the experimental group compared to the control group.

In a well known study of very low birthweight (VLBW) infants Brooten et al. (1986) demonstrated that the involvement of a CNS in an early discharge group resulted in significant outcomes. The experimental group were provided with instruction, counseling, home visits, and daily on-call availability of a hospital-based perinatal CNS. Findings included a decrease in LOS with infants that weighed 200 grams less, and were two weeks younger than those in the control group. These outcomes were achieved with no significant differences in the number of rehospitalizations, acute care visits, or growth and developmental outcomes between the two groups.

In a subsequent investigation, Brooten et al. (1988) used the same model to study three high risk, high volume, high-cost groups of women: unplanned cesarean births; pregnant diabetics; and post hysterectomy patients. Improved outcomes were found

including reduced rehospitalizations, increased patient satisfaction, increased infant immunizations, and health care cost reductions up to 38 percent.

Although no studies were found in the literature that assessed the impact of case management on patient outcomes with ESRD, findings from the above studies lend support to the notion that nursing can play a major role in the care of these patients. A masters prepared CNS with experience in nephrology nursing has the knowledge and skills necessary to monitor, and intervene to prevent the occurrence of some of the most common causes of hospitalization for ESRD patients. Targeted aggressive proactive care is likely to prevent many of the complications associated with nutritional status, anemia, vascular access, and fluid and electrolyte imbalances.

For example, conditions such as hypertension and diabetes are common among the ESRD population, and these conditions lend themselves to a variety of nursing interventions in terms of health education and promotion, and support groups. Having individuals better educated for self-management of these diseases can lead to fewer strokes, hospitalizations, and vascular complications such as amputations among the ESRD population. Benefits include: group counseling sessions for stress reduction and other methods designed to control hypertension; health education classes in nutrition specifically for the control of diabetes; classes or post-hospitalization home visits to teach diabetics proper foot care; and classes to improve patient understanding and compliance with treatment protocols (HCFA, 1996).

Although much of the research on the efforts of advanced practiced nurses has demonstrated differences in patient outcomes, Brooten and Naylor (1995) pose a set of challenging questions:

- Were they the right outcomes?
- Could these studies have demonstrated greater effects if other outcomes were studied?
- What outcomes should be measured?
- What nurse dose, that is, what nurse intervention in what amount is needed to show an effect?
- What nurse dose is needed in a given health care environment to show an effect?
- What nurse dose works for which patient group? (p. 97)

Some authors have tried to answer these questions. In Lang and Marek's (1992) review of patient outcomes, many categories of outcome measures that reflect the contributions of nursing practice were indicated. The general categories include: physiological status, psychological status, functional status, behavior, knowledge, symptom control, quality of life, home functions, family strain, goal attainment, utilization of service, safety, resolution of nursing problems, patient satisfaction, and caring. Brooten and Naylor (1995) add to this list cost of health services utilization.

However, the questions above remain largely unanswered in terms of whether these "nurse sensitive patient outcomes" are sensitive enough measures to capture the effect of nursing actions and whether they are sensitive to nursing alone. As nursing scholars continue to search for these answers, the reality that nurses do not care for patients in isolation and patients do not exist in isolation must be considered. While nursing practice may be more influential in a given context or environment, in other

settings, these same nurse sensitive outcomes may be influenced more by other disciplines or by family dynamics (Brooten & Nalyor, 1995).

Although the pivotal role in the CCM model is the clinical nurse specialist with the designated title of "case manager," the process of care management does not involve a single individual. Nurses, physicians, social workers, dieticians, pharmacists, and physician assistants as well as family members are involved in the case management process. For example, assessment may require both clinical and social interventions since the needs of the patient may involve legal/financial assistance as much as health care and services. Similar combined efforts may be required for other steps in the case management process (Merrill, 1985).

The role of the physician in the CCM model is essential. The nephrologist on the team is the most qualified practitioner to provide the medical direction for the care of the ESRD patient across the continuum. Many physicians would argue as "captain of the ship" they are the true "case manager." In most practice environments, the physician by law, regulatory standards, and reimbursement requirements continues to be the ultimate accountable practitioner for the health care of the patient. However, as physicians work within a case management structure with a chronic patient population across multiple settings, they begin to understand that the nurse case manager's role is different from the physician's role as a case manager (Cohen, 1996).

Although physicians are obviously concerned about the quality of care and meeting the medical needs of their patients, they have historically not been focused on assuring financial viability of the health care system. Once convinced that an interdisciplinary case management team that is coordinated by a nurse can improve quality of care and benefit

patients, physicians are less likely to object to the nurse assuming the case manager role (Cohen, 1996).

Other team members of the CCM model with ESRD patients include social workers, dieticians, pharmacists, and physician assistants. To meet the multiple needs of a chronic patient population, practitioners from various fields must pool their expertise to comprehensively provide the best care and service for the patients they serve (Del Togno-Armanasco et al., 1993). For example, social workers assist with legal and financial issues; dieticians with proper nutritional planning and counseling that is extremely important in this compromised population; and pharmacists are helpful in advising the staff and patients in the most beneficial and cost effective drug therapy appropriate for any given patient. Physician assistants are used in environments that do not have adequate support from residency programs. In some settings, nurse practitioners are used in this "house staff" supplemental status.

Support staff to the CCM team includes staff registered nurses, renal technicians, nursing assistants, and clerical personnel. Members that may be transitional to the process would include medical, nursing, and allied health students. Medical residents may be seen as full members of the team or transitional depending on their speciality focus.

According to Donabedian (1988), when the performance of practitioners is examined it is customary to distinguish two components in care: technical care and the management of the interpersonal process. In the above discussion of caregiver characteristics, that of the nurse, physician, and others, the technical component of care is captured in the qualifications, certifications, and competencies of the personnel. The interpersonal component refers to how responsive and attentive the caregiver is in

interacting with the patient (Wyszewianski, 1988). In assessing the effectiveness of the CCM model it seems appropriate to examine the interpersonal component of care in reference to, not only how the caregiver interacts with the patient, but how the caregiver interacts with the interdisciplinary, interprofessional team members.

Although effective interpersonal skills are required of all team members, the CNS as the pivotal, coordinating role must possess these skills at a high level if the goals of the CCM model are to be achieved. Several authors have extolled the "ideal" characteristics of the nurse case manager to include: a team player; ability to work with others; adaptability, flexibility, and creativity; and strong communication skills to name a few (Cohen, 1996; Del Togno-Armanasco et al., 1993; Powell, 1996). It is for these reasons that the interpersonal, as well as the technical aspects of care comprise the structural components of the CCM model.

The notion that "caregiver interaction" can have an impact on the performance in ICUs was studied extensively by Zimmerman (1989), Zimmerman et al. (1993), Shortell et al. (1991), Shortell et al. (1992), and Shortell et al. (1994). They found that "caregiver interaction" as measured by culture, leadership, communication, coordination, and problem solving abilities of unit members, was associated with greater efficiency of utilization, as measured by lower risk-adjusted LOS, and with higher perceived technical quality of care. This supports the importance of culture, in this case team culture to the CCM model. Smircich (1985) describes culture as:

> ...an attribute or quality internal to a group....a fairly stable set of taken-for-granted assumptions, shared beliefs, meanings, and values that form a kind of backdrop for action. (p. 58)

Culture so defined may be viewed in relation to the CCM model as an external independent or confounding variable that may affect the team, or as an internal variable that characterizes the values or style of the team. In the proposed conceptual framework, team culture is viewed as an internal variable, a means to internalize control; an informal structure that relies on individual members embracing common norms and values that orient and govern their contribution to the goals and objectives (Scott, 1992) of the CCM team. Culture in the CCM model is comprised of the structural components of the caregiver characteristics and performance that focuses on the interpersonal aspects in care and has a relationship to the processes and outcomes of the CCM model.

Patient Characteristics and Values. The second structural component in the CCM model is characteristics and values of the patient. These variables include: age; gender; race; socioeconomic status; primary diagnosis; co-morbidities; duration of dialysis; initial functional and health status; health habits and beliefs, attitudes about the health care system and health care providers; and preferences for life in general (Burrows-Hudson, 1995). These variables are defined as follows:

- primary diagnosis: the identified initial disease process resulting in ESRD;
- co-morbidity: a diagnosis present before hospitalization which is thought to extend the hospital stay at least one day for about 75 percent or more of the patients with a given principal diagnosis, i.e. diabetes mellitus (DM), tuberculosis (TB), acquired immunodeficiency syndrome (AIDS), human immunodeficiency virus (HIV), or others (Slee, Slee & Schmidt, 1996, p. 387);
- duration of dialysis: period of time from the onset of hemodialysis until initial data collection;

- initial functional and health status: the level of functioning and health of the patient at the time of initial data collection.

Information on most of these variables is captured in the case-mix severity or index used to assess reimbursement levels in acute care facilities (Slee, Slee, & Schmidt, 1996).

Data on some of these variables are easily obtained from patient interviews or the medical record, however the variables related to values and habits is not as accessible. The role of the patient's point of view in monitoring health care outcomes has been among the most important health care developments in the past 14 years. The goal of health care for most patients today is to obtain a more "effective" life (McDermott, 1981) and to maintain functioning and well-being (Cluff, 1981; Ellwood, 1988; Schroeder, 1987; Tarlov, 1983). According to McDermott, the best method to determine if these goals have been met is to collect patient data to assess health status.

One of the more recent surveys that has emerged from the Medical Outcomes Study (MOS) is the short-form survey (SF-36) (Ware & Sherbourne, 1992). The SF-36 includes one multi-item scale measuring each of eight health concepts that have been identified as reliable and valid measures of health status and changes in health over time. These concepts include: physical functioning; role limitations due to physical problems; social functioning; bodily pain; general mental health; role limitations due to emotional problems; vitality; and general health perceptions. Higher scores indicate a higher perception of health status on any given concept.

The patient is no longer a passive player in the health care system. The patient, as a consumer, not only requires care but can influence its delivery and its outcomes. Because the patient perspective has taken on greater importance in the health services literature, it

seems appropriate to include patient characteristics and values as described in the health concepts in the SF-36 as a part of the structure of the CCM model. To assess the effectiveness of the CCM model and to achieve the goals of health care as perceived by the patient, the patient's characteristics and values must be considered in the supporting structure of the CCM model as a resource in the provision of care.

It is believed that the CCM model structure described above provides an environment that supports the process of interdisciplinary case management as operationalized through communication, coordination, collaboration, continuity of care, and primary, secondary, and tertiary prevention interventions. It is also believed that this structure has, both a direct and indirect impact on patient and health care system outcomes.

Process

The process components, or key concepts of The CCM model, are communication, coordination, collaboration, continuity of care, and primary, secondary, and tertiary prevention interventions. These processes are responsible for "how" the work of the interdisciplinary team is accomplished.

As noted above, the beneficial effects of the CNS role in nursing interventions can have an impact with a variety of patient populations (Alexander et al., 1988; Brooten et al., 1986; Burgess et al., 1987; Lipman, 1986; McCorkle et al., 1989; Naylor et al., 1994; Neidlinger et al., 1987; Pozen, 1977;). From this review, it is concluded that a masters prepared CNS with experience in nephrology nursing has the knowledge and skills necessary to monitor, and intervene to prevent the occurrence of some of the most common causes of hospitalization for ESRD patients. Targeted aggressive proactive care

is likely to prevent many of the complications associated with nutritional status, anemia, vascular access, and fluid and electrolyte imbalances. In addition, intuitively, any program that reduces the number and severity of complications in any patient population should result in lower utilization of health care resources.

To understand the phenomenon and expand the knowledge base regarding the notion of case management as a nursing intervention and the role of the CNS, these concepts must be operationally defined and measured. These are interrelated and overlapping concepts that make this task difficult. It is believed that this lack of precision is why the "how" of case management remains a scientific enigma. For the proposed conceptual framework the key concepts are defined as follows:

- Communication: the ability of each practitioner to effectively exchange information and receive feedback in the process of meeting the ESRD patient care needs across the continuum of care. It is proposed that communication can be measured by timeliness, accuracy, openness, understanding, and practitioner satisfaction (Shortell et al., 1991).
- Coordination: degree to which work activities are coordinated through interdisciplinary communication, planning, and decision-making to improve efficiency and effectiveness of patient outcomes (England, 1986; Gillies, 1989; Shortell et al., 1991). Coordination can be measured within interdisciplinary groups and between groups within the same patient care environment, and between patient care environments. It is proposed that coordination can be measured related to practitioner compliance with

written plans and schedules, treatment protocols, policies, and procedures, unit director's efforts and face-to-face interaction (Shortell et al., 1994).

- Collaboration: a reciprocal relationship wherein the practitioners assume the greatest responsibilities for patient care within the framework of their respective fields; emphasis is on joint responsibility in patient care management with a bilateral process of decision making based on each practitioner's education and ability (Shortridge et al., 1986). Collaboration within the CCM model for an ESRD patient population is defined as a partnership among practitioners to meet patient needs across the continuum of care. It is proposed that collaboration among practitioners can be measured by the degree of power sharing/mutual power control; differences in responsibilities for practice spheres or roles; and each individual's degree of assertiveness and cooperativeness; and degree to which there is agreement on common patient goals (Giardino & Jones, 1994).
- Continuity of Care: the integration over time of practitioner and patient information and actions directed toward furthering the physical and psychosocial rehabilitation of the patient (Davis, 1980). Continuity of care is the process of health care delivery that minimizes the amount of variation in an uninterrupted succession of events consistent with the health care needs of the patient and characterized by a minimum number of careplanners and givers (Manthey, 1980; Shortell, 1976). Continuity of care in an ESRD patient population is proposed to be measured by the

number and kind of practitioners a patient sees for an episode of illness, and the number and duration of gaps in visits to the primary practitioner.

- Primary, Secondary, and Tertiary Prevention Interventions: those interventions that are targeted to slow the progression from one stage of disease consequences to another and to halt or limit complications and co-morbidities in an ESRD patient population (Macnee & Goeppinger, 1993). The impact of these interventions can be measured by the patient's response to their application.

Specific primary, secondary, and tertiary prevention interventions for ESRD patients that are considered "nursing" would include:

- primary: monitoring for adequacy of clinical therapies including nutritional intake, medication regime, and dialysis; patient/family teaching and counseling related to clinical therapies, health promotion, mastery (stress reduction and effective coping), self-care, caring, and cognition.
- secondary: implementation of specific treatment protocols, nutritional support, and medications, as well as the acquisition of appropriate services to sustain patient's functional status through various and often recurrent illness episodes.
- tertiary: interventions aimed at preventing movement from disability to handicap and often require intervention at the level of the family and /or community such as reorganizing the household to prevent the need to climb stairs for certain functions -toileting, bathing, sleeping, or laundry; and organizing support groups and increasing public awareness of renal

disease and its consequences are examples of community efforts (Macnee & Goeppinger, 1993).

Through these targeted aggressive proactive nursing interventions, it is believed that the progression from one stage of disease consequences to another in ESRD can be slowed and the development of complications and co-morbidities halted or limited.

As health care continues to move out of the illness model, from an institutional complex of structured care services to a predominantly community-health-prescribed set of services, expectations of the health care team will change. With clinical protocols and pathways becoming the framework for service delivery and outcome evaluation, the ambiguity of "process" of care is no longer acceptable. If process is not specifically tied to outcome and the relationship is not viable, the process must be changed until it achieves the expected outcome of both provider and consumer (Cohen, 1996). It is believed that the above processes are interrelated to both the structure and outcomes components of the conceptual framework of the CCM model.

Outcomes

Although chronic dialysis and renal transplantation are miracles of medical science and technology, medical effectiveness is increasingly viewed from multiple perspectives that include more than patient survival rates and clinical outcomes. Functional status and satisfaction, along with treatment costs, also are determinants of the effectiveness of care (Lohr, 1989; Lohr, 1992). For this reason quality and costs outcomes viewed from both a patient and health care system perspective are proposed outcomes of the CCM model. Quality outcomes include patient clinical status as measured by nutritional status, level of

anemia, and adequacy of dialysis; patient functional status and satisfaction. The only system outcome proposed is health services resource utilization as an indicator for cost.

A synthesis of the existing literature on case management, the keys concepts of communication, coordination, collaboration, continuity of care, and specific prevention interventions, and the impact of the clinical nurse specialist role on patient and system outcomes, is believed to comprise the template or the conceptual framework of the CCM model. Although this is a collaborative model, the focus of the framework is on case management as a nursing intervention with a renal CNS serving as the case manager. For this reason, outcome variables identified to be influenced by the structure (indirectly) and the process (directly) components have been selected to assess the impact of nursing interventions within the CCM model for an ESRD patient population. Because of the overlapping functions encased in an interdisciplinary model, the measurement of those outcomes that are considered "nurse sensitive" presents a design challenge.

Active management of problems associated with ESRD patients could potentially improve the quality of care and reduce health services utilization through targeted primary, secondary, and tertiary prevention activities. Examples of specific prevention interventions that the CNS can provide to ESRD patients have been previously discussed and include in a broad sense: patient/family teaching related to health promotion and care; patient/family counseling; proactive early assessment of signs and symptoms to minimize unplanned treatments and procedures; and implementation of protocols to prevent further complications. These nursing interventions can be effective in impacting both patient and system outcomes (Berkoben & Schwab, 1995; Smith & Hoffart, 1996).

The outcome measures of the CCM model in an ESRD patient population are believed to be both patient and health care system focused and include: clinical status; functional status; patient satisfaction; and health services resource utilization. It is also believed that with a renal CNS as the case manager to guide the processes of communication, coordination, collaboration, continuity of care, and perform primary, secondary, and tertiary prevention interventions, these outcomes can be impacted in this patient population.

Clinical Status. Four clinical status outcome variables are proposed for the CCM model. They have been selected for their relevance to ESRD and are believed to be influenced by both the structure (directly and indirectly) and process (directly) of the CCM model. These clinical outcomes are believed to have a direct impact on the system outcome -health services resource utilization. In an effort to assess and improve care provided to ESRD patients, health care providers, patients, the ESRD networks, and HCFA have developed the ESRD Health Care Quality Improvement Program (HCQIP). Nutritional status, treatment for anemia, and adequacy of dialysis met the Institute of Medicine's (IOM) selection criteria for quality indicators in this population (McClellan et al., 1995). For this reason, these outcome variables were selected for the conceptual framework. Because of the complications associated with vascular/prosthetic hemodialysis access in ESRD (Berkoben & Schwab, 1995), and their response to prevention interventions, these have also been selected as outcome variables.

The deterioration of normal kidney function -excretion of the end products of metabolism, regulation of fluid balance, and endocrine function- effect the way nutrients are utilized and impact the ESRD patients' nutritional status. In ESRD, almost every

nutrient system is altered including: fluid-electrolyte balance, acid-base balance, carbohydrate metabolism, protein metabolism, including accumulation of nitrogenous waste products, lipids and lipoproteins. These may lead to gastrointestinal disturbances that may result in anorexia, nausea, vomiting, muscle wasting, malnutrition, decreased immune response, and poor rehabilitation (Michigan Public Health Institute, 1995).

Poor nutritional status is revealed in lower albumin levels caused by increased catabolism and reduced dietary protein intake (Bianchi, Mariani, Guiseppina, & Carmass, 1978). Protein malnutrition is mimicked when significant losses of amino acids are filtered into the dialysate (Rubini & Gordon, 1968) and the essential amino acid/non-essential amino acid ratio is reduced (Kopple, 1978). Malnutrition contributes to higher rates of complications and hospitalizations with infections and cardiovascular problems leading to higher costs. Malnutrition may also increase the risk of death in these patients (Michigan Public Health Institute, 1995).

The necessary nutritional therapies for these patients are individualized and complex and require innovative interventions by the renal team. Many nutrients need simultaneous management and may change with the progression of the disease or changes in ESRD therapy (Michigan Public Health Institute, 1995). This is sound rationale for the comprehensive treatment approach offered by an interdisciplinary renal team as described in the CCM model. Adequate nutritional status in ESRD can be measured by serum albumin levels, and body weight (Flanigan, Lim, & Redlin, 1995; McClellan & Soucie, 1994).

Nursing interventions to assure adequate nutritional status include patient and family teaching/counseling regarding management of the symptoms of gastrointestinal

problems and the prevention of complications of poor or inappropriate dietary intake. Monitoring laboratory results and body weight for changes and trends is also an important aspect of nursing care in ESRD (Crandall, 1989).

Patients with ESRD are typically anemic (Guthrie et al., 1993). The clinical signs and symptoms of anemia in chronic renal failure are similar to those seen in patients with other chronic conditions. The symptoms include fatigue, angina, and shortness of breath, generalized coldness, anorexia, insomnia, depression, and sexual disinterest and dysfunction (Levin, 1992). In addition, as the duration increases, cardiomegaly may develop, as well as impaired central nervous system function (Eschbach, 1989). According to Levin, these clinical manifestations may have a profound effect on quality of life in the patient with ESRD, effecting physical functioning, emotional well-being and social interactions.

Anemia is the primary hematologic abnormality found in patients with chronic renal failure. Most dialysis patients demonstrate a significant anemia with a hemoglobin concentration between 6-8g/dl (Van Stone, 1983) and a hematocrit of about 20 percent. The etiological factor of anemia in renal failure is the decreased production of erythropoietin, a hormone normally produced by the kidney that stimulates the production of red blood cells. Toxins present in the serum of these patients also inhibit erythropoiesis and accelerate red blood cell destruction. Blood loss is also a contributing factor to anemia in these patients. Excessive laboratory testing, bleeding from the gastrointestinal mucosa, and incidences occurring during dialysis such as leaks, rupture, or residual blood remaining in the dialyzer post-procedure can also contribute to anemia in ESRD (Ulrich, 1989). Treatment for anemia in ESRD includes repeated transfusions, and drug therapy

such as iron and folate supplements, androgens and epoetin (recombinant human erythropoietin), and nutritional therapy (Szromba, 1992). Anemia can be measured by monitoring the patients hemoglobin and hematocrit before, after, and during hemodialysis.

Nursing interventions for anemia include patient teaching/counseling to prevent complications that may result from the hematologic abnormalities occurring in renal failure. Specific areas to focus on include understanding and compliance with medications and diet; measures to prevent bleeding (use soft toothbrush, avoidance of vigorous nose-blowing, and avoidance of contact sports); the importance of rest and exercise in managing fatigue; and stress and coping techniques for persons with chronic illness. Nurses and others can work together to avoid excessive blood loss from unnecessary laboratory testing and from the dialysis procedure. One major aspect of nursing care for hematologic abnormalities is assuring adequate dialysis of the patient for the removal of uremic toxins (Szromba, 1992; Ulrich, 1989).

Hemodialysis is a life-saving treatment for more than 120,000 patients with ESRD in the United States. The efficient elimination of excess fluid and toxins produced from protein metabolism and other sources (uremic toxins) and the maintenance of homeostasis are primary functions of the kidney. The uremic syndrome, a life-threatening state results when these functions fail (Keen & Schulman, 1995). Evidence suggest that inadequately prescribed or delivered dosage of hemodialysis is associated with increased morbidity and mortality in patients with ESRD (Gotch, Yarian, & Keen, 1990; Hakim, 1990; Sargent, 1990). Coincidentally, increased levels of hemodialysis are associated with decreased mortality rates (Hakim, Breyer, Ismail, & Schulman, 1994; Parker et al., 1994).

The high mortality rates and international and regional differences in risk of death among ESRD patients in the United States may be attributed to differences in the amount of dialysis these patients received (Held et al., 1992). The high incidence of inadequate dialysis dosage in the United States ESRD program and the relationship between inadequate dialysis and increased mortality has been established by multi-center and United States Renal Data System (USRDS) studies (Parker, 1994; Parker et al., 1994). This analysis of aggregated national data and network-specific data indicates that variations across facilities in the process of care might be a contributing factor to this adverse outcome experienced by ESRD patients (Kusek, Agodoa, & Jones, 1993).

The amount of dialysis can be quantitated as urea clearance adjusted for patient size, fractional clearance or K/V multiplied by dialysis duration (t). Urea is used as a marker of dialyzer clearance because it is present in relatively high and easily measured concentrations in the serum, and it is easily dialyzed. Kt/V is indirectly measured with a predialysis and post dialysis blood urea nitrogen (BUN), C_o , and C respectively. Analysis of urea kinetics during hemodialysis show that Kt/V is primarily a function of the log ratio of C_o /C. (Depner, 1995). Clinically the adequacy of dialysis can be assessed using the urea reduction ratio laboratory test; higher ratios indicate greater amounts of dialysis completed.

Although, the net cost of providing adequate dialysis is not known, it is reasonable to expect that increasing Kt/V to acceptable levels will increase costs; however, it is also reasonable to assume that adequate dialysis will result in fewer hospitalizations and a lower mortality rate (Rubin, 1996).

Nursing interventions in assuring adequacy of dialysis include monitoring the frequency and amount of time the patient is dialyzed and communicating with the team members when signs and symptoms of inadequate dialysis, i.e. changes in Kt/V, decreases in functional status, appetite, and/or cognition are present (Burrows-Hudson, 1995). Another nursing intervention to assure the greatest amount of dialysis is achieved, would come from patient/family education and counseling regarding the importance of not missing dialysis treatments and other scheduled appointments with appropriate practitioners.

The fourth clinical status outcome variable is problems related to vascular/prosthetic hemodialysis access. Complications associated with creating and maintaining a vascular access for hemodialysis which include clotting, infection, pseudoaneurysm, stenosis, recirculation, and swelling/erythema account for a significant amount of health services costs in ESRD patients (Berkoben & Schwab, 1995). The nursing interventions identified above related to patient/family teaching of health promotion and care, and proactive early assessment of, and intervention with untoward signs and symptoms of vascular access complications to prevent further complications, can influence both the quality and resource utilization of care for these patients (Smith & Hoffart, 1996). Vascular/prosthetic hemodialysis access problems can be measured by the frequency of clotting, infection, pseudoaneurysm, stenosis, recirculation, and swelling/erythema incurred in a defined period of time.

Functional Status. Functional status is broadly defined as the degree to which an individual can perform the activities necessary to ensure well-being, and is conceptualized as the integration of three domains of function: biological, psychological (cognitive and

affective), and social (Matteson, McConnell, & Linton, 1997). Functional status is frequently used as an indicator of quality of life (Harris, Luft, Rudy, & Tierney, 1993). McClellan and Socuie (1994) categorized functional status in ESRD as normal if the patient was able to perform all usual daily activities without assistance.

In addition to experiencing increased mortality compared to other populations, ESRD patients experience increase morbidity, including significant loss in the quality of life. From 1991 through 1995, all Medicare recipients 65 years of age and older were hospitalized for an average of 2.5 days per year (United States Bureau of the Census, 1996). Dialysis patients 65 years of age and older at onset of ESRD were hospitalized on average 11.7 days per year during the time period, more than four times higher than the corresponding non-ESRD population (USRDS, 1997). Biological, psychologic, and social well-being are important components of quality of life that have been considered in studies of ESRD patients (Harris et al., 1993). Although the available modes of therapy for ESRD patients have increased in recent years, they have failed to return patients to the quality of life anticipated by both patients and health care professionals, as evidenced by the number of those patients who have decided to stop treatment with full knowledge of the consequences (Neu & Kjellstrand, 1986).

With recognition of the quality of life issue, and concern for the cost of ESRD, attention has turned from focusing on how renal replacement therapy can extend life to considering the quality of life that is being preserved. Quality of life has recently gained acceptance as an important patient outcome in studies involving chronic disease, and the concept has many definitions and methods of measurement. For the CCM conceptual framework, functional status is defined as the degree to which an ESRD patient can

perform the necessary activities of daily life to ensure a sense of well-being. Functional status in the ESRD patient is believed to be measured by the ability to work, to carry on normal activity, i.e. eating, walking, sleeping, etc., and to care for themselves (Jones, 1990).

Patient Satisfaction. Patient satisfaction is frequently defined as an outcome variable (Donabedian, 1983; Vuori, 1987). Weiss and Ramsey (1989) found support for the relationship between continuity of care and patient satisfaction; the greater the continuity the greater the patient satisfaction. Kibbe, Bentz, and McLaughlin (1993) advised that careful attention to the need for continuity in the design of care delivery systems can improve patient satisfaction.

In a global sense, patient satisfaction is a multidimensional concept, it is an attitude, the patient's evaluation of perceptions about health care received (Risser, 1975). For the CCM conceptual framework, patient satisfaction with care is defined as the degree of congruence between ESRD patients' expectations of nursing care and their perceptions of care actually received for a defined period of time. This definition is consistent with that originally conceptualized by Risser. Risser described three dimensions of nursing performance contributing to patient satisfaction in an outpatient setting:

- technical-professional: activities associated with nursing care tasks, and the knowledge base required for competent performance;
- trusting relationship: behaviors and characteristics which permit productive patient-nurse communication and interaction;
- education relationship: provision of information.

Research findings cited earlier by Collard et al. (1990), Lamb (1992), Van Dongen and Jambunathan (1992), and Lamb and Stempel (1994) support the need to assess the level of patient satisfaction as an outcome variable when evaluating any case management program. Patient satisfaction is a meaningful outcome measure when evaluating case management as an intervention, because patients are the recipients of the care and can therefore determine if the care they receive meets or exceeds their expectations (Mateo, Newton, & Warner, 1996). Assessment of patient satisfaction as an outcome indicator is receiving more attention under managed care as the quality of care delivery with these systems is questioned (Barr, 1995). In addition, patient satisfaction is considered by HCFA (1996) to be an indicator of quality and performance improvement in managed care ESRD programs. Patient satisfaction in an ESRD population is believed to be measured by the following:

- patient's statement that the level of care received meets or exceeds his/her expectations;
- patient's statement that the level of communication between himself/herself and the care team meets or exceeds his/her expectations;
- patient's statement that the level of teaching received meets or exceeds his/her expectations.

Studies of patient satisfaction with other populations have found that patients stressed that their caring and supportive relationship with the nurse was an important component of their care (Lamb & Stempel, 1994; Van Dongen & Jambunathan, 1992). Patients identified in these studies listening, counseling, problem solving, and teaching as essential nursing case management interventions that effected how satisfied they were with

their care. Although no studies were found that looked at patient satisfaction and nursing interventions with ESRD, it is believed that these interventions would have a similar impact on this patient population.

As noted previously, the patient is no longer a passive player in the health care system, he/she not only requires care but can influence its delivery (process) and its outcomes. Again, this supports the interrelationship between the components of the conceptual framework for the CCM model -structure, process, and outcome.

Health Services Resource Utilization. Health services resource utilization is the only health care system outcome variable selected for the proposed conceptual framework. With the onset of renal failure, patients and their families encounter a devastating medical, social, and economic burden for themselves and for society. Because Medicare covers approximately 92-93 percent of ESRD patients in the United States, this segment of the total ESRD population serves as the source to describe the issues that are important to the care of these patients. The United States Renal Data System (USRDS) collects and analyzes data related to recent trends in the incidence and prevalence of treated Medicare ESRD patients, methods of treatment, and patient outcomes. Subsequently, this data is published in the Annual Data Report (ADR) of the USRDS. The following information is extracted from the 1997 ADR as reported by Held et al. as cited in the USRDS Annual Report (1997).

The cost of renal replacement therapy is disproportionately high compared with the cost of care for most other chronic diseases. There are more than 250,000 patients with ESRD in the United States. This includes Medicare patients receiving dialysis and patients with a functioning graft. The number of patients starting ESRD therapy

continues to increase, although recent evidence shows that the incidence rates are growing a slower pace than they did in earlier years. The total number of patients undergoing ESRD therapy also continues to increase, but the rate of increase is down to 7 percent from 9-10 percent. According to the USRDS (1997), these findings must be reviewed tentatively because of uncertainties in the database, i.e. increased reporting of non-Medicare patients to HCFA and entry of such patients into the HCFA database.

The total estimated spending for ESRD as reported by HCFA from 1991-1995 was $34.91 billion. The estimated total direct costs of treating ESRD in the United States in 1995 for public and private sources were $13.06 billion. The estimated total federal spending was $9.74 billion or 75 percent of the total estimated cost.

Medicare payments per patient year ranged from $38,000 for all ESRD patients to $46,000 for those on hemodialysis from 1991-1995. Rates of spending decreased from 3.8 percent change per year in 1992 to 1993 to a 2.8 percent change from 1994 through 1995. Although the rate of spending is slowing, the data show that the program costs are reflective of the increase in the number of patients treated for ESRD (Held et al., as cited in the USRDS Annual Report, 1997).

Driven by the fact that most of the health care costs for ESRD are incurred in outpatient dialysis settings and in inpatient utilization, hospitals and payers are searching for approaches to deliver care to this patient population cost effectively without sacrificing quality (Smith & Hoffart, 1996). From the literature review, it is believed through the process variables of the CCM model -communication, coordination, collaboration, continuity of care, and primary, secondary, and tertiary prevention interventions- a beneficial impact can occur on the clinical outcomes to slow or halt the progression from

one stage of disease consequences in ESRD to another. This progression can be monitored through clinical status, functional status, patient satisfaction, and health services resource utilization -the outcomes of the CCM model. Again, from the literature, it is believed that the clinical status of the ESRD patient can have an influence on the utilization of health services. It is proposed that the impact on resource utilization be measured by assessing the following:

- number of and reasons for emergency department visits;
- number and type of special procedures;
- number of and reasons for hospital admissions;
- number of hospital days.

Confounding Variables

Several confounding variables have been identified in the literature that could potentially impact the case management process. These variables contribute to the methodological issues previously cited as problematic in the study of case management such as: case-mix severity; service standards of the institution; physician practice patterns; organizational culture; and lack of comparability of the information used or variability within groups and between groups of study patients. To this list, Edwardson and Giovannetti (1987) include the neglect of variables that effect nursing care in addition to what has been identified as the indicators sensitive to the case management intervention. These variables must be addressed in any study design of case management for the findings to be adequately interpretable (Polit & Hungler, 1991).

One confounding variable that could influence the outcomes in any study of diagnostic related groups (DRGs) is the case-mix severity of the study facility(ies).

Case-mix severity is defined as "the degree of illness of a given group of patients" (Slee, Slee, & Schmidt, 1996, p. 89). This value is computed to a case-mix index for the institution for the basis of reimbursement. Patients with the same diagnosis can vary significantly with the same DRG from being mildly ill to being extremely ill, or even dying. At present no allowance is made for the severity of the patient's illness under the prospective payment system (PPS). Therefore, everyone with the same DRG is given the same "price tag." However, several systems are in development or in use in hospital settings and include: Apache II, staging (diseases) patient, patient management categories (PMCs), computerized severity index (CSI), personal computer stager (PC-stager), and Medis-Groups (Slee, Slee, & Schmidt, 1996). It is believed that the conceptual framework of the CCM model has addressed the issue of case-mix severity in the structural component of patient characteristics and values.

Edwardson and Giovannetti (1987) noted other confounding variables to include service standards of the institution(s), physician practice patterns, and organizational culture. All of these factors can impact the LOS and other resource utilization aspects of care.

Assumptions

Assumptions underlying the conceptual framework of the Collaborative Case Management model include:

- The components of the CCM model can be viewed from a structure-process-outcome perspective.
- Case management encased in the CCM model is a nursing intervention with five key concepts, communication, coordination,

collaboration, continuity of care, and primary, secondary and tertiary prevention interventions.

- Case management as an intervention is the independent variable.
- A CNS with expertise in nephrology nursing serves as the case manager within the interdisciplinary team.
- The selected outcomes are sensitive to the nursing interventions of case management.

Propositions

The relational propositions in the conceptual framework in the CCM model are derived from Donabedian's (1988) approach to quality assessment:

> ...specified structural characteristics increase the probability of providing specified kinds of care, and because specified properties of the process of care improve the probability of obtaining specified changes in the health and well-being of individuals and populations. (p.177)

Using this approach, the relational propositions of the conceptual framework for the CCM model are as follows (Figure 3):

1. Structural components -caregiver characteristics and performance, and patient characteristics and values- directly influence one another.
2. Structural components -caregiver characteristics and performance, and patient characteristics and values- directly influence process components.
3. Structural components -caregiver characteristics and performance, and patient characteristics and values- indirectly influence outcome components.

4. Structural components -patient characteristics and values- directly and indirectly influence patient -clinical, functional status, and satisfaction outcome components.
5. Process components -communication, coordination, collaboration, continuity of care, and primary, secondary, and tertiary prevention interventions- directly influence patient -clinical, functional, and satisfaction outcome components.
6. Outcome components patient -clinical outcomes directly influence system outcome -health services resource utilization.
7. Outcome component -functional status- directly influences system outcome -health services resource utilization.

Summary

A conceptual framework for a Collaborative Case Management model has been developed for an ESRD patient population. The structure and process of the CCM model is believed to have an impact on patient and health care system outcomes. Specifically, the interdisciplinary structure of the CCM model with a CNS as the case manager to guide the key process concepts -communication, coordination, collaboration, and continuity of care, as well as key primary, secondary, and tertiary prevention interventions- are believed to have a beneficial effect on patient outcomes (clinical status, functional status, and satisfaction) and system outcomes (health services resource utilization). The outcomes have the potential to influence both the structural and process components of the model throughout the patient experience.

From a critical review and analysis of the literature on case management, six overriding research questions have emerged from the conceptual framework. In the following sections the research questions and hypotheses generated from the conceptual framework will be presented.

Research Questions

1. Is there a relationship between the implementation of a collaborative model of case management and the clinical outcomes experienced by ESRD patients?
2. Is there a relationship between the implementation of a collaborative model of case management and functional status experienced by ESRD patients?
3. Is there a relationship between the implementation of a collaborative model of case management and patient satisfaction with care or perceived quality?
4. Is there a relationship between the implementation of a collaborative model of case management and subsequent health services resource utilization by patients with ESRD?
5. Is there a relationship between the implementation of a collaborative model of case management and continuity of care with ESRD patients?
6. Is there a relationship between the implementation of a collaborative model of case management and the level of communication, coordination, and collaboration perceived by non-physicians and physician practitioners?

Hypotheses

To answer these research questions, the following hypotheses are proposed:

I. ESRD patients that receive care using a CCM model will have a significantly higher level of quality of care than those patients who receive care under the existing practices.

IA. ESRD patients that receive care using a CCM model will have a higher level of nutritional status than those patients who receive care under the existing practices.

IB. ESRD patients that receive care using a CCM model will have significantly lower levels of anemia than those patients who receive care under the existing practices.

IC. ESRD patients that receive care using a CCM model will have significantly more adequate doses of dialysis than those patients who receive care under the existing practices.

ID. ESRD patients that receive care using a CCM model will have significantly fewer complications related to vascular/prosthetic hemodialysis access problems than those patients who receive care under the existing practices.

II. ESRD patients that receive care using a CCM model (initial episode with CCM model) will have no change or significantly less negative change in functional status upon discharge from the hospital and six weeks post hospital than those patients who receive care under existing practices.

III. ESRD patients that receive care using a CCM model will have a significantly higher level of satisfaction than those patients who receive care under existing practices.

IV. ESRD patients that receive care using a CCM model will incur significantly lower health services resource utilization than those patients who receive care under the existing practices.

IVA. ESRD patients that receive care using a CCM model will have significantly fewer emergency department visits, and hospital admissions, and for different reasons than those patients who receive care under the existing practices.

IVB. ESRD patients that receive care using a CCM model will have significantly fewer hospital days and fewer special procedures performed, and for different reasons than those patients who receive care under the existing practices.

V. ESRD patients that receive care using a CCM model will experience significantly higher levels of continuity of care than those patients who receive care with existing practices.

VI. Non-physician and physician practitioners working within patient care units that have implemented a CCM model will perceive significantly higher levels of communication, coordination, and collaboration than those units functioning with existing care delivery practices.

To empirically assess the impact of case management as a nursing intervention on patient and system outcomes a testable model of case management must developed. An

effort to operationally define these concepts relevant to an ESRD patient population has been presented as a prelude to this task. In Chapter IV a design to empirically test the Collaborative Case Management model in an ESRD patient population is presented.

CHAPTER IV

RESEARCH DESIGN AND METHODS

This chapter explains the methods and materials used to empirically test components of the conceptual framework for a Collaborative Case Management (CCM) model (Figure 3). The chapter consists of seven sections: 1) selected components; 2) setting; 3) sample; 4) methods and materials for data collection; 5) research design; 6) data analysis plan; and 7) protection of human subjects.

Selected Model Components

To empirically test the CCM model, the following components were selected (Figure 4):

- structure: patient acuity;
- process: communication, coordination, collaboration, continuity of care, primary, secondary, and tertiary prevention interventions;
- outcomes: clinical status -nutritional level, level of anemia, adequacy of dialysis, vascular/prosthetic access problems;
- outcomes: health services resource utilization -emergency department visits, special procedures, hospital admissions, and hospital LOS.

These components were selected based on the ability to access and measure the data

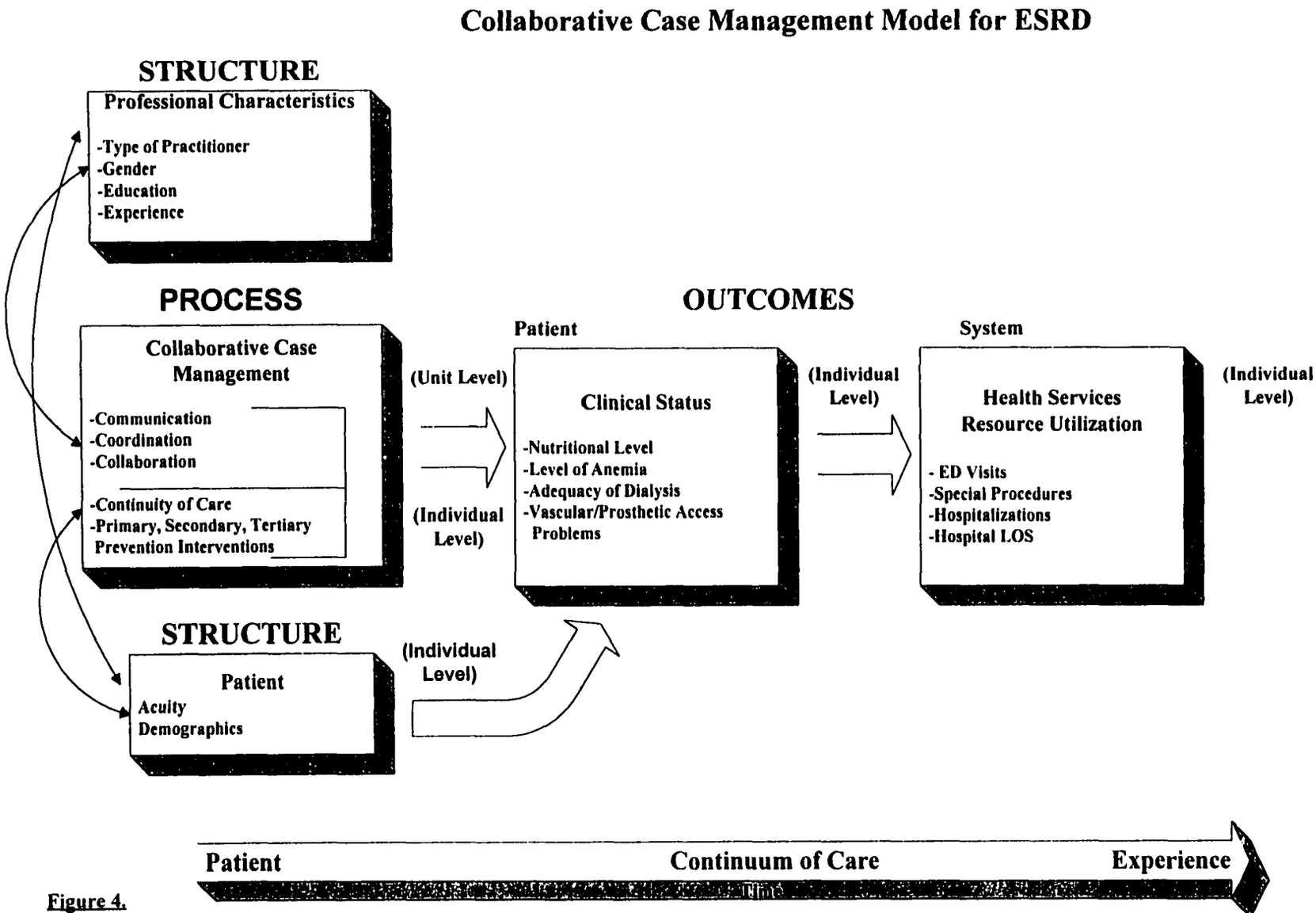


Figure 4.
Collaborative Case Management Model for ESRD

required to determine the impact of the CCM model. These variables were operationally defined in Chapter III.

Setting

There were two settings required for this study. The experimental group was drawn from The Detroit Medical Center-Grace Renal Program and the control group from Mercy Renal Services of Detroit.

Grace Renal Program

Grace Hospital, a 551 bed teaching hospital located in metropolitan Detroit, is a member of The Detroit Medical Center (DMC). The DMC is a multi-hospital, integrated health care system affiliated with Wayne State University and provides services for approximately 700,000 people in the metropolitan Detroit area. The case-mix index for all patients at Grace Hospital in 1996 was 1.37 (Grace Hospital, 1998).

The Grace Renal Program is comprised of inpatient and outpatient dialysis centers that work in partnership with the inpatient renal unit. The program served a population of 203 ESRD patients during the study period (July 1995 through March 1996), ranging in age from 18-94 years. Thirty-four were peritoneal dialysis patients and the remainder were on hemodialysis (169). Fifty-eight percent were greater than 60 years in age and 76 percent were African-American in descent. Fifty-two percent of all patients had diabetes mellitus as a primary diagnosis or co-morbid factor (Grace Hospital, 1998).

These data are not congruent with national statistics. According to Held et al. as cited in the USRDS Annual Report (1997) data for ESRD in 1995 was the following: 38.0 percent were between 45-64; 21.1 percent between 65-74; and 12.6 percent were 75 and older; 31.9 percent were African-American and 62.4 percent were Caucasian; and

31.4 percent had diabetes mellitus as a co-morbid. Patients enrolled in the Grace program are cared for by five nephrologists with practice privileges at Grace Hospital; therefore, patients use the hospital's emergency department as well as the inpatient and outpatient facilities for health care needs.

Collaborative Case Management at Grace Hospital. A case management program was implemented at Grace Hospital in February 1992. The program was designed on the elements of partnership-efficiency-quality. The original organizational structure of the case management program was traditional in that it reported administratively through the vice president of patient care services (Figure 5). The departments of utilization review, quality assurance, and social work reported to the vice president for finance. The amount of fragmentation and the number of "hand-offs" in terms of discharge planning led to significant variation in communication patterns and patient outcomes. For example, it was not unusual for three people from three separate departments to call the ambulance to transport the patient out of the hospital, or conversely, no one called the ambulance.

Although during the next several years, cost outcomes from the program were positive, LOS and the cost of specialty beds were decreasing, while the use of home antibiotic therapy was increasing, they were minimal. The only quality outcome reported related to physician and nursing satisfaction and this was only anecdotal in nature. It became clear that to position the hospital for an ever shrinking reimbursement base in a managed care environment, more had to be done faster. Over the next three years the program evolved to a collaborative matrix structure shown in Figure 6. The uniqueness of this model lay in the relationship established between nursing and medicine. The streamlining of accountability through one administrative track was also recognized as a

COLLABORATIVE CASE MANAGEMENT STRUCTURE
FEBRUARY 1992

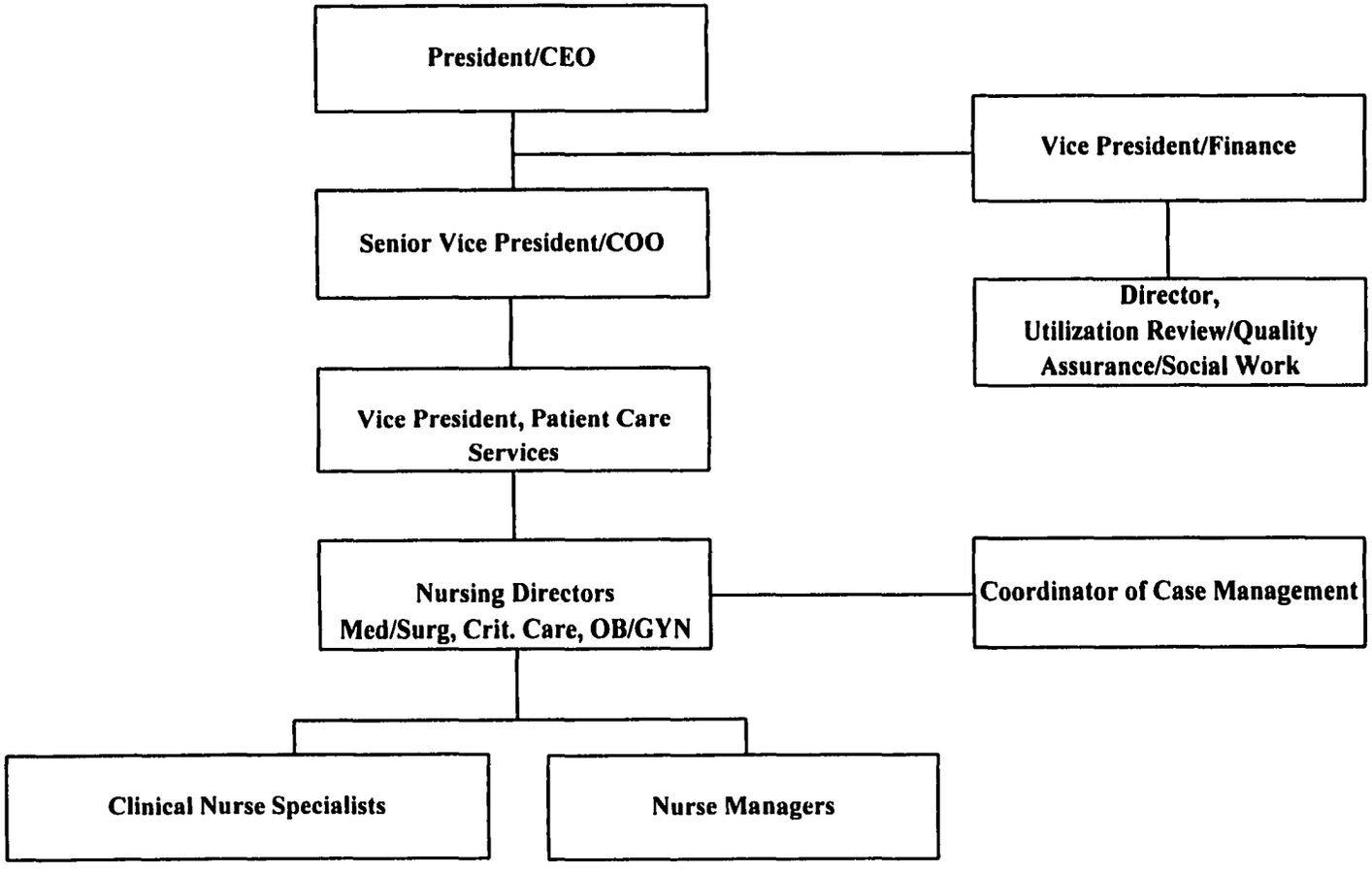


Figure 5.
Grace Hospital Collaborative Case Management Structure, February 1992.

COLLABORATIVE CASE MANAGEMENT STRUCTURE
OCTOBER 1995

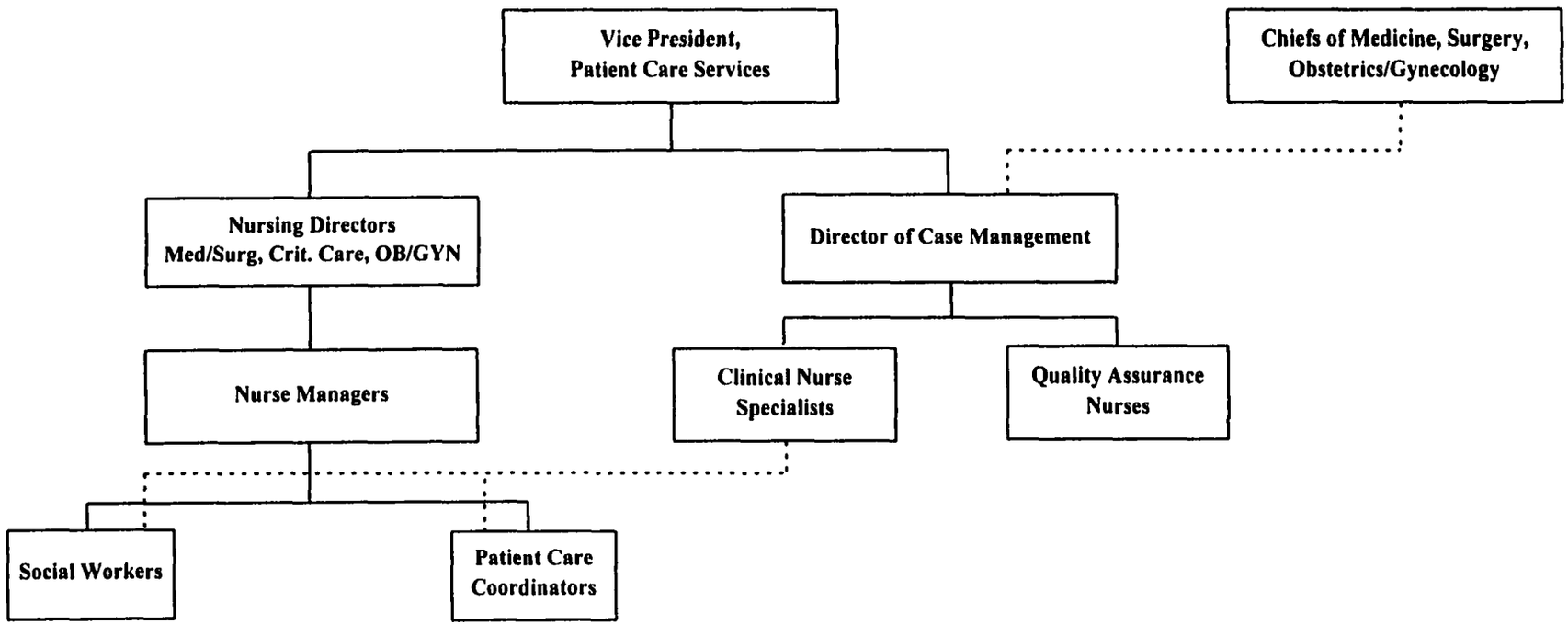


Figure 6.

Grace Hospital Collaborative Case Management Structure, October 1995.

different and positive approach to not only discharge planning, but to monitoring utilization of resources as well (Grace Hospital, 1995). The structure was developed with the goal to improve communication, coordination, and collaboration within the nursing staff and across disciplines. The objective was not only to improve the quality of patient care delivered, but lower costs through reduced utilization of services and earlier discharge from the hospital. A second goal was to improve the continuity of care for these patients after discharge through prevention interventions of teaching, counseling related to self-care, health promotion, coping and so forth.

This matrix relationship at multiple levels in the organization was developed and implemented with a new role, the director of case management as the pivotal player. This position would have a matrix reporting relationship with the vice president of patient care services, and the chiefs of the departments of medicine, surgery, and obstetrics and gynecology. In this structure, another role was created called a patient care coordinator. This baccalaureate prepared registered nurse position combined home care placement, utilization review, and some basic discharge planning duties previously completed by social workers into a single multi-skilled role.

The CCM model structure at the patient care unit level was comprised of a CNS, patient care coordinator and social worker. The patient care coordinator and social worker had a direct reporting relationship to the nurse manager and an indirect relationship to the CNS. The CNS reported directly to the Director of Case Management. Within this matrix structure, the patient care coordinator and social worker performed the following functions: discharge planning including post-discharge placement if needed;

legal functions such as guardianship and power of attorney arrangements; and utilization review.

Much of the work of the CCM team was completed on a patient-to-patient basis augmented by weekly CCM team meetings. These meetings were chaired by the CNS and attended by the unit CCM team, including the physician or his designee (resident and/or physician assistant), the staff registered nurses and nursing management. In keeping with the collaborative concept, the dietician and pharmacist assigned to the unit also attended and participated in the rounds.

The first two years of this collaborate partnership -medicine and nursing- have resulted in the following outcomes (compared to prior year) in two targeted patient populations, gerontology (nursing home admissions) and all surgical inpatients: decrease in the number of inappropriate admissions through the emergency department; decrease in the number of denials from Medicare/Medicaid; expansion of the number of 23-hour observation (short stay) patients; and drop in the number of ancillary tests/procedures such as laboratory and radiology. In addition, the overall adult hospital LOS decreased from 6.0 to 5.2 days during this time period (Grace Hospital, 1998).

In terms of the organizational management processes, the perceived level of communication, coordination, and collaboration within, and between the nursing staff with other disciplines was believed to have improved in areas where the CCM model had been implemented. There was no way to access at that time if the continuity of patient care after discharge or between admissions had improved for the patients.

It would have been premature to attribute these outcomes to the evolved case management program. To support this notion, the program needed to be empirically tested with a rigorous research design.

Because of the high volume and high levels of resources utilized, the renal patient population was the next major group to address. The CCM model was implemented on the in-patient renal unit in October 1995.

Late in 1996 as the DMC developed a competitive strategy to succeed in a managed care environment, the Collaborative Case Management model (CCM) at Grace Hospital served as a template for the development of a system-wide approach to clinical resource management using ancillary protocols and clinical pathways to guide medical practice. The interest was spurred by the unique nature of the model; the CCM model was not just another nursing care delivery system. The model engaged all health care disciplines in a collaborative team approach and impacted all processes from admission to discharge, and home care where appropriate.

Inpatient Center. The 10 station inpatient hemodialysis unit is located on the same level of the hospital as the inpatient renal care unit. The staff of these units are separate. The inpatient dialysis unit provides care for ICU patients, other inpatients, and high acuity outpatients too unstable to dialyze elsewhere. Staffing is all registered nurse (RN), with a 1:1 nurse-patient ratio for ICU patients and 2:1 for all others. There are 20-30 patients treated per day in this unit (Grace Renal Program, 1998).

Outpatient Center. Patient care is delivered in this outpatient unit by a "Care Pair" delivery model. A RN and clinical technician (CT) manage the care of a cadre of six patients each shift, three shifts daily. Treatments are three to four hours in length with any

required patient care intervention communicated by the patient's Care Team to the multi-disciplinary team. Problems, issues and concerns regarding the patient's care and treatment are also referred to the team for investigation and resolution (Grace Hospital, 1998).

Inpatient Unit. The inpatient unit is a 41 bed Endocrine/Nephrology unit. The unit caregiver staff during the study period (July, 1995 through March, 1996) was practical nurses (LPNs), and nursing assistants (NAs). Support personnel were also assigned to the unit and included a patient care coordinator, social worker, dietician and clinical pharmacist.

Peritoneal dialysis is completed on the unit by either the patient, when able, or the nursing staff. All registered nurses working on the unit are trained to perform this treatment. The unit census ranges from 35-38 with approximately one-half to three-quarters of the patients on the nephrology service at any one time (Grace Hospital, 1998).

Mercy Renal Services

Mercy Hospital of Detroit is a 268-bed community hospital located in East Detroit owned by the Sisters of Mercy Health Care System. The hospital serves a similar mix of patients to that described for Grace Hospital (case-mix index was 1.35 in 1996). Mercy's program is guided by three nephrologists with privileges at Mercy Hospital, therefore the patients use the emergency department as well as the inpatient and outpatient facilities of the hospital. The program's configuration is similar to that of Grace, with an inpatient and outpatient dialysis center, and an inpatient renal unit (Mercy Hospital, 1998).

Patient demographic data were not available for the study period, however at the time of data collection the patient population was as follows: total ESRD was 265, 240

on hemodialysis and 25 on peritoneal dialysis; 55 percent were older than 60 years; 95 percent were African-American; and 55 percent had diabetes mellitus as a primary diagnosis or co-morbid factor (Mercy Hospital, 1998).

Inpatient Center. The inpatient center is comprised of six stations and is staffed with RNs. The nurse to patient staffing ratios are consistent with those in the DMC. Treatment volume averages 12 patients daily (Mercy Hospital, 1998).

Outpatient Center. The outpatient unit has 26 patient stations. Patient care is delivered using a team approach of one RN and three CTs for each group of 14 patients (Mercy Hospital, 1998).

Inpatient Unit. The 30 bed inpatient unit cares for both hemodialysis and peritoneal dialysis patients with an average daily census of 14-18. Caregiver staffing during the study period was comprised of a nurse manager, RNs, LPNs, and NAs. The unit was also supported by social work, nutritional support, pharmacy, and utilization review staff from centralized departments within the hospital. In contrast to the Grace CCM model, there was no CNS assigned to the unit and no weekly discharge planning rounds, although patient care conferences were frequently held to discuss an individual patient care issue. The nurse manager had no authority/responsibility/accountability for the outcomes of personnel that did not report to her. Although the interdisciplinary working relationships, as well as nursing staff relationships in this environment were reported to be positive, there was no formalized structure that defined standards for communication, coordinated the various components of patient care, or emphasized collaboration (Mercy Hospital, 1998).

Sample

Two different samples were selected at each site; patient and professional staff. The patient sample for each group was drawn from the DMC-Grace Renal Program and the Mercy Renal Services patient rosters. These patients met the program's criteria for ESRD. The ESRD inclusion criteria are shown in Table 1. The professional sample consisted of staff non-physicians (unit management, staff RNs, CNS, social workers, dieticians, pharmacists, and physician assistants), and attending physicians.

Grace Renal Program

The CCM model was implemented at Grace Hospital in October 1995. All patients on hemodialysis who had been in the program for the three month period (July through

September, 1995) prior to the implementation, and who remained in the program through the second measurement period (January through March, 1996) at the Grace site were potentially eligible. In addition, the patient must have had at least one encounter with the hospital during the study period. These encounters included: emergency department visits; hospitalization; 23-hour observation stays; and/or outpatient procedures such as surgery, shuntogram, or endoscopy. Routine phlebotomy and radiological procedures were not included. The medical and financial records for these patients were retrieved for the time period of the study.

The patients' records (both in- and outpatient) were accessed for all patient related information. Using a cross-referencing approach between the Renal Center's patient

Table 1

ESRD Criteria

Approval Criteria for HCFA 2728
(For patients aged >17 years)

NOTE: Lab dates no more than 45 days earlier than date in #23

Abbreviations/formulas:

SC = serum creatinine (mg/dl)
CC = creatinine clearance (ml/min)
UC = urea clearance (ml/min)
Estimated (est.) *CC* =

$$\frac{\text{weight in kg} \times (140\text{-age})}{72 \times \text{SC}}$$

(For females, multiply est. CC by .85)

Criteria:
Transplant as initial modality, OR
SC > 8 (> 6 for diabetics), OR
CC < 10 (< 15 for diabetics), OR
(CC + UC)/2 < 10 (< 15 for diabetics), OR
Est. CC < 10 (< 15 for diabetics)

Body Surface Area Adjustment

The criteria includes an adjustment for body surface area (BSA). This adjustment may be used when:

(Height in cm) x (Weight in kg) > 10,706

Use the table below to estimate whether adjusting for BSA will pass the criteria.

For Ht. x Wt. =	Multiply CC, Est. CC or (CC + UC)/2 by:
11,863	.95
13,217	.90
14,818	.85
16,728	.80
19,033	.75
21,849	.70
25,339	.65
29,739	.60

If the result is < 10 (< 15 for diabetics), the case will pass. If none of the criteria are met (or if in doubt), see back for documentation instructions.

(United States Renal Data System, 1996)

roster and a report from the hospitals admitting computer system, there were originally 139 potential patient medical records identified for the study. Records were eliminated for the following reasons: 1) if 25 percent or more of the information related to the identified prevention interventions was missing from the record, i.e not documented; 2) if the reliability of the health services resource utilization indicators was below 90 percent as determined by comparison of documented services with the patient's financial record. Application of the eligibility and exclusion criteria resulted in 59 patient records (42 percent) in the experimental group.

The CNS, staff RNs, LPNs, social workers, dieticians, pharmacists, and physician assistants assigned to the inpatient unit of the Grace program were recruited for the professional sample. Although the nursing management staff of the unit were not always involved with direct patient care, they were considered to be a vital part of the renal team, and therefore were also recruited. In addition, all active attending nephrologists were recruited (five). Thirty-five non-physician staff were recruited with 29 completing the questionnaire (83 percent). All five of the attending physicians completed the questionnaire for a return rate of 100 percent. In addition, 10 interviews were completed with available staff from the experimental unit.

Mercy Renal Services

The patient sample for the control group was drawn from the Mercy Renal Program patient roster that met the same criteria. The process for obtaining patient information was the same as described for the experimental group. The potential eligible

patient sample was 70. Out of this number, 39 records (56 percent) met all criteria and were included in the study.

The Mercy Hospital staff, nursing management, and physicians were selected following the same process as described for the Grace program. The eligible professional sample was as follows: 25 non-physicians and three physicians. The return rate of questionnaires was 76 percent (19) and 100 percent (3) respectively.

Methods and Materials for Data Collection

To empirically test the CCM model in an ESRD patient population, the following components of the conceptual framework were selected: structure -patient acuity; process -communication, coordination, collaboration, continuity of care and primary, secondary, and tertiary intervention activities; and outcome - patient clinical status (nutritional level, level of anemia, adequacy of dialysis, and vascular/prosthetic hemodialysis access problems), and health services resource utilization (emergency department visits, special procedures, hospitalizations, and hospital LOS) (Figure 4).

Several data extraction forms were investigator-generated and appear in the appendices. Interrater reliability for data collectors using these forms was completed with a minimum of 91 percent agreement obtained on all data forms (Appendices B-C, E-H). This process was completed by all individuals participating using these forms as follows: 10 percent of outpatient records were selected from the experimental patient group (the goal for the total patient sample size was 100); data from each record was extracted by each of the data collection assistants for every form; and the renal CNS verified the accuracy of the information extracted. This process was completed on a total

of 14 records until the interrater agreement reached 91 percent. The following section will describe all components of the testable model of CCM, including those variables not tested in the study.

Structural Variables

From the literature it is believed that the structural variables of professional characteristics -type of practitioner, gender, education, and years of experience- can have an impact on both the process and outcomes of CCM model. Data related to the professional characteristics was collected through demographic information. Information on the patient characteristics -acuity and demographics was retrieved from the medical records. This information is globally captured in the case-mix index for the hospital as well. Case-mix index is used to assess reimbursement levels in acute care facilities (Slee, Slee, & Schmidt, 1996). In the study institutions the case-mix index for all patients was 1.37 for the experimental group (Grace Hospital, 1998), and 1.35 for the control group in 1996 (Mercy Hospital, 1998).

Professional Characteristics. Professional demographics collected are displayed in Appendix A. The data were collected from each participating practitioner once, and related to the data collection period (October-December 1997) versus the time period of the study (July 1995-March 1996).

Patient Characteristics. Patient acuity was determined using a rating scale of 1 to 3 with 3 being the most severely ill value. Excluding missing data, the range of scores could be from 4 to 12, missing data were counted as 0. The Patient Acuity Form (Appendix B) was designed by the investigator to capture this information from each

patients' medical record. This information included age, co-morbidity, nutritional status, and functional status. Patient demographics were also collected from the medical record. These data were extracted using the Patient Demographic Record shown in Appendix C. These data were collected on each patient during the study period and recorded once.

Process Variables

The CCM model is viewed as the independent variable in the proposed study. The CCM model is operationalized through the process components of communication, coordination, collaboration, continuity of care, and primary, secondary, and tertiary intervention activities. Before the impact of these variables on the dependent variables was assessed, the presence and level of these factors in the study settings were determined. A discussion of how the level of each of these process variables was identified and measured is presented.

Communication, Coordination, and Collaboration. A modification of the instrument "Organization and Management of Intensive Care Units" developed by Shortell, Rousseau, Gillies, Devers, and Simons (1991) was used to measure the level of communication, coordination, and collaboration present in each study setting. In its original format, the questionnaire was divided into two major components, physician and nursing. Each component consists of eight-item scales involving the extent to which unit leaders emphasized standards of excellence to the staff, communicated clear goals and expectations, responded to changing needs and situations, and were in touch with unit members' perceptions and concerns.

Communication is measured along a number of dimensions including openness, accuracy, timeliness, understanding and satisfaction. Openness is measured by four,

five-point Likert scale items, and involves the extent to which nurses and physicians are able to say what they mean when speaking with each other without fear of repercussions or misunderstanding (Roberts & O'Reilly , 1974; Shortell et al., 1991).

Accuracy refers to the degree to which nurses and physicians believe in the accuracy of the information conveyed to them by the other person (Roberts & O'Reilly, 1974) and is measured by an eight-item scale. Timeliness, measured by these same items, involves the degree to which patient care information is related promptly to the people who need to be informed. Understanding, an eight-item scale, involves the extent to which nurses and physicians believe communication is comprehensive and effective. Two separate items are also used to measure the effectiveness of nurse-physician communication between shifts. Satisfaction with communication, a three-item scale for nurses and four items for physicians, is defined as the degree of satisfaction with nurses (physician) communication with patients, patients' families, and other nurses (physicians) (Shortell et al., 1991).

Coordination is defined as the degree to which work activities are coordinated within the nursing and physician groups and between the two groups within the unit. It is measured by five-items related to written plans and schedules, treatment protocols, policies and procedures, unit management efforts and face-to-face interaction (Van de Ven & Ferry, 1980). Between unit coordination, measured by four items, is defined as coordination between the study unit and other units in the hospital such as emergency department, operating room, the ancillary support services and other inpatient units. An additional four-item scale of relationships between units was developed based on perceptions of the degree of cooperation received from other units (Shortell et al., 1991).

To address issues of problem-solving/conflict management in ICUs, there is a four-item scale that measures open, collaborative problem-solving (Shortell et al., 1991). The scale involves the extent to which physicians and nurses work actively to make sure that all available expertise is brought to bear on a problem with the goal of arriving at the best possible solution. This measure is reflective of and consistent with the collegial definition of collaboration in the study: a reciprocal relationship wherein the practitioners assume the greatest responsibilities for patient care within the framework of their respective fields; emphasis is on joint responsibility in patient care management with a bilateral process of decision making based on each practitioner's education and ability (Shortridge et al., 1986). Therefore, the problem solving/conflict management component of the tool was used as the indicator to measure collaboration in the study.

Reliability coefficients for each of the scales are shown in Table 2. Most of the scales demonstrate good to high reliability using 0.70 as the commonly accepted cutoff criterion (Ghiselli, Campbell, & Zedeck, 1981). The exceptions (timeliness of communication, within-shift communication, and satisfaction with nurse communication) are above 0.60, approaching commonly accepted reliability standards.

Convergent validity of the selected scales is shown in the correlation matrix in Table 3. Specifically, from a convergent validity perspective, it is hypothesized that all measures of coordination will be positively correlated with all measures of effective communication and collaboration. As shown in columns a, b, and c of Table 3, these predicted relationships are supported. Inspection of the other columns reveals consistent support for the convergent validity of all the selected measures (Shortell et al., 1991).

Table 2

Descriptive Statistics and Cronbach's Alphas for Scales

Scale	No. of Items	Mean	SD	Alpha
Coordination				
Within-unit (SWUCOORD)	5	3.62	.69	.80
Between-unit (SBUCOORD)	4	3.41	.74	.81
Communication				
Openness-WG (SOPENWG)	4	3.92	.67	.83
Openness-BG (SOPENBG)	4	3.60	.77	.88
Accuracy-WG (SACCWG)	4	3.55	.77	.78
Accuracy-BG (SACCBG)	3	3.45	.75	.74
Accuracy-overall (SACC)	8	3.52	.64	.82
Shift communication (SSHCWG)	2	3.64	.74	.68
Understanding (SUNDERBG)	8	3.29	.67	.86
Timeliness (STIME)	3	4.01	.52	.64
Satisfaction with nurse communication (SSATN)	3	3.94	.56	.68
Satisfaction with physician communication (SSATD)	4	3.37	.76	.80
Conflict Management				
Problem-solving-WG (SCPSWG)	4	3.20	.70	.81
Problem-solving-BG (SCPSBG)	4	3.12	.72	.82

WG, within group
BG, between group
SD, standard deviation

(Shortell, et al., 1991, 715)

Table 3

Pearson Correlations of Scales[a] - The Organization and Management of ICUs

		a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.	m.	n.	o.
Coordination																
a.	SWUCOORD	1.00														
b.	SBUCOORD	.68	1.00													
c.	STUNIT	.38	.37	1.00												
Communication																
d.	SOPENWG	.35	.23	.37	1.00											
e.	SOPENBG	.26	.25	.32	.34	1.00										
f.	SACCWG	.32	.25	.42	.51	.34	1.00									
g.	SACCBG	.23	.22	.25	.21	.43	.43	1.00								
h.	SACC	.34	.29	.42	.45	.50	.87	.80	1.00							
i.	SSHCWG	.37	.29	.33	.60	.30	.53	.27	.50	1.00						
j.	SUNDERBG	.38	.38	.43	.38	.74	.47	.49	.60	.43	1.00					
k.	STIME	.34	.28	.30	.39	.39	.34	.34	.42	.40	.47	1.00				
l.	SSATIN	.37	.27	.33	.46	.31	.39	.30	.42	.44	.37	.46	1.00			
m.	SSATD	.32	.33	.39	.33	.62	.45	.43	.55	.37	.77	.35	.38	1.00		
Problem Solving																
n.	SCPSWG	.44	.35	.42	.49	.28	.43	.21	.40	.38	.44	.29	.32	.40	1.00	
o.	SCPSBG	.40	.38	.39	.32	.43	.35	.29	.40	.31	.55	.28	.26	.51	.65	100

[a]Significant at P. $\leq$ .05 level

(Shortell et al., 1991, p. 718-719)

The Organization and Management of Intensive Care Units was modified for the study to measure the degree to which communication, coordination, and collaboration are present in each setting of the study. This modified instrument, termed The Organization and Management of Collaborative Case Management, is shown in Appendix D. Copies of the cover letter distributed with each questionnaire are also included. Both non-physician and physician professional staff were recruited to complete the appropriate questionnaire. Each study group had an accumulated score on these items that represented the degree to which they were present; the higher the score the more likely the managerial practices and organizational processes of communication, coordination, and collaboration were present. To determine the reliability of the modified instrument, a sample of 17 non-physician staff and 7 physicians completed the questionnaires. The reliability coefficients are shown in Table 4. These values are consistent with those on the original instrument.

Continuity of Care. Shortell's (1976) definition of continuity of care as "the extent to which medical care services are received as a coordinated and uninterrupted succession of events consistent with the medical care needs of patients" (p.378) provides a guide to operationalize the concept for the study. In his work, Shortell operationalized continuity of care with two indicators: number of different sources of care seen by an individual for given episode of illness; and the means by which patients come into contact with their primary provider of care.

Continuity of care for ESRD patients was measured by the following: number of times the patient sees his/her primary practitioner(s) (physician, social worker, dietician, or other). The nurse initiated each dialysis treatment and therefore was seen with each visit

Table 4

Descriptive Statistics and Cronbach's Alphas for Scales-CCM

Scale	No. of Items	Mean	SD	Alpha
Coordination				
Within-unit (SWUCOORD)	5	3.88	1.52	.85
Between-unit (SBUCOORD)	4	3.53	1.42	.90
Communication				
Openness-WG (SOPENWG)	4	3.89	.93	.89
Openness-BG (SOPENBG)	4	3.74	.67	.68
Accuracy-WG (SACCWG)	4	3.19	.82	.78
Accuracy-BG (SACCBG)	3	2.88	.69	.87
Accuracy-overall (SACC)	8	3.05	.69	.74
Shift communication (SSHCWG)	2	3.24	.82	.90
Understanding (SUNDERBG)	8	3.18	.53	.66
Timeliness (STIME)	3	3.51	.56	.76
Satisfaction with nurse communication (SSATN)	3	3.45	.96	.87
Satisfaction with physician communication (SSATD)	4	3.30	.68	.72
Collaboration (Conflict Management				
Problem-solving-WG (SCPSWG)	4	3.09	.61	.75
Problem-solving-BG (SCPSBG)	4	2.78	.79	.89

WG, within group
BG, between group
SD, standard deviation

(Adapted from Shortell et al., 1991, p. 715)

to the dialysis center, these visits were not counted during the measurement periods. In addition because of the chronic nature of ESRD, missed appointments are not uncommon and can lead to interruptions in care and treatment (Berkoben & Schwab, 1995). Therefore the number, type, and duration of any gaps in care or service during the measurement periods was also measured. A gap was defined as any suspension or break in treatment or service as outlined in the patient's care plan or as indicated by the standards of practice. This would include the hemodialysis schedule (usually three times per week), as well as the standard that each patient is to be seen by a nurse at each visit, and by the physician, social worker, and dietician at least monthly while in treatment (USRDS, 1996). In addition, any observations noted in the medical record that required follow-up treatment/service that were not completed were considered a gap.

This information was obtained from the medical record of the study subjects using the investigator-generated Continuity of Care Assessment Form (Appendix E). The number of times the practitioner was seen, or the number of gaps in visits with the practitioner and the length of the gap –duration, for these indicators were recorded, summed and the mean change scores were compared within the groups for each measurement period, and between the experimental group and the control group for the study period. These data were verified for accuracy and completeness with the patient's financial record and the patient appointment book or log of visits. Only those patient records with a reliability of .90 on both of these indicators were included in the study.

Primary, Secondary, and Tertiary Prevention Interventions. Specific primary, secondary, and tertiary prevention interventions for ESRD patients are shown in Table 5. If these nursing interventions are targeted, proactive, and aggressive the development of

Table 5

Primary, Secondary, Tertiary Prevention Interventions

Level	Interventions
Primary	• Monitoring for adequacies of clinical therapies Nutritional intake Medication regime Dialysis Prevent/slow complications
	• Patient/family teaching and counseling Clinical therapies Health promotion Mastery (stress reduction and effective coping) Self-care Caring Cognition
	• Monitoring for adequate support services Housing Health insurance
Secondary	• Implementation of Specific Protocols Dialysis and other treatments Nutritional support Medications Prevent/slow complications
	• Monitoring for compliance with therapies/protocols
	• Acquisition of appropriate services to sustain the patients functional status through various and often recurrent illness episodes.
Tertiary	• Life Style Changes: Patient/Family/Community Reorganizing household to prevent the need to climb stairs for toileting, bathing, sleeping, laundry, etc. Organize support groups for patients/families. Increase public awareness of renal disease and its consequences.

(Macnee & Goeppinger, 1993)

complications and co-morbidities can be slowed or limited in this chronic patient population (Macnee & Goeppinger, 1993).

The presence of these interventions in the study settings was determined through retrospective medical record review of each subject. These data were collected utilizing the Prevention Interventions Assessment Form shown in Appendix F for each period. Each study subject would have a summed score to reflect the frequency with which interventions at each level were implemented for each measurement period. These frequencies were summed and the mean change scores were compared within the groups from the pre to the post measurement periods, and between the groups for the study period.

Summary of Determination of Process Variables

To summarize, it was predicted that the independent variables of communication, coordination, collaboration, continuity of care, and primary, secondary, and tertiary prevention interventions could be identified and measured in the study settings on two levels: unit and individual patient. First, each unit (experimental and control) would have a score to represent the level of communication, coordination, and collaboration as determined by a modification of The Organization and Management of Intensive Care Units termed, The Organization and Management Assessment of CCM (adapted from Shortell et al., 1991, Appendix D).

Second, each individual patient had two separate scores, one score to represent the extent of the continuity of care that he/she experienced, and one score to reflect the extent

of prevention interventions experienced during each measurement period. These measures operationalized the CCM model, and thus were used to assess the independent variable on the dependent variables in the study.

Outcome Variables

Clinical Status. From the literature review, it is believed that, through the process variables associated with the nursing intervention, CCM, a beneficial impact can occur on the clinical outcomes by slowing or halting the development of complications and co-morbidities in ESRD patients. The dependent variables are represented by both patient and health care system outcomes. The patient outcomes included: clinical status -nutritional level; level of anemia; adequacy of dialysis; and vascular/prosthetic access problems. The system outcome measured was health services resource utilization and included: number of and reason for emergency department visits; number and type of special procedures; number of and reason for hospitalizations; and number of hospital days (Figure 4).

Information related to the clinical status variables is routinely collected from ESRD patients and was obtained from the medical record for both measurement periods. These indicators are shown in Table 6 and displayed in the Clinical Status Outcomes Form in Appendix G. The reliability of the nutrition, anemia, and adequacy of dialysis data was determined by comparison with the patient's financial record. The data for the frequency of vascular/prosthetic access problems was also verified with the financial record as well as the patient appointment and/or log book. To be included in the study, the data retrieved from the medical record had to have a reliability of at least .90 when compared to the financial and/or log books.

Table 6

Clinical Outcomes Measures

Dependent Variable	Measure
Nutrition	Serum Albumin (g/dL)*
Anemia	Hemoglobin (g/dL)* Hematocrit (%)*
Adequacy of Dialysis	Urea Reduction Ratio > 65%*
Vascular/Prosthetic Access Problems	Frequency of:** Clotting Infection Pseudoaneurysm Stenosis Recirculation Swelling/Erythema

* Monthly values over designated period(s) of time.
** Total number over designated period(s) of time.

Health Services Resource Utilization. Again, from the literature, it is believed that the clinical status of the ESRD patient can have an influence on the utilization of health services. It is proposed that this impact can be measured by assessing the following:

- number of and reasons for emergency department visits;
- number and type of special procedures;
- number of and reasons for hospital admissions;
- number of hospital days.

These data were collected during both measurement periods from all patient records in both groups. The data was recorded on the investigator generated Health Services Resource Utilization Form shown in Appendix H. These data were compared to the patient's financial record with a reliability of at least .90.

Summary of Data Collection for the Outcome Variables. Clinical status data (nutritional level, level of anemia, adequacy of dialysis, and vascular/prosthetic access maintenance) was collected from the medical record of each patient in the study for the specified data collection periods. Health services resource utilization data (emergency department visits, special procedures, hospital admissions and hospital days) were also obtained from each patient's medical record (in- and outpatient) in a similar fashion.

The reliability for these data was verified by reconciliation of documented events in the patient's medical record with patient financial data, and admission/and or log book of visits. The acceptable reliability level was .90.

Confounding Variables

Several confounding variables have been identified in Chapter III that could potentially impact the case management process and outcomes of ESRD patients. These

variables include: case-mix severity; service standards of the institutions; physician practice patterns; and organizational culture within the study institutions. Two of these confounding variables have been addressed. The case-mix severity, as measured by the case-mix index, is comparable in the study institutions and the standards and specific outcomes of care for ESRD patients is directed by the United States Renal Data System (1997). However, uncontrollable factors such as the individual physician practice patterns and the organizational culture could have had a significant impact on the process and outcomes of the CCM model.

Research Design

This study examined the effects of the CCM model on the clinical and health services resource utilization outcomes. A quasi-experimental field design with non-equivalent groups and pre-post test measures was used. As a result of the number and types of patients enrolled on the renal service of both study sites, the researcher was unable to assign homogenous groups. Data for the clinical and resource utilization variables were obtained from the patients' medical records (in- and outpatient) for a three month period prior to implementation (July through September 1995) of CCM model at the experimental site (October, 1995) (pre-intervention data), and again for a three month time period post-implementation (January through March 1996). To provide for as much consistency in the data collection process as possible, data from the control group was collected from the same time periods. Since there was no pre-implementation data from either group related to the organizational processes on the unit, available professional staff on the experimental unit were interviewed using an opened-ended questionnaire (Appendix I). This was completed to get a sense from those staff if they currently

assessed the organizational processes on the unit to be different from those prior to the implementation of the CCM model.

To determine sample size, a power analysis was completed. The power to test significance of the independent variables in the CCM model for results with a medium effect at an alpha of .05 was computed to be .73 with a sample size of 100 (Borenstein & Cohen, 1988). However, only 98 patient medical records met the criteria for this pilot study: experimental group = 59; control group = 39. In most cases, to decrease the probability of a Type II error the minimum acceptable power is .80 (Shott, 1990). Therefore, the potential for a Type II error, failing to detect a significant finding when there was one, in the hypothesis testing for this study could be substantial.

Data Analysis

Measures of central tendency and variability were used to describe demographic characteristics of all study subjects. To determine the presence and level of the process variables- communication, coordination, collaboration, continuity of care, and primary, secondary, and tertiary prevention interventions- data were analyzed on two levels, unit and individual (Figure 4). Unit data included mean values to represent the presence and level of communication, coordination, and collaboration from both the experimental and control group at the time of data collection. Individual patient level data included: level of continuity of care; level of prevention interventions applied; and patient acuity. Intraclass correlations were computed to determine the clustering effect of the unit related to communication, coordination, and collaboration.

From the literature, a number of exogenous factors have been identified in the model. These include the structural components of professional and patient

characteristics. There is reason to believe that these factors are correlated with the process variables. First, it is believed that there is a correlation between the professional characteristics of type of practitioner, gender, education, and experience, and organizational management processes of communication, coordination, and collaboration (Brooten et al., 1986; Lamb & Stempel, 1994; Shortell et al., 1991; Shortell et al., 1992; Shortell et al., 1994; Wyszewianski, 1988; Zimmerman, 1989; Zimmerman et al., 1993).

Second, it is believed that there is a correlation between the structural components of professional and patient characteristics. The aspects of professional characteristics - type of practitioner, education, and experience- could potentially impact the assessment of the patient's acuity or certain demographic data such as socioeconomic status. And third, the literature supports the correlation between continuity of care, prevention interventions and patient characteristics -acuity and demographics- (Burrows-Hudson, 1995; McDermott, 1981). For these reasons, to determine the impact of these organizational management processes on the patient and system outcomes these exogenous factors should be controlled for in the analysis. However in this pilot study, only patient acuity was controlled for in relation to the continuity of care and prevention interventions, and the clinical status and health services resource utilization outcomes.

The literature also supports the belief that there is a positive association between communication, coordination, and collaboration within the work unit and the level of continuity of care experienced by each patient (Manthey, 1980; Rettig & Levinsky, 1991; Shortell, 1976). It is also believed that communication, coordination, and collaboration are linked to the determination of the appropriate primary, secondary, and tertiary

prevention interventions planned and implemented for each patient (Macnee & Goeppinger, 1993; Shortell et al., 1991).

The individual patient level data for continuity of care, prevention interventions, patient acuity, clinical status, and health services resource utilization were statistically analyzed. To determine if there were significant differences between the experimental and control patients for these variables, t test for change scores for independent groups was computed. For example, the level of continuity of care was assessed for each study patient during each measurement period. The mean change score for this variable for the experimental group was compared to the mean change score of the patients in the control group. Within group differences were also computed using t test for change scores. Similar procedures were performed for the other individual level process and outcome variables.

The relationship between continuity of care, prevention interventions, and patient acuity, and patient clinical status and health services resource utilization was determined through multiple regression techniques. The relationship between the independent variables and clinical status was directly determined. However, the impact of the model on health services resource utilization was mediated by the clinical status variables. Therefore, a test of mediation as described by Baron and Kenny (1986) was performed.

To clarify the meaning of mediation (Figure 7): "a) variations in the independent variable significantly account for variations in the presumed mediator (i.e., Path a); b) variations in the mediator significantly account for variations in the dependent variable (i.e., Path b); and c) when Paths a and b are controlled, a previously significant relation between the independent and dependent variables is no longer significant, with the

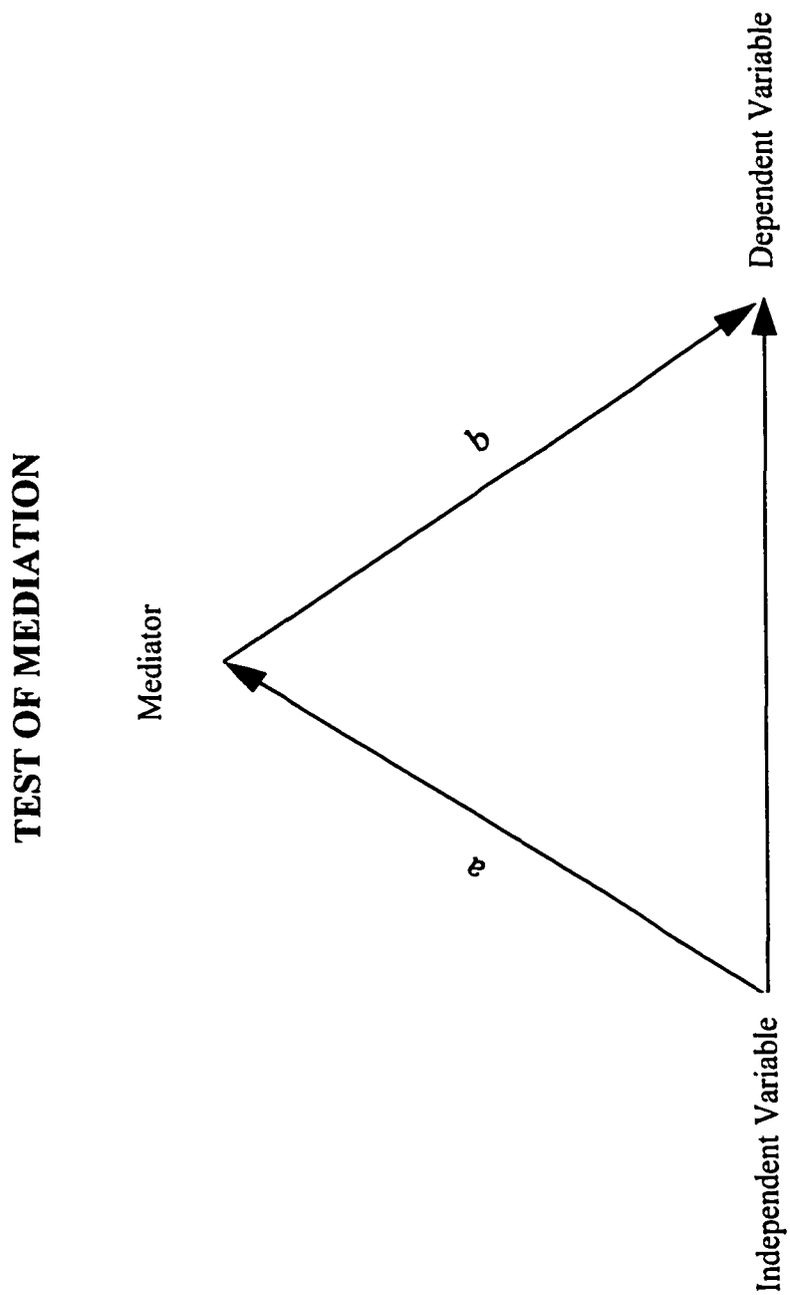


Figure 7.

Test of Mediation

(Baron & Kenny, 1986)

strongest demonstration of mediation occurring with path c is zero." (Baron & Kenny, 1986, p.1176).

In this technique a series of three regression models were estimated: first, each mediator (one of the clinical status variables) was regressed on the set of independent variables (continuity of care, prevention interventions, and patient acuity); second, the dependent variable (health services resource utilization) was regressed on the set of independent variables (continuity of care, prevention interventions, and patient acuity); and third, the dependent variable (health services resource utilization) was regressed on both the set of independent variables (continuity of care, prevention interventions, and patient acuity) and on the set of mediator variables (clinical status) as shown in Figure 8.

For this analysis the experimental and control groups were combined to determine the mediation effect. This provided a greater number of cases for the tests of mediation.

Chi-square analysis was completed to determine the differences between groups for patient demographic data related to primary diagnosis. The number of co-morbid conditions, and duration of dialysis between the groups was analyzed using t test for independent groups. Analysis of covariance was computed to determine if the patient groups differed by hospital based on the incidence of diabetes mellitus. Proportional analyses was completed to determine if there were any differences between the groups for the reasons for emergency department visits, type of special procedures, and reasons for hospital admissions. The professional staff responses to The Organization and Management of Collaborative Case Management was analyzed using a one-way ANOVA.

TEST OF MEDIATION - COLLABORATIVE CASE MANAGEMENT

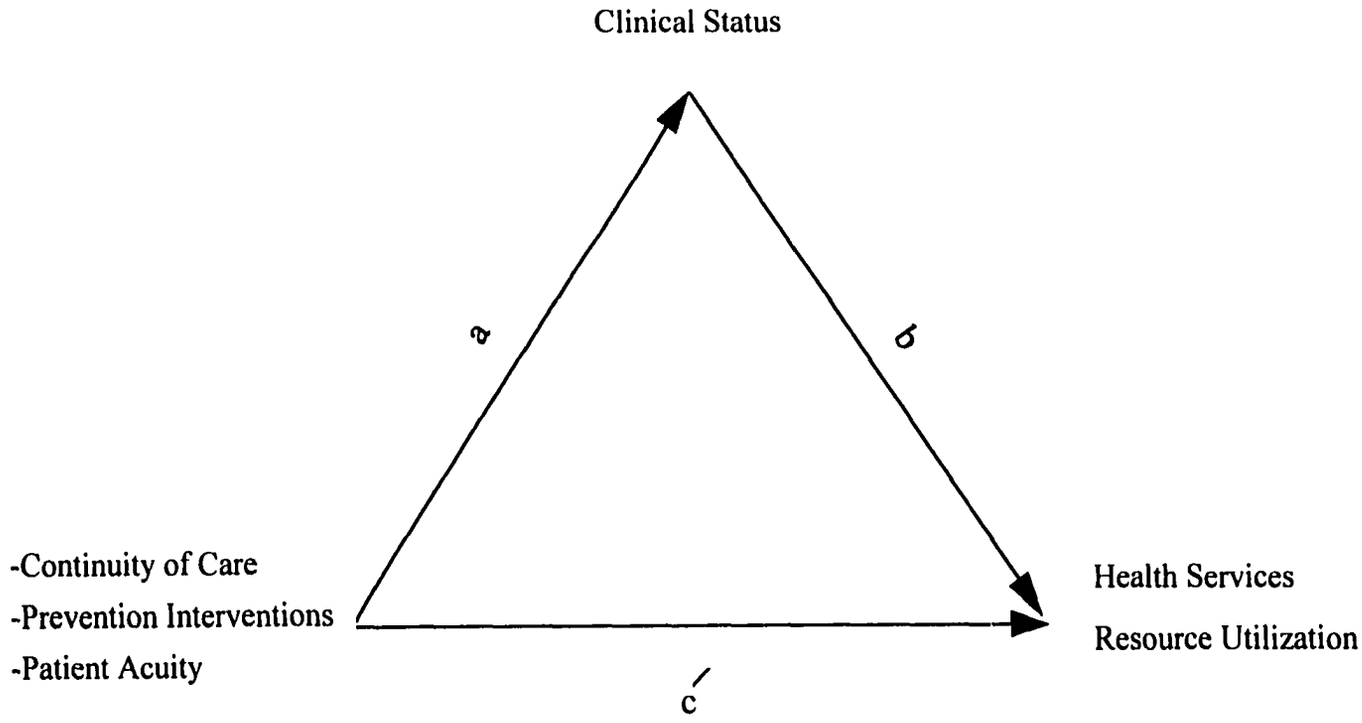


Figure 8.

Test of Mediation - Collaborative Case Management (Adapted from Baron & Kenny, 1986)

Protection of Human Subjects

Protection of human subjects was obtained from The Detroit Medical Center and Mercy Hospital of Detroit Institutional Review Boards (IRBs) (Appendix J). All patient data were extracted from the medical records (in- and outpatient) of the subjects. Professional staff, physicians and non-physicians were recruited to complete a questionnaire. In addition, the professional staff at the experimental site was interviewed. Subjects were assured of confidentiality and not identified by name on the questionnaire nor in the interview process.

Summary

To empirically test the CCM model the following components from the conceptual framework were selected (Figure 3). These included: structural -patient acuity ; process -communication, coordination, collaboration, continuity of care, and primary, secondary, and tertiary prevention interventions; outcomes -patient (clinical status) and system (health services resource utilization) (Figure 4).

Revised Research Questions. To test these components, this study responded to four of the original six overriding research questions:

1. Is there a relationship between the implementation of a collaborative model of case management and the clinical outcomes experienced by ESRD patients?
2. Is there a relationship between the implementation of a collaborative model of case management and subsequent health services resource utilization by patients with ESRD?

3. Is there a relationship between the implementation of a collaborative model of case management and continuity of care with ESRD patients?
4. Is there a relationship between the implementation of a collaborative model of case management and the level of communication, coordination, and collaboration perceived by non-physician and physician practitioners?

Revised Research Hypotheses. To answer these research questions, the following hypotheses were tested:

I. ESRD patients that receive care using a CCM model will have a significantly higher level of quality of care than those patients who receive care under the existing practices.

IA. ESRD patients that receive care using a CCM model will have a significantly higher level of nutritional status than those patients who receive care under existing practices.

IB. ESRD patients that receive care using a CCM model will have a significantly lower level of anemia than those patients who receive care under the existing practices.

IC. ESRD patients that receive care using a CCM model will have significantly more adequate doses of dialysis than those patients who receive care under the existing practices.

ID. ESRD patients that receive care using a CCM model will have significantly fewer complications related to vascular/prosthetic access problems than those patients who receive care under the existing practices.

II. ESRD patients that receive care using a CCM model will incur significantly lower health services resource utilization than those patients who receive care under existing practices.

IIA. ESRD patients that receive care using a CCM model will have significantly fewer emergency department visits, and for different reasons than those patients who receive care under the existing practices.

IIB. ESRD patients that receive care using a CCM model will have significantly fewer special procedures performed, and for different reasons than those patients who receive care under the existing practices.

IIC. ESRD patients that receive care using a CCM model will have significantly fewer hospital admissions and for different reasons than those patients who receive care under the existing practices.

IID. ESRD patients that receive care using a CCM model will have significantly fewer hospital days than those patients who receive care under the existing practices.

III. ESRD patients that receive care using a CCM model will experience significantly higher levels of continuity of care than those patients who receive care with existing practices.

IV. Non-physician and physician practitioners working within patient care units that have implemented a CCM model will perceive significantly higher levels of communication, coordination, and collaboration than those units functioning with existing care delivery practices.

The results from the data analysis completed to statistically test the CCM model will be presented in Chapter V.

CHAPTER V

PRESENTATION AND ANALYSIS OF DATA

In this chapter the data analysis used to test components of the CCM model and the results will be presented. The analysis is divided into two main sections: the data extracted from the medical records for the study patients, and data collected from professional staff.

Patients

Demographic data for the experimental and control groups are provided in Table 7. The mean age of the patients in the experimental group was 54.53 years with a range from 18 to 78; 57.6 percent were 60 years or above. Thirty-two (54.2%) were male and 58 (98.3%) were African-American. Twenty-two (37.3%) were married and 49 (83.1%) remained in the program at the time of data collection (July 1997-December 1997). Thirty-two (54.2%) had renal disease listed as their primary diagnosis and 23 (39.0%) as diabetes mellitus listed as primary. Hypertension was the most common co-morbid condition (n = 15, 25.4%) followed by the combination of diabetes mellitus and hypertension (n = 14, 23.7%).

The control group patient sample was similar in composition. A mean age of 55.62 years with a range from 32 to 78; 35.9 percent were over the age of 60 years.

Table 7

Descriptive Information for Patients

Variable	Experimental (N = 59)	Control (N = 39)
Age		
Mean	54.53	55.62
SD*	15.87	14.02
Range	18-78	32-78
Gender	n (%)	n (%)
Male	32 (54.2)	24 (61.5)
Female	27 (45.8)	15 (38.5)
Race	n (%)	n (%)
African-American	58 (98.3)	38 (97.4)
Caucasian	1 (1.7)	1 (2.6)
Marital Status	n (%)	n (%)
Married	22 (37.3)	11 (28.2)
Single	25 (42.4)	16 (41.0)
Sep/Div†	2 (3.4)	4 (10.3)
Widowed	8 (13.6)	6 (15.4)
SO×	0 (0.0)	1 (2.6)
Missing	2 (3.4)	1 (2.6)
Education	n (%)	n (%)
Less than HS	16 (27.1)	3 (7.7)
HS Graduate	18 (30.5)	4 (10.3)
Some College	1 (1.7)	0 (0.0)
College Grad	1 (1.7)	0 (0.0)
Missing	23 (39.0)	32 (82.0)
Employment Status	n (%)	n (%)
Employed	2 (3.4)	3 (7.7)
Unemployed	4 (6.8)	1 (2.6)
Un/Public Assit	32 (54.2)	22 (56.4)
Ret/Public Assit	16 (27.1)	8 (20.5)
Dis/Public Assit	4 (6.8)	5 (12.8)

Table 7 (Continued)

Health Insurance	n (%)	n (%)
Medicare	6 (10.2)	4 (10.3)
Medicade	7 (11.9)	8 (20.5)
Medicare/Medicade	19 (32.2)	16 (41.0)
BC/BS	1 (1.7)	3 (7.7)
HMO	1 (1.7)	0 (0.0)
Medicare/Other	25 (42.4)	8 (20.5)
Primary Diagnosis	**n (%)**	**n (%)**
Renal	32 (54.2)	27 (69.2)
Diabetes Mellitus	23 (39.0)	7 (17.9)
Hypertension	2 (3.4)	0 (0.0)
Other	2 (3.4)	5 (12.8)
Co-Morbid Conditions	**n (%)**	**n (%)**
CVD	1 (1.7)	6 (15.4)
DM/CVD	3 (5.2)	2 (5.1)
Hypertension	15 (25.4)	15 (38.5)
CVD/Hyper	10 (16.9)	2 (5.1)
DM/Hyper	14 (23.7)	5 (12.8)
DM/CVD/Hyper	12 (20.3)	8 (20.5)
Other	2 (3.4)	0 (0.0)
None	2 (3.4)	1 (2.6)
Duration of Dialysis	**n (%)**	**n (%)**
< 1 Year	6 (10.2)	3 (7.7)
2-3 Years	5 (8.5)	8 (20.5)
4-5 Years	30 (51.0)	13 (38.5)
6-7 Years	5 (8.5)	9 (23.1)
> 7 Years	12 (20.3)	3 (7.7)
Missing	1 (1.7)	1 (2.6)
Current Status	**n (%)**	**n (%)**
Remains in Program	49 (83.1)	39 (100%)
Transferred	1 (1.7)	0 (0.0)
Expired	5 (8.5)	0 (0.0)
Unknown	4 (6.8)	0 (0.0)

*Standard Deviation
†Separated/Divorced
×Significant Other

Males comprised 61.5% (24) of the predominant African-American (n = 38, 97.4%) sample. Eleven (28.2%) were married and all 39 (100%) remained in the program at the time of data collection. In comparison to the experimental group, 27 (69.2%) had renal disease documented as the primary diagnosis and 7 (69.2%) had diabetes mellitus documented. Again, hypertension was the most frequent co-morbid condition (n = 15, 38.5%) with diabetes mellitus, cardiovascular disease and hypertension in combination the second most common co-morbid factor (n = 8, 20.5%). In addition, within the experimental group, three patients were status post renal transplant, one was positive for HIV/AIDS, and two had a history of substance abuse compared to two, one and six (respectively) within the control group.

Analyses of means was used to determine statistical differences between the groups. The findings from the analyses related to primary diagnosis, co-morbid conditions, and duration of dialysis are shown in Table 8. The most interesting finding is the number of patients in the experimental group with diabetes mellitus, 23 (39%) as the primary diagnosis compared to 7 (17.9%) in the control group. Using chi-square analysis, this was a significant difference between the experimental and control groups ($\chi^2 = 4.24$, df =1, $p \leq .04$). Also, the patients within the experimental group were found to have been receiving dialysis for a significantly longer period of time; 81 percent 4 years or greater compared to 71 percent within the control group($t = 2.43$, $p < .02$).

Statistical differences were found between the groups for the presence of co-morbid conditions. Overall, there appeared to be a significant difference between the groups, with the experimental group experiencing more co-morbid conditions ($t = 1.96$, $p \leq .05$). In addition, cardiovascular disease and hypertension in combination

Table 8

Comparison Between Groups for Primary Diagnosis, Co-Morbid Conditions, and Duration of Dialysis

		Renal	Diabetes Mellitus	Other
Chi-Square				
Primary Diagnosis				
	Experimental	32	23	4
	Control	27	7	5
$\chi^2 = 4.24$, df = 1, $p \leq .04$				
		N	**Mean**	**t**
t Test				
Co-Morbid Conditions				
	Experimental	59	5.39	
	Control	39	4.69	
	Change		.70	1.96*
Cardiovascular/hypertension				
	Experimental	59	.17	
	Control	39	.05	
	Change		.12	1.94*
Duration of Dialysis				
	Experimental	59	5.61	
	Control	39	4.31	
	Change		1.30	2.43**

* $p < .05$
** $p < .02$

was significant within the experimental group ($t = 1.94$, $p \leq .05$). It would appear that the experimental group patients were more likely to have diabetes mellitus as the primary disease, a higher incidence of co-morbidity, and be longer term dialysis patients.

To more clearly determine the effect that diabetes mellitus had on the patient acuity, an analysis of covariance was completed. Change scores for the clinical status variables (nutritional status, level of anemia, adequacy of dialysis, and vascular access problems) were used to determine if the number of diabetic mellitus patients in the experimental group (hospital) had an effect on the acuity of the patients. The results showed that the experimental patient group was significantly different in relation to the number of diabetic mellitus patients for the following clinical status variables: nutritional status (F [degrees of freedom = 1,96] = 3.83, $p \leq .05$); adequacy of dialysis (F [degrees of freedom = 1,96] = 5.57, $p \leq .02$; and vascular access problems (F [degrees of freedom = 1,96] = 3.99, $p \leq .05$). It appeared that the presence of diabetes mellitus in the experimental patient group did effect the clinical outcomes which in turn could have had an effect on the patient acuity.

Change Scores

To determine if there were significant differences for the individual patient level data, t tests for change scores were computed within groups and between groups. The variables analyzed included: continuity of care, prevention interventions, patient acuity, clinical status, and health services resource utilization (Figure 4). Mean change scores were calculated for each variable from the pre- and post-measurement periods. The mean change scores were computed as follows: mean values were computed for continuity of care, prevention interventions, patient acuity, health services resource utilization, and

clinical status -vascular access problems for July-September 1995 (pre) and January through March 1996 (post) for each patient sample. The change score was computed by subtracting the post value from the pre value. For the clinical status variables -albumin, hemoglobin, hematocrit, and urea reduction ratio, the actual laboratory value for the respective variable was used to calculate the mean change score following the method above. Missing data were treated as zero in the analyses. The analysis will be presented by variable.

Continuity of Care. Continuity of care was hypothesized to improve with the implementation of CCM model. The paired t test for all of the continuity of care variables are shown in Table 9. There were significant changes from the pre- to post-measurement period in the expected direction for two variables within the experimental group: the gap in social worker visits decreased from 2.20 to 1.39 ($t = 5.43$, $p \leq .00$); and visits with the primary practitioner social worker increased from 1.90 to 2.73 ($t = -5.49$, $p \leq .00$). However, the gap in physician visits actually increased from .32 to 3.52 ($t = -15.86$, $p \leq .00$); this was not expected. Interestingly, within the control group the only significant difference was also observed in the gap in physician visits: again, this gap increased from .15 to 3.28 ($t = -31.78$, $p \leq .00$).

Using independent t test for change scores, continuity of care was also tested between the experimental and control groups (Table 10). Two significant differences in change scores in the expected direction were found. First, the findings suggest that the gaps in the experimental group for social work visits decreased significantly more than compared to the actual increase in the gaps in the control group with a mean change score of -1.17 ($t = -5.00$, $p \leq .00$). Second, the number of visits to a primary practitioner

Table 9

Paired t Test Change Scores- Continuity of Care

		Experimental n = 59 df = 58	t	Control n = 39 df = 38	t
Gap Freq. Dietician	Pre	.00		.00	
	Post	.00		.00	
	Change	.00	-	.00	-
Gap Freq. Nurse	Pre	.10		.00	
	Post	.03		.00	
	Change	.07	1.00	.00	-
Gap Freq. Phys.	Pre	.32		.15	
	Post	3.52		3.28	
	Change	-3.20	-15.86*	-3.13	-31.78*
Gap Freq. SW	Pre	2.20		1.44	
	Post	1.39		1.79	
	Change	.81	5.43*	-.35	-2.02
Freq. Prim. Prac.-Diet.	Pre	3.90		3.26	
	Post	3.80		3.28	
	Change	.10	.16	-.02	-.15
Freq. Prim. Prac.-Phys.	Pre	3.69		3.82	
	Post	3.71		3.77	
	Change	-.02	.90	.05	1.67
Freq. Prim. Prac.-SW	Pre	1.90		2.54	
	Post	2.73		2.23	
	Change	-.83	-5.49*	.31	1.67
Freq. Prim. Prac.-Oth.	Pre	.00		1.00	
	Post	.00		1.05	
	Change	.00	-	-.05	-1.43
Freq. Non-Prim. Prac. Dietician	Pre	.00		1.00	
	Post	.00		1.03	
	Change	.00	-	.03	-1.00

Table 9 (Continued)

Freq. Non-	Pre	.00		1.00	
Prim. Prac.	Post	.00		1.03	
Phys.	Change	.00	-	.03	-1.00
Freq. Non-	Pre	1.00		1.00	
Prim. Prac.	Post	1.02		1.03	
SW	Change	-.02	-1.00	-.03	-1.00
Freq. Non-	Pre	.00		1.05	
Prim. Prac.	Post	.00		1.08	
Other	Change	.00	-	.03	-.30

*$p \leq .00$

Table 10

Independent t Test Change Scores- Continuity of Care (df = 96)

		N	Mean	t
Gap Fre-Diet.	Experimental	59	.00	
	Control	39	.00	
	Change		.00	-
Gap Fre-Nur.	Experimental	59	-.07	
	Control	39	.00	
	Change		-.07	-.81
Gap Fre-Phys.	Experimental	59	.07	
	Control	39	.13	
	Change		-.06	-.33
Gap Fre-SW	Experimental	59	-.81	
	Control	39	.36	
	Change		-1.17	-5.00**
Prim. Prac.	Experimental	59	.75	
	Control	39	-.28	
	Change		1.03	2.88*
Non-Prim. Prac.	Experimental	59	.02	
	Control	39	.10	
	Change		-.08	-.54

*$p \leq .01$
**$p \leq .00$

increased while there was no difference in the number of visits in the control group with a mean change score of 2.88 ($t = 2.88$, $p \leq .01$).

Prevention Interventions. It was hypothesized that prevention interventions would increase with the implementation of the CCM model. Table 11 shows the results of the paired t test change scores for prevention interventions. There is support for this hypothesis: all three levels of intervention -primary, secondary, and tertiary- had significant increases between the pre and post measurement period for the experimental group. The greatest difference was seen in primary interventions with a mean change score of -9.69 ($t = -13.32$, $p \leq .00$). Within the control group, only primary interventions increased significantly with a change score of -1.79 ($t = -3.10$, $p \leq .01$) and secondary interventions actually slightly decreased. Independent t test change scores for prevention interventions also revealed significant differences for all three levels (Table 12). Again, the greatest change occurred with primary interventions (mean change score = 7.90, $t = 7.80$, $p \leq .00$).

Patient Acuity. Tables 13 and 14 display the findings of the paired t test and the independent t test for change scores for patient acuity respectively. Within the experimental group the mean patient acuity increased significantly from 6.88 to 7.19 ($t = -3.13$, $p \leq .01$) during the study period. There was no statistical difference noted in the control group. Between group differences indicated that the patients in the experimental group became significantly more acute than patients in the control group during the study period (mean change score = .26, $t = 2.44$, $p \leq .02$). This may explain some of the findings related to both clinical and utilization outcomes of the study. Support for this finding was also determined through the analysis of covariance with the number of diabetic mellitus

Table 11

Paired t Test Change Scores- Prevention Interventions

		Experimental n = 59 df = 58		Control n = 39 df =38	
			t		t
Primary	Pre	18.25		19.90	
	Post	27.95		21.69	
	Change	-9.70	-13.32***	-1.79	-3.10**
Secondary	Pre	3.03		3.28	
	Post	3.41		3.21	
	Change	-.38	-2.25*	.07	.60
Tertiary	Pre	.44		.85	
	Post	1.36		.95	
	Change	-.92	-6.12***	-.10	-.54

*$p \leq .03$
**$p \leq .01$
***$p \leq .00$

Table 12

Independent t Test Change Scores- Prevention Interventions (df = 96)

		N	Mean	t
Primary	Experimental	59	9.69	
	Control	39	1.79	
	Change		7.90	7.80***
Secondary	Experimental	59	.37	
	Control	39	-.08	
	Change		.45	2.14*
Tertiary	Experimental	59	.92	
	Control	39	.10	
	Change		.82	3.38**

*$p \leq .04$
**$p \leq .01$
***$p \leq .00$

Table 13

Paired t Test Change Scores- Patient Acuity

		Experimental n = 59 df = 58		Control n = 38 df = 38	
			t		t
Patient Acuity	Pre	6.88		6.56	
	Post	7.19		6.62	
	Change	-.31	-3.13*	-.06	-1.43

*$p \leq .01$

Table 14

Independent t Test Change Scores- Patient Acuity (df = 96)

		N	Mean	t
Paitent Acuity	Experimental	59	.31	
	Control	39	.05	
	Change		.26	2.44*

*$p \leq .02$

patients in the experimental group effecting the clinical status variables -nutritional status, adequacy of dialysis, and vascular access problems.

Clinical Status. Clinical status in the experimental group was hypothesized to improve with the implementation of the CCM model. The within group changes for the clinical status variables -albumin, hemoglobin, hematocrit, urea reduction ratio, all vascular access problems, and those related to clotting and infection- are shown in Table 15. There is some support for this hypothesis. Within the experimental group the clinical level of hemoglobin increased from 8.19 to 9.14 grams ($t = -2.09$, $p \leq .04$); the percent of the urea reduction ratio increased from 51.51 to 59.40 ($t = -7.89$, $p \leq .01$); the number of vascular access problems decreased from an average of .66 to .45 ($t = 2.53$, $p \leq .01$); and specifically, the average number of vascular access infections decreased from an average of .09 to .04 ($t = 2.26$, $p \leq .03$) The only variable that did not change in the expected direction within the experimental group was albumin; there was a slight decrease in the level. Within the control group the mean clinical levels of albumin and hematocrit increased significantly from 3.62 to 3.99 grams ($t = -3.08$, $p \leq .01$) and from 26.98 to 29.02 percent ($t = -2.60$, $p \leq .01$) respectively. A slight non-significant increase in hemoglobin was also noted in the control group.

Between group differences are shown in Table 16. Significant changes were seen in albumin, urea reduction ratio levels, and vascular access problems. The increase in albumin levels for the control group was significantly higher than the decrease in the experimental group with a mean change score of -.40 ($t = -2.13$, $p \leq .04$). However, the urea reduction ratio had a greater increase in the experimental group as compared to a

Table 15

Paired t Test Change Scores- Clinical Status

		Experimental n = 59 df = 58		Control n = 39 df = 38	
			t		t
Albumin	Pre	3.44		3.62	
	Post	3.41		3.99	
	Change	.03	.19	-.37	-3.08***
Hemoglobin	Pre	8.19		8.59	
	Post	9.14		8.78	
	Change	-.95	-2.09*	-.19	-.72
Hematocrit	Pre	26.97		26.98	
	Post	28.74		28.87	
	Change	-1.77	-1.34	-1.89	-2.21*
Urea Reduc.	Pre	51.51		58.16	
Ratio	Post	59.40		57.12	
	Change	-7.89	-3.31***	1.04	.53
Vas. Access	Pre	.66		.37	
Prob.	Post	.45		.47	
	Change	.21	2.53***	-.10	-.71
Vas. Access	Pre	.20		.09	
Prob.-Clotting	Post	.20		.10	
	Change	.00	.00	-.01	-.18
Vas Access	Pre	.09		.05	
Prob.-Infect.	Post	.04		.02	
	Change	.05	2.26**	-.03	1.43

*$p \leq .04$
**$p \leq .03$
***$p \leq .01$

Table 16

Independent t Test Change Scores- Clinical Status (df = 96)

		N	Mean	t
Albumin	Experimental	59	-.03	
	Control	39	.37	
	Change		-.40	-2.13*
Hemoglobin	Experimental	59	.95	
	Control	39	.19	
	Change		.76	1.43
Hematocrit	Experimental	59	1.77	
	Control	39	2.04	
	Change		-.26	-.17
Urea Reduc.	Experimental	59	7.78	
Ratio.	Control	39	-1.04	
	Change		8.82	2.55**
Vas. Access	Experimental	59	-.21	
Prob.	Control	39	.09	
	Change		-.31	-2.06*
Vas. Access	Experimental	59	.00	
Prob.-Clott.	Control	39	.01	
	Change		-.01	-.12
Vas Access	Experimental	59	-.05	
Prob.-Infec.	Control	39	-.03	
	Change		-.02	-.49

*$p \leq .04$
**$p \leq .01$

decrease in the control group (mean change score = 8.82, t = 2.55, $p \leq .01$). The frequency of all vascular access problems decreased significantly more in the experimental group as compared to the increase in the frequency within the control group; mean change score = -.31, t = -2.06, $p \leq .04$.

Health Services Resource Utilization. It was hypothesized that health services resource utilization would decrease with the implementation of the CCM model. This hypothesis was not statistically supported. Results of the paired t test for mean change scores for the health services resource utilization variables -emergency department visits, special procedures, hospital admissions, and hospital LOS are shown in Table 17. The only significant finding was in the control group for hospital admissions: there was a decrease from .92 to .31 (t = 3.19, $p \leq .01$). Although not statistically significant, the number of hospital days for the experimental group decreased from 7.36 to 6.20 during the study period.

Similarly, the between group analysis showed a significant difference with hospital admissions: the experimental group experienced more admissions compared to an actual decrease in the control group with a mean change score of .95 (t = 3.08, $p \leq .01$) (Table 18). These findings may be associated with the level of acuity noted above within the groups; the experimental patient group acuity level increased significantly more than the increase in the control group.

Multiple Regression

The relationship between continuity of care, prevention interventions and patient acuity, and clinical status and health services resource utilization was determined through multiple regression techniques. The relationship between the independent variables and

Table 17

Paired t Test Change Scores- Health Services Resource Utilization (df = 96)

		Experimental n = 59 df = 58		Control n = 39 df = 38	
			t		t
Emergency Department Visits	Pre	4.22		4.05	
	Post	4.39		4.10	
	Change	-.17	-1.18	-.05	-.26
Special Procedures	Pre	4.58		4.21	
	Post	4.66		3.85	
	Change	-.08	-.26	.36	1.19
Hospital Admissions	Pre	.93		.92	
	Post	1.27		.31	
	Change	-.34	-1.56	.61	3.19*
Hospital LOS	Pre	7.36		4.86	
	Post	6.20		4.79	
	Change	1.16	.75	.07	.05

*$p \leq .01$

Table 18

Independent t Test Change Scores- Health Services Resource Utilization (df = 96)

		N	Mean	t
Emergency Department Visits	Experimental	59	.17	
	Control	39	.05	
	Change		.12	.50
Special Procedures	Experimental	59	.08	
	Control	39	-.36	
	Change		.44	.99
Hospital Admissions	Experimental	59	.34	
	Control	39	-.62	
	Change		.96	3.08*
Hospital LOS	Experimental	59	-1.16	
	Control	39	-.06	
	Change		-1.10	-.49

*$p \leq .01$

clinical status was directly determined. Additionally, a test for mediation as described earlier, was computed to determine if the impact of the independent variables on health services resource utilization was mediated by the clinical status variables.

Mediation Effect. To determine what variables were appropriate to include in the set of multiple regression equations to assess mediation, Pearson correlations for change scores (pre-post) in the independent variables, the clinical status variables, and in the health services resource utilization variables were computed (Table 19). Only those variables that were significantly correlated with any other variable were included in the mediation regression equations. In addition, the variables -duration of gaps for dietician, nurse, physician, and social worker were deleted because of multicollinearity with frequency of gaps for the same practitioners. These correlations ranged from .82 (dietician) to 1.00 (nurse, physician, social worker) (Hamilton, 1992). The mediation will be presented in three sections following the Baron and Kenny (1986) description above.

Path "a" (Figure 8): multiple regression for clinical status variables on continuity of care and prevention interventions (Table 20). Each clinical status variable was regressed separately on the independent variables (predictors) with which they were significantly correlated. For example, albumin was significantly correlated with the continuity of care variables -gap in dietician, nurse, and physician visits, and with the intervention variable -primary. Table 20 shows this regression. Continuity of care and interventions together explained 22 percent of the variation in the albumin level of the subjects with a significant F value ($F = 6.40$, $p \leq .00$). An increase in gaps in the frequency of dietician ($p \leq .00$) and physicians visits ($p \leq .01$), and an increase in the

Table 19

Table of Pearson Correlations: Clinical Status and Health Services Resource Utilization Variables with Continuity of Care, Prevention Interventions, and Patient Acuity Variables

Independent Variable	Albumin	Hemoglobin	Hematocrit	Urea Red. Ratio	Vasc. Acc. Prob.	ED Visits	Spec. Proc.	Hosp. Adm.	Hosp. LOS
Primary Pract.	.21 *	.23 *	.15	.07	.27 *	.01	-.06	.02	-.11
Non-Prim. Pract.	-.01	-.03	-.03	.03	.02	.17	.04	.07	.03
Gap-Dur. Diet.+	-.30 **	-.16	-.07	.04	-.14	.05	.17	.10	.15
Gap-Dur. Nurse+	-.20 *	-.11	-.12	-.07	-.30 *	.03	.15	.13	.44 **
Gap-Dur. Phys.+	-.32 **	-.20	-.23	-.03	-.13	-.10	.13	.06	.22 *
Gap-Dur. SW+	.12	-.12	-.01	-.10	.01	.02	-.07	-.11	.03
Gap-Freq. Diet.	.30 **	-.09	-.06	-.28 *	-.18	.03	.24	.21 *	.19
Gap-Freq. Nurse	-.20 *	-.11	-.12	-.07	-.30 *	.03	.15	.13	.44 **
Gap-Freq. Phys.	-.32 **	-.20	-.26	-.03	-.13	-.10	.13	.06	.22 *
Gap-Freq. Sw	.12	-.18	-.01	-.10	.01	.02	-.07	-.11	.03
Prim. Interv.	.33 **	.45 *	-.31	.47 *	.27 *	.02	.07	.19	-.15
Sec. Interv.	.20	.22 *	.12	.38 *	.24 *	.12	.07	.00	-.10
Tert. Interv.	-.07	.10	.02	.14	-.01	-.05	.04	.08	-.01
Patient Acuity	-.07	.10	-.04	.10	.15	.12	.16	.09	.16

*** $p < .05$**

**** $p < .01$**

+ Deleted - multicollinearity

Table 20
Multiple Regression for Clinical Status Variables on Continuity of Care and Prevention Interventions

Predictor	Beta	t	Significance t
Path a			
ALBUMIN			
Continuity of Care			
Primary Practitioner	-.12	-1.06	.29
Gap-Frequency			
Dietician	-.31	-3.14	.00**
Nurse	.01	.10	.92
Physician	-.27	-2.68	.01**
Interventions			
Primary	.33	3.21	.00***
Multiple R = .51, Adjusted R^2 = .22			
F [degrees of freedom = (5, 92)] = 6.40 Significance of F = .00			
HEMOGLOBIN			
Continuity of Care			
Primary Practitioner	.09	.84	.40
Interventions			
Primary	.46	4.33	.00****
Secondary	-.11	-1.07	.29
Multiple R = .46, Adjusted R^2 = .19			
F [degrees of freedom = (3, 94)] = 8.41 Significance of F = .00			
HEMATOCRIT			
Continuity of Care			
Gap-Frequency			
Physician	-.20	-2.05	.04*
Interventions			
Primary	.26	2.68	.01**
Multiple R = .36, Adjusted R^2 = .11			
F [degrees of freedom = (2, 95)] = 7.20 Significance of F = .00			

Table 20 (Continued)

UREA REDUCTION RATIO			
Continuity of Care			
Gap-Frequency			
Dietician	.13	1.50	.14
Interventions			
Primary	.38	4.09	.00****
Secondary	.27	2.94	.00***

Multiple R = .54, Adjusted R^2 = .27
F [degrees of freedom = (3, 94)] = 12.94 Significance of F = .00

VASCULAR ACCESS PROBLEMS			
Continuity of Care			
Primary Practitioner	.11	.96	.34
Gap-Frequency			
Nurse	-.22	-2.19	.03**
Interventions			
Primary	.12	1.13	.26
Secondary	.14	1.29	.20

Multiple R = .40, Adjusted R^2 =.13
F [degrees of freedom = (4, 93)] = 4.50 Significance of F = .00

* $p \leq .05$
** $p \leq .04$
*** $p \leq .01$
**** $p \leq .00$

number of primary interventions performed ($p \leq .00$) were associated with a significant increase in serum albumin level.

In a similar fashion, hemoglobin, hematocrit, urea reduction ratio, and vascular access problems were regressed separately on the appropriate independent variables. These regressions are also displayed in Table 20. Although the adjusted R^2 ranged only from .11 to .27 with F values ranging from 4.50 to 12.94, these were all significant ($p \leq .00$). Several of these variables were found to be significant predictors of clinical status. Hemoglobin levels were significantly higher as the number of primary interventions performed increased ($F = 8.41$, $p \leq .00$). An increase in the number of gaps in physician visits and the number of primary interventions performed together explained 11 percent of the variation in the hematocrit level with a significant F value ($F = 7.20$, $p \leq .01$). An increase in the number of primary and secondary interventions performed ($F = 12.94$, $p \leq .00$) were associated with a significant increase in the urea reduction ratio level with 27 percent of the variation explained. The decrease in the number of gaps of nurse visits was associated with a significant decrease in the number of vascular access problems ($F = 4.50$, $p \leq .03$) with 13 percent of the variation explained.

Path "c" (Figure 9): the multiple regression equation for the health services resource utilization variables regressed on continuity of care is shown in Table 21. Again, each variable -health services resource utilization variables- was regressed separately on the independent variables -continuity of care. The only dependent variables that were significantly correlated with the independent variables were as follows: special procedures -gap in dietician visits; hospital admissions -gap in dietician visits; hospital LOS -gap in nurse and physician visits. The results of the first and second

IMPACT OF CONTINUITY OF CARE AND PREVENTION INTERVENTIONS ON HEALTH SERVICES RESOURCE UTILIZATION

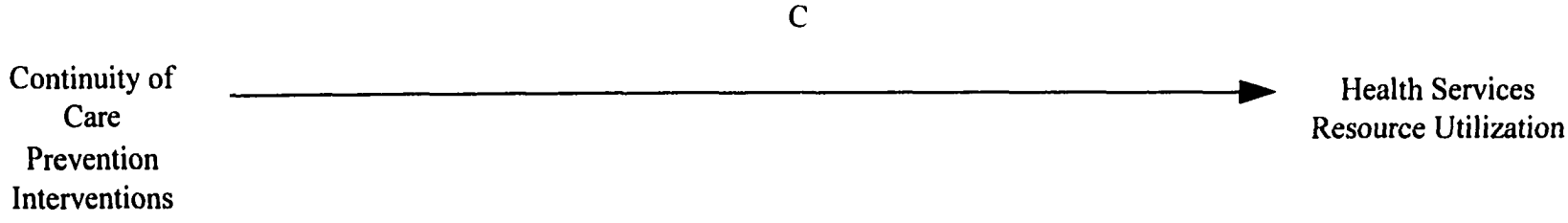


Figure 9.

Impact of Continuity of Care and Prevention Interventions on Health Services Resource Utilization

Table 21

Multiple Regression for Health Services Resource Utilization Variables on Continuity of Care

Predictor	Beta	t	Significance t
Path c			
SPECIAL PROCEDURES			
Continuity of Care			
Gap-Frequency	.24	2.42	.02**
Dietician			
Multiple R = .24, R^2 = .05			
F [degrees of freedom = (1, 96)] = 5.85 Significance F = .02			
HOSPITAL ADMISSSIONS			
Continuity of Care			
Gap-Frequency			
Dietician	.21	2.08	.04**
Multiple R = .23, R^2 = .03			
F [degrees of freedom = (1, 96)] = 4.31 Significance of F = .04			
HOSPITAL LOS			
Continuity of Care			
Gap-Frequency			
Nurse	.41	4.29	.00***
Physician	.13	1.35	.18
Multiple R = .45, Adjusted R^2 = .19			
F [degrees of freedom = (2, 95)] = 12.22 Significnace of F = .00			

* $p \leq .05$
** $p \leq .03$
*** $p \leq .01$

regressions as seen in Table 21 indicated that the frequency of the visits with the dietician is a significant predictor of the number of special procedures ($R^2 = .05$, $F = 5.85$, $p \leq .02$) and the number of hospital admissions ($R^2 = .04$, $F = 4.31$, $p \leq .04$). The third regression equation revealed that the frequency of nurse visits was a predictor of hospital LOS ($R^2 = 19$, $F = 12.22$, $p \leq .00$). Therefore, as the number of gaps decreased, the LOS decreased.

Path c´ (Figure 8): from the previous regression equations, the following significant variables emerged as appropriate for the test of mediation: predictors -gaps in dietician and nurse visits; mediators -albumin and vascular access problems. These variables were regressed on the significant health services resource utilization variables -special procedures, hospital admissions, and hospital LOS. The results of the test of mediation are shown in Table 22.

Albumin level was a significant factor in predicting the number of special procedures ($t = -2.06$, $p \leq .05$) but not for the number of hospital admissions ($t = -.96$, $p \leq .34$). Albumin together with gaps in dietician visits explained 31 percent of the variation in special procedures ($F = 5.14$, $p \leq .01$).

Neither gaps in dietician visits nor albumin were found to be significant predictors for hospital admissions ($F = 2.61$, $p \leq .08$). Gaps in the frequency of nurse visits continued to be a significant factor in the prediction of hospital LOS ($t = 4.25$, $p \leq .00$) while vascular access problems were not a significant factor in LOS ($t = -.84$, $p = .40$). Together these variables predicted 44 percent of the variation in hospital LOS ($F = 11.54$, $p \leq .00$).

Table 22
Multiple Regression for Health Services Resource Utilization Variables on Continuity of Care and Clinical Status

	Beta	t	Significance t
Path c			
Predictor			
SPECIAL PROCEDURES			
Continuity of Care			
Gap-Frequency			
Dietician	.18	1.75	.08
Mediator			
Cinical Status			
Albumin	-.21	-2.06	.04*
Multiple R = .31 Adjusted R^2 = .08			
F [degrees of freedom = (2, 95] =5.14 Significance of F = .01			
Predictor			
HOSPTIAL ADMISSIONS			
Continuity of Care			
Gap-Frequency			
Dietician	.18	1.70	.09
Mediator			
Clinical Status			
Albumin	-.10	-.96	.34
Multiple R = .23, Adjusted R^2 = .03			
F [degrees of freedom = (2, 95)] = 2.61 Significance of F = .08			

Table 22 (Continued)

Predictor			
HOSPITAL LOS			
Continuity of Care			
Gap-Frequency Nurse	.41	4.25	.00**
Mediator			
Clinical Status			
Vascular Access Problems	-.08	-.84	.40

Multiple R = .44, Adjusted R^2 = .18
F [degrees of freedom =(2, 95)] = 11.54 Significance of F = .00

---

* $p \leq .05$
** $p \leq .01$

A summary of all three regression equations is shown in Table 23. The summary of the results of the test of mediation is displayed in Table 24. There appears to be some support for the mediation effect of clinical status. First, with special procedures and gap in dietician visits with (Path c Beta = .24, Path c′ Beta =.18). This indicates that albumin had a mediating effect on the relationship between special procedures and gap in dietician visits. Second, although albumin was not a significant factor in predicting hospital admissions, in conjunction with gap in dietician visits it also appears to have had a slight mediating effect on hospital admissions (Path c Beta = .21; Path c′ Beta = .18). However, hospital LOS did not appear to be mediated by vascular access problems with Path c and c′ Betas remaining constant at .41.

Proportional Analyses of Visits, Procedures, and Admissions

To determine if there were any differences based on reasons for emergency department visits, special procedures, and hospital admissions, both within (pre-post) the groups and between the groups, proportions in each category were calculated.

The reasons for emergency department visits were classified into three categories: those related to problems with the access device (catheter or shunt); to complications of diabetes mellitus; or for other reasons. If there were multiple reasons for the visit, the reason identified on the patient's discharge or transfer from the emergency department as the "chief complaint" was selected (Table 25).

The most frequent reason documented for visits within the experimental group was "other" (29) followed closely by "access device"; these same reasons were tied at 17 within the control group. The category "other" included such reasons as: heart disease; respiratory conditions; and infections excluding those related to the access device.

Table 23

Summary of Mediation Regression Equations: Health Services Resource Regressed on Continuity of Care, Prevention Interventions, and Clinical Status

	Equation #1 **Path a**					Equation #2 **Path c**				Equation #3 **Path ć**			
	AL	HB	HM	URR	VAP	ED	SP	HA	LOS	ED	SP	HA	LOS
Predictor													
Primary Practitioner	ns†	ns	-	-	ns	-	-	-	-	-	-	-	-
Gap-Frequency													
Dietician	.00*	-	-	ns	-	-	.02*	.04*	-	-	ns	ns	-
Nurse	ns	-	-	-	.03*	-	-	-	.00*	-	-	-	.00*
Physician	.01*	-	.04*	-	-	-	-	-	ns	-	-	-	-
Interventions													
Primary	.00*	.00*	.01*	.00*	ns	-	-	-	-	-	-	-	-
Secondary	-	ns	-	.00*	ns	-	-	-	-	-	-	-	-
Mediator													
Clinical Status													
Albumin	na×	-	-	-	-	-	-	-	-	-	.04*	ns	-
VAP	-	-	-	-	na	-	-	-	-	-	-	-	ns

† non-significant
- not in the equation
* p
× not applicable

Table 24

Results of Mediation for Health Services Resource Variables Regressed on Continuity of Care Controlling for Clinical Status

Predictor LOS	Special Procedures	Hospital Admissions	
	Beta	Beta	Beta
Continuity of Care			
Gap-Frequency			
Dietician			
Path c	.24	.21	-
Path ć	.18	.18	-
Nurse			
Path c	-	-	.41
Path ć	-	-	.41

Table 25

Comparison Within and Between Groups on Reasons for Emergency Department Visits

	Emergency Department Visit Reasons							
Group	**Access Device**		**Diabetes Mellitus**		**Other**		**Total**	
Experimental	*n*	Proportion	*n*	Proportion	*n*	Proportion	*n*	Proportion
Pre	26	.41	7	.11	29	.47	62	1.00
Post	43	.43	9	.09	49	.49	101	1.00
Total	69	.42	16	.10	78	.48	163	1.00
Control								
Pre	17	.43	6	.15	17	.43	40	1.00
Post	20	.43	5	.11	22	.47	47	1.00
Total	37	.42	11	.13	39	.45	87	1.00

"Access device" included any problem (clotting, infection, pseudoaneurysm, stenosis, recirculation, and swelling/erythema) related to the catheter or shunt used for the dialysis procedure. The proportions for each category of reasons vary only slightly within and between the groups indicating that there is no difference in the reasons for the emergency department visits.

Similarly, the reasons for special procedures and their respective proportions are shown in Table 26. The reasons fell into one of four categories: catheter/shunt; vessel; blood transfusion; and other. Reasons related to "vessel" ranked the most frequent procedure performed in both groups. These included any procedure involving the arterial or venous blood vessels used for dialysis such as thromboplasty, angioplasty, or incision and drainage. Procedures involving the dialysis catheter or shunt emerged the second most frequent reason within the experimental group, while blood transfusions came in second for the control group. There is considerable variation within and between the groups for several of the categories to suggest that there is a difference in the reasons for the special procedures. Most notably, there were proportionately fewer procedures related to "vessel" during the post measurement period in the experimental group (.28) compared to the control group (.44).

The reasons for hospital admissions were assessed using the principle diagnosis as defined by the ICD-CM 9 code for each patient upon discharge from the hospital. These reasons fell into three categories: renal disease; complications of diabetes mellitus; and other. "Other" included conditions related to heart disease, respiratory disease, or surgical procedures (excluding those related to the access device or the vessel). In both groups

Table 26

Comparison Within and Between Groups on Reasons for Special Procedures

	Special Procedure Reasons									
Group	**Catheter/Shunt**		**Vessel**		**Blood Transfusion**		**Other**		**Total**	
Experimental	*n*	Proportion	*n*	Proportion	*n*	Proportion	*n*	Proportion	*n*	Proportion
Pre	28	.27	33	.32	21	.21	20	.20	102	1.00
Post	39	.35	32	.28	14	.13	28	.25	113	1.00
Total	67	.31	65	.30	35	.16	48	.22	215	1.00
Control										
Pre	7	.13	24	.44	14	.25	10	.18	55	1.00
Post	5	.12	18	.44	7	.17	11	.27	41	1.00
Total	12	.13	42	.44	21	.22	21	.22	96	1.00

those diagnoses related to "renal disease" were found to be the most frequent reason followed by the "other" category (Table 27).

The proportion of patients admitted for diabetes mellitus (.17) was greater in the experimental group in the post measurement period compared to the proportion of patients in the control group for the same period (.08). However, there were fewer patients proportionately admitted for "other" reasons in this period in the experimental group (.36) compared to the control group (.42). These results support that the reasons for hospital admissions were different between the groups. The higher incidence of diabetes mellitus and the higher patient acuity within the experimental may have contributed to this finding.

Professional Staff

Non-Physicians

The non-physician practitioner group at each site was comprised of registered nurses, social workers, pharmacists, dieticians, and physician assistants. The demographic data for these groups are shown in Table 28. Twenty-nine out of a possible 35 (83%) subjects from the experimental group responded to the questionnaire. In comparison, 19 from a total of 24 (79%) participated from the control group. The age, years since original licensure, years worked in the institution and in the unit were similar between the groups. Within the experimental and control groups most of the participants were registered nurses, female, worked the day shift and were full time employees. Differences between groups included more staff rotation to the evening and night shifts and more full-time staff within the experimental group compared to those in the control group. In

Table 27

Comparison Within and Between Groups on Reasons for Hospital Admissions

	Hospital Admissions Reasons							
Group	**Renal**		**Diabetes Mellitus**		**Other**		**Total**	
Experimental	*n*	Proportion	*n*	Proportion	*n*	Proportion	*n*	Proportion
Pre	29	.53	6	.11	20	.36	55	1.00
Post	35	.47	13	.17	27	.36	75	1.00
Total	64	.49	19	.15	47	.36	130	1.00
Control								
Pre	18	.50	6	.17	12	.33	36	1.00
Post	6	.50	1	.08	5	.42	12	1.00
Total	24	.50	7	.15	17	.35	48	1.00

Table 28

Descriptive Information for Non-Physicians

Variable	Experimental n = 29	Control n = 19
Age		
Mean	41.36	41.42
SD	10.81	9.34
Years-Original License		
Mean	13.29	12.68
SD	10.24	10.24
Years-Institution		
Mean	8.69	7.79
SD	5.45	7.04
Years-Unit		
Mean	5.76	4.39
SD	3.05	3.81
Gender		
Male	5 (17.2%)	3 (15.8%)
Female	24 (82.8%)	16 (84.2%)
Discipline		
Nursing	21(72.4%)	14 (73.7%)
Social Work	1(3.4%)	1 (5.3%)
Pharmacy	2 (6.9%)	1 (5.3%)
Dietetics	1 (3.4%)	1 (5.3%)
Physician Assistant	4 (13.8%)	1 (5.3%)
Missing	0 (0.0%)	1 (5.3%)
Education		
Nursing		
BS	3 (10.3%)	3 (15.8%)
AD	11(37.4%)	4 (21.1%)
Diploma	4 (13.8%)	5 (26.3%)
MS	2 (6.9%)	0 (0.0%)

Table 28 (continued)

Non-Nursing		
BS	8 (27.6%)	3 (15.8%)
MS	1 (3.4%)	1 (5.3%)
Missing	0 (0.0%)	3 (15.8%)
Shift		
Day	14 (48.3%)	14 (73.7%)
Evening	2 (6.9%)	1 (5.3%)
Night	1 (3.5%)	3 (15.8%)
Day-Evening (7a-7p)	8 (27.6%)	0 (0.0%)
Evening-Night (7p-7a)	4 (13.7%)	1 (5.3%)
Status		
Full Time	24 (83%)	11 (57.9%)
Part Time	2 (7%)	3 (15.8%)
Contingent	3 (10%)	5 (26.3%)

addition, there were only two master's prepared nurses in the sample and both were from the experimental group.

The non-physician responses to The Organization and Management of Collaborative Case Management (Appendix D) are summarized in Table 29. This instrument was adapted from Shortell et al's. (1991) work with intensive care units and was used to assess the level of communication, coordination, and collaboration present in the study groups. The questionnaire was divided into three main sections, one for each variable with a total possible score of 270 allocated as follows: communication (185 points), coordination (45 points), and collaboration (40 points). Higher scores are representative of higher levels of the respective variable. Each main section was then sub-divided as follows:

-communication: within practitioner group (non-physician to non-physician) = 50
between practitioner groups (non-physician to physician) = 55
general relationships = 45
satisfaction = 35
-coordination: within patient care unit = 25
between patient care units = 20
-collaboration: within practitioner group = 20
between practitioner groups = 20
-total responses = 270.

Items in each sub-section were summed and compared using a one-way ANOVA test to examine whether any observed differences were reasonably attributed to chance or whether there was reason to suspect true differences between the hospitals. Two significant differences were found: coordination (within patient care unit -within hospitals) ($F = 5.48$, $p = .02$); and collaboration (within practitioners-within hospitals) ($F = 6.93$, $p = .01$) (Table 30). Coordination within the patient care unit was perceived to be higher in the unit with the CCM model as well as collaboration with the non-physician

Table 29

Non-Physician Responses: Communication, Coordination, and Collaboration

Scale	Experimental n = 29		Control n = 19	
	Mean	SD	Mean	SD
Communication-				
Within Practitioner Group	34.69	6.51	34.53	6.43
Between Practitioner Groups	38.83	6.33	38.21	5.33
General Relationships	27.69	3.78	27.63	4.75
Satisfaction	26.10	2.40	24.68	3.42
Coordination-				
Within Patient Care Unit	19.90	2.21	17.89	3.73
Between Patient Care Units	13.93	3.32	13.16	5.08
Collaboration-				
Within Practitioner Group	13.97	2.46	11.26	4.64
Between Practitioner Groups	12.90	3.48	11.47	4.13
Total Responses	188.00	22.66	178.84	23.81

Table 30

One-Way ANOVA Results of Non-Physician Practitioners Grouped by Hospital (n = 48)

Scale	df	Sum of Squares	F Ratio	Probability
Communication-				
Within Practitioners				
Between Hospitals	1	.31		
Within Hospitals	46	1930.94	.01	.93
Between Practitioners				
Between Hospitals	1	4.37		
Within Hospitals	46	1633.30	.12	.73
General Relationships				
Between Hospitals	1	.04		
Within Hospitals	46	806.63	.00	.96
Satisfaction				
Between Hospitals	1	23.12		
Within Hospitals	46	370.80	2.87	.10
Coordination-				
Within Patient Care Unit				
Between Hospitals	1	46.00		
Within Hospitals	46	386.48	5.48	.02*
Between Patient Care Units				
Between Hospitals	1	6.86		
Within Hospitals	46	772.39	.41	.53
Collaboration-				
Within Practitioners				
Between Hospitals	1	83.83		
Within Hospitals	46	556.65	6.93	.01*
Between Practitioners				
Between Hospitals	1	23.24		
Within Hospitals	46	645.43	1.66	.21
Total Responses				
Between Hospitals	1	962.72		
Within Hospitals	46	24580.53	1.80	.19

*$p \leq .02$
**$p \leq .01$

group, as compared to the unit not functioning with the CCM model. However, communication was not significantly different on any of the dimensions examined and no differences were found between the groups (hospitals).

Based upon the results of the one-way ANOVA test, the intra-class correlation coefficients were calculated to examine clustering effects. As shown in Table 31, the intra-class correlation coefficients (ri) ranged from -.04 to .20. The estimation of the intra-class correlation coefficients is considered to be a good index of estimating between group, in this case, hospital variance (Blalock, 1960; Florin, Giamartino, Kenny, and Wandersman, 1990). Here, the intra-class correlation coefficient values are small (less than .20). These measures take on greater magnitude as between groups variances increase and within groups variances decrease; i.e. less than 0 values are reflective of larger variances (less homogeneity) within the hospital groups compared to variances between the hospitals.

These intra-class correlation coefficients suggest that, although these measures were collected using cluster sampling techniques (patient care unit by hospital), it is appropriate to analyze these non-physician practitioners using the individual level scores. In other words, the patient care units are not very homogeneous and there is considerable within-class variation. As a result, it is appropriate to use individual level measures for analyses regardless of using cluster sampling techniques for data collection.

Physicians

The sample size for both physician groups was small: the experimental group was five and the control group was three. However, the samples are representative of all of

Table 31

Measures of Association

Scale	Intra-class correlation coefficient (ri)	
	Non-Physicians	Physicians
Communication-		
Within Practitioners	-.04	-.33
Between Practitioners	-.04	.47
General Relationships	-.04	.50
Satisfaction	.07	-.11
Coordination-		
Within Patient Care Unit	.16	.54
Between Patient Care Units	-.03	.31
Collaboration-		
Within Practitioners	.20	-.13
Between Practitioners	.03	-.29
Total Responses-	.03	.37

Note.
ri = (Between Mean Squares-Within Mean Squares)/[Between Mean Squares+ (Average /Case per Class-1)×Within Mean Squares].

the nephrologists that practice in the respective hospital. The demographic information for all physicians in the study is shown in Table 32. The control group is slightly older (Mean = 51, SD = 2.65) compared to the experimental group (Mean = 46, SD = 7.75).

The same questionnaire, with semantic modifications to address "physicians" was used to assess the level of communication, coordination, and collaboration present in each setting (Appendix D). The intra-class correlations for the physician group were very high (-.29 to .54) indicating that it was inappropriate to calculate significance tests on the differences in means, therefore no additional analyses were completed.

Since there were no pre-implementation data from either the non-physician or physician group related to organizational processes from the experimental site, 10 available staff RNs were interviewed using an investigator generated opened-ended questionnaire (Appendix I). None of the physicians were available to be interviewed. All of the participants indicated that in their perception, in general the level of communication, coordination, and collaboration was enhanced with the implementation of the CCM model on the patient unit. Most of them (7) stated that this increased level was most apparent in the support for the discharge planning activities, i.e., nursing home placement, arrangements for home care including durable medical equipment, and completion of the continuing care form required for those patients.

In addition, many (6) of the participants stated that the amount of consistent change experienced in the environment, such as patient unit/service consolidations, turnover of nursing staff, and increased emphasis on shorter LOS, had had a negative impact on their ability to provide for quality nursing care. Half (5) of those interviewed stated that the role of the CNS and the patient care coordinator (the role that was created

Table 32

Descriptive Information for Physicians

Variable	Experimental n = 5	Control n = 3
Age		
Mean	46.00	51.00
SD	7.75	2.65
Years-Original License		
Mean	14.40	18.33
SD	9.40	13.43
Years-Institution		
Mean	8.00	6.00
SD	3.08	4.00
Years-Unit		
Mean	7.80	6.00
SD	3.35	4.00
Gender		
Male	4 (80.0%)	3 (100.0%)
Female	1 (20.0%)	0 (0.0%)

with the CCM model) was the strongest support available to them as staff nurses in the provision of quality nursing care in the face of pervasive change.

The discussion of the findings of the test of the CCM model and related conclusions will be presented in Chapter VI. Recommendations for future research and implications for practice will also be offered.

CHAPTER VI

DISCUSSION, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this pilot study was to examine the effectiveness of a collaborative case management model in an end stage renal disease patient population. In this final chapter the discussion of the study findings in relation to the research questions and the hypotheses, conclusions, limitations, and implications and recommendations for future study will be presented. The discussion will begin with the results in terms of the proposed hypotheses.

Hypotheses

Hypothesis I

Hypothesis I was related to the quality of care that patients in the experimental group received compared to the quality of care received in the control group. The data were analyzed using t tests for both paired and independent samples with the clinical status variables: albumin, hemoglobin and hematocrit, urea reduction ratio, and vascular access problems. These variables were used to assess nutritional status, the level of anemia, adequacy of dialysis, and vascular access problems in and between both the experimental and control groups. This hypothesis was partially supported. Patient acuity, including primary diagnosis and co-morbid conditions, prevention interventions, and continuity of care explain these findings.

Hypothesis IA- Nutritional Status. This hypothesis was not supported, in fact, the albumin level in the experimental group actually slightly decreased from the pre- to the post-measurement period while the level increased significantly in the control group (Table 15). This increase resulted in a significant difference between the groups for this variable (Table 16) in the post-implementation period.

There are a number of possible reasons why this unexpected finding occurred. First, this finding could be attributed to the increase in patient acuity within the experimental group from the pre- to the post-measurement period (Table 13). The patient acuity level between the groups also supported the conclusion that experimental group patients were significantly more acutely ill compared to those patients in the control group. This was further supported by the number of diabetic mellitus patients within the experimental group that was shown to have had an effect on the nutritional status of these patients.

There are several observations that could explain the differences in the patient acuities. The higher incidence of diabetes mellitus as a primary diagnosis in the experimental group may have contributed not only to the higher patient acuity, but to the decrease in the albumin level over time in this group (Table 8). The longer duration of dialysis experienced within the experimental group may also have contributed to the decrease in the albumin level (Table 8).

An additional reason may be related to the number of co-morbid conditions within the experimental group. Although there were no statistical differences found between the groups for the number of co-morbid conditions present, it did appear that proportionately the experimental group experienced more co-morbid conditions than the control group for

some categories, i.e. cardiovascular disease/hypertension and diabetes mellitus/hypertension (Table 8). There is evidence in the literature that higher incidence of diabetes mellitus, higher numbers of co-morbid conditions, and longer duration of dialysis can result in lower albumin levels as the disease progresses (Levine, 1997).

A second reason for the findings related to nutritional status may be attributed to the continuity of care experienced within each group. For example, there were no gaps observed in the visits with the dietician in either group. However, within the experimental group there was a slight, non-significant decrease in the frequency of visits with the primary dietician, while the frequency for the control group remained essentially unchanged (Table 9).

The significant increase in the number of gaps in visits with the physician may also have had some impact on this variable. This gap was noted in both groups. These continuity of care factors may have had more impact on the experimental group than on the control group because of the increasing patient acuity, presence of diabetes mellitus, greater number of co-morbid conditions, and the longer duration of dialysis within the experimental group.

The renal diet is difficult for patients to follow and may be a third reason to explain the findings related to nutrition. The kinds of food, the variety, and the amounts, added to the number of supplements and other medications that are prescribed, often leads to frustration and non-compliance. As the disease progresses and the diet's complexity increases, adherence to the dietary regimen decreases (Ulrich, 1989). The longer duration of dialysis that characterized the experimental group could explain why their albumin levels had a tendency to decrease over time.

And lastly, during data collection it was also noted that the albumin levels for the control patients were consistently above 3.0, which is unusual for this patient population (Kopple, 1978). Different clinical laboratories were used by each group. This suggests that it is possible that the higher albumin levels in the control group were related to the process by which the laboratory values were computed rather than to the management of the patients themselves.

Hypothesis IB- Level of Anemia. The level of anemia as assessed with hemoglobin and hematocrit levels was partially improved within the experimental group after implementation of the CCM model (Table 15). Both indicators increased in the post-measurement period with a significant rise in the hemoglobin, therefore partially supporting this hypothesis. The levels also increased in the control group, with a significant difference noted for hematocrit. However, there were no differences noted between the groups for hemoglobin and hematocrit levels (Table 16).

These results could be attributed to the number of prevention interventions the patients' received. There were significant differences in the frequency of all levels of prevention interventions within the experimental group: primary; secondary; and tertiary (Table 11). In chronic illness these interventions are aimed at prevention of dysfunction or disability rather than prevention of the disease itself. The interventions selected to measure for the study were: primary (monitoring for adequacy of clinical therapies, patient/family teaching related to clinical therapies, health promotion, and self-care); secondary (implementation of specific treatment protocols, nutritional support and medications, and acquisition of appropriate services to sustain functional status); and tertiary (interventions at the family level and community level). These interventions are

targeted to slow the progression from one stage of the disease to the next and to halt or limit complications and co-morbidities in ESRD patients (Macnee & Goeppinger, 1993). Therefore, it is reasonable to believe that the level of anemia could have been affected by the frequency with which these interventions were experienced by these patients. Although these interventions were implemented within an interdisciplinary, collaborative framework in the CCM model, they were guided by the expertise of the renal CNS and many of them were completed by the RNs on the renal unit.

The impact of interventions on nutritional status and anemia can be viewed from another perspective; the "provider-induced" versus the "patient-induced" intervention perspective. In contrast to nutritional status, the level of anemia is more easily affected by provider-induced interventions such as blood transfusions or administration of certain hematologic agents (epoetin alfa recombinant -Epogen). For example, the levels of hemoglobin and hematocrit can rise dramatically following a single blood transfusion, a common intervention used in this patient population to treat anemia. Whereas in the case of nutritional status, the level of albumin is most readily affected by the ingestion of food, supplements, and oral medications which have a much slower impact on the blood chemistry level of albumin. The intake of these substances are more patient-induced in that the provider may deliver the substances to the patient, may counsel and educate the patient related to their value, but ultimately the patient may or may not ingest them, therefore exercising a certain amount of control over their effectiveness. Although albumin can be more readily altered with the administration of intravenous agents, this intervention was rarely utilized in both study samples.

Hypothesis IC- Adequacy of Dialysis. This hypothesis was supported, with significant improvement within the experimental group and differences between the groups with increasing levels of the urea reduction ratio (Tables 15 and 16). The control group levels actually deceased from the pre- to the post-measurement period indicating lower adequacy of dialysis for these patients. This finding is especially interesting given that the experimental group patients were becoming relatively more acutely ill as the study progressed. In addition, diabetes mellitus was more prevalent in the experimental patient group and was found to have had an effect on the adequacy of dialysis.

The levels of urea reduction ratio are affected by the integrity of the access device (Burrows-Hudson, 1995). This may explain the differences noted within and between the groups for this variable. The experimental group had a significant decrease in all vascular access problems, and specifically in problems related to infections from the pre- to the post-measurement period compared to an actual increase within the control group (Table 15). The decrease in all vascular access problems was also significant between the groups (Table 16). In addition, the control group had proportionately more emergency department visits related to the access device (Table 25) and more special procedures related to "catheter/shunt" or "vessel" than the experimental group (Table 26).

Another reason for the decreased level of urea reduction ratio within the control group may have been related to the duration of individual dialysis treatments over time. Frequently patients will request early termination of the dialysis treatment because of nausea, headache, general malaise or other physical complaints. To achieve the maximum benefit from each treatment, the nurse will encourage all patients to tolerate as much of the prescribed dose as possible. However, it was observed within the control group that

the patients requested, and subsequently were granted, early withdrawal from the dialysis machine more frequently than those in the experimental group.

Again, the number of prevention interventions implemented by the CCM team, especially those related to nursing interventions may have supported these positive findings. These interventions included: monitoring of clinical values; patient/family teaching/counseling involving health promotion and self-care; and implementation of specific protocols, i.e. medication administration. These interventions may have been responsible for the higher incidence of therapy completion that was observed with the experimental patient group that could have contributed to the improved urea reduction ratio levels in these patients.

Hypothesis ID- Vascular Access Problems. This hypothesis was supported. Vascular access problems significantly decreased in the experimental group from the pre- to the post-measurement period while increasing in the control group. The indicator that contributed to this decrease in the experimental group occurred primarily in infection problems of the access device (Table 15). The difference between the groups for overall vascular access problems was also significant. These findings were particularly interesting given that the acuity -based on the incidence of diabetes mellitus, co-morbidity, and duration of dialysis- of the experimental patients was greater than those observed in the control group.

The prevention interventions noted above, especially those related to health promotion and self-care, could have had an impact on decreasing the incidence of vascular access problems involving infections. It is not surprising that these interventions had no impact on problems related to clotting. The tendency for the patient's access device to

clot is less likely to respond to prevention interventions of health promotion and self-care than those problems involving infections, i.e. care of the site, recognition of signs and symptoms of infection and so forth.

Hypothesis II

Hypothesis II stated that the experimental group would incur significantly lower health services resource utilization and for different reasons as measured by emergency department (ED) visits, special procedures, hospital admissions, and hospital length of stay (LOS). In addition to t tests for paired and independent groups to test the hypothesis (Tables 17 and 18), each dependent variable was examined in terms of specific categories to determine if proportionately there were differences based on reasons for these visits/procedures/admissions (Tables 25, 26, and 27). This hypothesis was only partially supported. The rationale for these findings will be explained in terms of patient acuity, the number of prevention interventions, and the level of continuity of care experienced by the patients.

Hypothesis IIA- Emergency Department Visits. The analysis showed slight non-significant increases in the frequency of ED visits for both groups with the experimental group having more visits than the control group (Tables 17 and 18). Based on the literature review and the conceptual model, this was not expected.

To explain these findings, a number of possible reasons will be explored. First, the ED tends to be the site of care selected by this patient population regardless of the reason for the visit, i.e. the ED is used as the primary site for care with the ED physician serving as the primary care provider (Smith &Hoffart, 1996). This is supported by the number of visits incurred by both groups that were categorized as "other" (Table 25). The reasons

for these visits in both groups ranged from cold/ flu-like signs and symptoms to cardiac/respiratory arrest. Also, this finding may be related to the significant increase in the gaps in the visits with the primary physician observed in both groups.

Second, the ED was the most available and appropriate location in both study sites for the assessment and implementation of interventions related to the access device, the second highest category for visits in both groups. More comprehensive renal programs have a designated area for these procedures external to the ED. Additionally, in some programs there is a dedicated physician with expertise in vascular access problems. This may be a vascular surgeon or a radiologist with specialized training in the care and treatment of access devices (Grace Hospital, 1998).

In both groups over 40 percent of the reasons for ED visits involved problems related to the access device which included clotting, infection, swelling/erythema, and/or pain (Table 25). There appeared to be no differences in reasons for the ED visits between the groups.

Third, the presence of diabetes mellitus and the number of co-morbid conditions tends to increase patient acuity which in turn places these patients at greater risk for ED visits (Burrows-Hudson, 1995). Fourth, those patients receiving higher levels of prevention interventions -namely primary and secondary nursing interventions, may have had health problems detected earlier with treatment ensuing in a more timely fashion, i.e. visits to the ED.

Hypothesis IIB- Special Procedures. The number of special procedures was hypothesized to be lower for those patients cared for with the CCM model. The findings revealed the opposite for the experimental group, while the number of special procedures

slightly decreased for the control group (Tables 17 and 18). The increasing patient acuity, including the incidence of diabetes mellitus, the number of co-morbid conditions, and the duration of dialysis, and the significant increase in gaps of visits with the primary physician within the experimental group are possible explanations for these findings.

Procedures involving the "vessel" (thromboplasty, angioplasty, and incision/drainage) were proportionately the highest category in the pre-measurement period for the experimental group and in both the pre and post periods for the control group (Table 26). There did appear to be more procedures related to the "vessel" in the control group compared to those in the experimental group. In addition, there was no decrease in the number of "vessel" procedures in the control group between the measurement periods as seen in the experimental group. This finding is consistent with the decrease in the number of infections related to the access device in the experimental group. It is also believed that this finding is related to the completion of prevention nursing interventions as noted above related to the access device.

Hypothesis IIC- Hospital Admissions. The number of hospital admissions increased for the experimental group and decreased for the control group (Tables 17 and 18). This finding was not expected. The rationale once again could be attributed to the deteriorating health of the experimental patients as evidenced by the significant increase in the patient acuity accentuated by the higher incidence of diabetes mellitus, co-morbid conditions, and the duration of dialysis.

In addition, it is believed that continuity of care as evidenced by the significant decrease in the gaps in the visits with the social worker and the increase in the frequency of the visits with the social worker in the experimental group may have had an influence

on this finding. Social worker involvement, coupled with the nursing prevention interventions related to health promotion and self-care those patients received with the CCM model, may have detected health problems earlier with treatment ensuing in a more timely fashion, i.e. hospitalization versus no immediate treatment leading to subsequently more extensive treatment, both clinically and financially. There is some support for this notion in the findings related to hospital LOS as reported below.

In contrast, the significant increase in the gaps in physician visits with the experimental group may also have had an impact on the number of hospital admissions incurred by this group. This is consistent with the literature related to the importance of continuity of care, especially in chronic illness (Shortell, 1976).

The most frequent reason for hospitalization for all study patients was related to renal disease. No differences in reasons for all admissions between the groups were noted (Table 27).

Hypothesis IID- Hospital LOS. Although the experimental group experienced more hospital admissions they were hospitalized for shorter periods of time. However, statistically, this hypothesis was not supported. Although the decrease in the LOS for the experimental hospital (group) was not statistically significant, it does have a dramatic impact on the health services resource utilization for these patients (Tables 17 and 18). Every one day decrease in the LOS, is estimated to save the hospital $250 in marginal cost. The experimental group experienced a decline of 1.16 days in the LOS, equating to a $290 cost savings per discharge. In this sample of 59 patients with a total of 75 discharges with ESRD as the principle diagnosis (DRG 585) in the post-measurement period, (January-March) this resulted in approximately a $21,750 in cost savings. In 1996

the experimental group reported 325 discharges with this principle diagnosis. Annualized, this could result in a cost savings of $94,250 for this patient population in this hospital (Grace Hospital, 1998).

More importantly, the impact this decrease in LOS had on the net revenues for the experimental group hospital is substantial. The decrease in LOS was computed to be 1.16 days, annualized for 1996 for this DRG would equate to a reduction of 377 days (325 x 1.16). With this reduction, approximately 60 additional patients could be admitted without increasing the cost (377 days ÷ 6.20 average LOS in the post-measurement 60). Under a fixed reimbursement arrangement each discharge is worth approximately $7,000 in net revenues to the hospital (Grace Hospital, 1998). In this case, assuming that the patient demand is present, i.e. incrementally more patients, the addition of 60 patients would result in approximately $420,000 in annual net revenues ($7,000 x 60) to the hospital. This is a major contribution to the financial viability of the hospital.

There was also a slight, non-significant decrease in the LOS for the control group. This phenomenon is consistent with the overall national trend of shortened hospitalizations (Kerr, et al., 1995). In addition, within the experimental group the frequency of the 23-hour observation status versus a true hospital admission was used only 5 times in the pre- period compared to 12 times in the post period. Within the control group the comparison was 0 to 3 respectively. Reimbursement for 23-hour observation patients is more favorable if specific criteria are met compared to an admission that may be denied based on inappropriate criteria (Grace Hospital, 1998). This suggest that with the CCM model, with a formalized, systematic approach to providing patient care and services in the experimental group hospital the effort to diagnosis, treat, and discharge these patients in a

more timely fashion was in place. Additionally, the explanations presented above related to patient acuity, prevention interventions, and continuity of care are also believed to have had an impact on this finding.

Hypothesis III

Continuity of care was assessed using the gaps in practitioner visits, and the number of times the primary practitioner was seen using the United States Renal Data System (1997) criteria for the minimum number of visits: nurse -each visit, physician - once a month, dietician -once a month. Continuity of care was hypothesized to improve with the implementation of the CCM model. There was some support for this hypothesis with the frequency of gaps in visits with the social worker and the number of visits with the primary social worker showing significant improvement within the experimental group (Table 9). In addition, the between group comparison found that the gaps in social worker visits actually decreased significantly more compared to the actual increase in gaps for the control group, and visits with a primary practitioner of any kind increased in the experimental group compared to no change in the control group (Table 10).

Visits with the nurse were consistently documented in all study patients for every visit to the dialysis center. In most cases there was evidence in the medical record that visits with the dietician occurred at least once, and in many cases more than once a month. From the data, it appears if a scheduled visit with the social worker or dietician was missed on one visit, the practitioner was seen in a subsequent visit within a short time frame.

Contrary to what was expected, the gaps in visits to the physician increased in both groups between the pre- and post-measurement periods. From the medical record it was

difficult to determine the reason for these gaps in most cases. One explanation may be attributed to regional (mid-western) seasonal effects: the pre-measurement period was from July-September with the post period from January-March. It appeared from the documentation that most of the patients in both groups did not have access to independent transportation. To clarify, there was heavy reliance on some type of supported transportation such as family/friends, public, and/or sponsored shuttle services.

In contrast to the visits with the social worker and dietician, it appears that in most cases if one monthly scheduled visit was missed, the physician was not seen again until the following month. As noted above, this finding could have had an impact on the number of ED visits, special procedures, and hospitalizations especially within the experimental group.

One reason for the increase in the gaps of visits with the primary physician may be found in the relationship the physician has with the study site. All of the physicians in the study were private practitioners with only a practice affiliation with the respective institution. In other words, they were not employees, and therefore not subject to the same expectations required of the other professionals in the study. This raises the issue of physician incentive, what was the incentive for the physician to "make-up" a missed visit with the patient? Under the reimbursement for Medicare and Medicaid, in which most of the patients were enrolled (Table 7), the reimbursement for his/her services would be the same whether the patient was actually "seen" by the physician or not. However, there was evidence in the medical records that the physician was still directing the patients' treatment plan.

In addition to the bivariate analyses, multiple regression techniques were computed to further explain the relationship between the independent and dependent variables (Figure 4). The results indicated that primary and secondary nursing interventions and continuity of care were significant predictors of clinical status. This is supportive of the hypothesis that the CCM model has an impact on the quality of care in relation to patient outcomes as measured by the nutritional status, level of anemia, adequacy of dialysis, and occurrence of vascular access problems in this patient population.

When each health services resource utilization variable was regressed on the set of independent variables, support for the hypothesis that the CCM model has an impact of the utilization of health services was found. Continuity of care related to gaps in visits with the dietician were significant predictors of the number of special procedures and hospital admissions, while gaps in nurse and physician visits were predictors of hospital LOS.

When these relationships are examined using a mediation technique, there appeared to be some mediation present. The findings are suggestive that albumin as an indicator of nutritional status had a mediating effect on the relationship between special procedures and the gap in visits with the dietician. In other words, as the gap in visits with the dietician increased the level of nutrition decreased and the number of special procedures increased.

In addition, when albumin and gaps in dietician visits are analyzed together it appeared to have had a slight mediating effect on the number of hospital admissions. When the patient misses visits with the dietician, is possible that the nutritional status will decrease, therefore placing the patient at greater risk for a hospital admission. In this

study there were no changes in the frequency of gaps in visits with the dietician for either group. Based on these findings, the nutritional status, the number of special procedures and hospital admissions would have been at greater risk if the dietician had not been seen on a regular and consistent basis in both groups.

Hypothesis IV

The final hypothesis was related to the professional staff. It was hypothesized that non-physician and physician staff working within patient care units that have implemented the CCM model will perceive significantly higher levels of communication, coordination, and collaboration than those units functioning with existing care delivery practices. Only partial support for this hypothesis was found. Statistical analyses using ANOVA, revealed two variables with a significant difference within the experimental unit for the non-physicians, coordination and collaboration (Table 30). Coordination within the patient care unit was perceived to be higher in the unit with the CCM model, as well as collaboration with the non-physician group, as compared to the unit not functioning with the CCM model. However, no significant findings were noted related to communication or between the groups. Organizational processes such as redesign, staff turnover, low staffing levels, and lack of adequate continuing education regarding the CCM model could be responsible for this finding.

It is interesting to note that on five of the 29 (17%) questionnaires returned from the experimental group, there were written-in comments about the relationship between the patient care unit and the emergency department. These comments characterized the ED and its staff as follows: "poor communicators", "lack of accurate information from the ED", and comments indicating the ED is neither cooperative nor pleasant in their

dealings with the patient care unit. This same phenomenon was noted with the control group with three of the 19 (16%) questionnaires having similar comments related to their relationship with the emergency department.

A small number (10) of staff nurses from the experimental group who remained on the patient care unit at the time of data collection were interviewed (Appendix I). Their comments generally supported the hypothesis that communication, coordination, and collaboration improved with the implementation of the CCM model on their patient unit. Again, the relationship between the patient care unit and the ED was viewed as less than satisfactory by these subjects.

A similar analysis of the physician staff was completed. However, the intra-class correlation revealed that the variation on the dimensions assessed within the group was so small that no conclusions could be proposed. This may stem from the fact that three out of the five physicians that participated in the study were from the same physician practice group. In comparison, the physicians from the control group were not partnered in the same practice. This finding in the experimental group may have been because the physician member of the CCM team was the only professional not consistently on the patient care unit, and therefore did not feel as engaged in the processes of the CCM model as did the employed professional staff. In addition, none of the physicians from the experimental unit were available for interviews to determine their perceptions of the level of communication, coordination, and collaboration following the implementation of the CCM model compared to the previous practice on the patient unit.

Conclusions

In this pilot study case management was viewed as the independent variable and viewed as a nursing intervention with strong support from the medical staff as well as allied health professionals. The role of the clinical nurse specialist as the pivotal, coordinating role in the CCM model was reviewed in detail. From the literature review, the study design was developed around a fundamental belief: the educational preparation of the CNS in areas of health promotion and disease prevention, and the focus of the individual in the context of the family render this practitioner the most qualified person to serve in the role as "case manager."

Operationally, the interdisciplinary structure of the CCM model, with a CNS as the case manager to guide the key process concepts -communication, coordination, collaboration, and continuity of care- as well as key primary, secondary, and tertiary prevention interventions- was believed to have a beneficial effect on patient outcomes (clinical status) and system outcomes (health services resource utilization). The findings from this pilot study were partially supportive of the study hypotheses.

Although the experimental group had a higher incidence of diabetes mellitus, more co-morbid conditions, and a longer duration of dialysis therapy, and experienced relatively greater acuity as the study progressed, the findings were generally supportive of the hypothesis related to quality of care. Specifically, a positive difference in the level of anemia, the adequacy of dialysis, and in the number and type of vascular access problems experienced by patients in the experimental group as compared to those experienced by the control group patients was noted.

In terms of the hypothesis related to health services resource utilization, although no statistical differences were found in the experimental group, the impact on the LOS was notable. The decrease in LOS had a potentially significant effect on both the costs savings and the net revenues for the experimental group institution.

The third hypothesis involved continuity of care. Significant differences were found for the frequency of gaps in social worker and physician visits, and in the frequency of visits with the primary social worker. These findings were linked with the clinical and health services resource utilization outcomes.

The fourth and final hypothesis pertained to the professional staff. There was some support that the patient care unit managed under the CCM model did improve in the level of coordination and collaboration for non-physician practitioners. In contrast, within the physician group, because of clustering effects, no further analyses were possible.

More importantly, this pilot study attempted to confront some of the conceptual and methodological issues surrounding the study of case management. Those issues included: absence of a theoretical framework; the omission of operational definitions of case management; lack of clear specification and measurement of sample selection criteria; the frequent use of weak pre-post designs; and the use of unstandardized instruments. The following initiatives to address these issues were presented: a theoretical framework was developed in which to study the phenomenon; a testable model with operational definitions was developed; components of the model were tested and statistically analyzed; the study was guided by a pre-post, quasi-experimental design that utilized specific sample selection criteria; and an attempt to quantify and measure specific prevention nursing interventions was completed.

The implementation of the CCM model appeared to be associated with selected clinical outcomes (hemoglobin, urea reduction ratio, and vascular access problems) that were associated with nursing prevention interventions at all three levels, primary, secondary, and tertiary. However, this model did not appear to change levels of communication, coordination, or collaboration in a systematic fashion. Within unit variation was greater than between unit variation for the non-physician groups. These could be attributed to insensitive instruments, lack of implementation of certain parts of the model, and/or small sample sizes.

Also, the increase in the number of physician gaps during the study period questions if they were really an essential part of the CCM model. This finding appeared to suggest that in a chronic patient population the direct role of the physician is less important in terms of patient and system outcomes. The physician role in the model may have been centered around model development versus on-going model implementation. For example, once protocols and outcomes were mutually agreed to by the team, the role of the physician became peripheral to the process of the CCM model. This notion would be in contrast to more acute patient care environments such as emergency departments or intensive care units where patient outcomes are tied more closely to physician involvement with other health care professionals.

In this study, the role of the dietician emerged as a significant component of the CCM model. This was demonstrated by the increase in gaps in visits with the dietician , decreased nutritional status as measured by albumin level, and the mediating effect albumin had on special procedures and hospital admissions. Also, the role of the social worker was observed to be an important component of the CCM model as evidenced by

the decrease in gaps in the visits with the primary social worker.

Limitations

Although this pilot study was a pre-post, quasi-experimental design, it was not possible to obtain data prior to the implementation of the CCM model in either setting on the organizational components of communication, coordination/planning, collaboration, and continuity. To offset this limitation, professional staff present during the pre-implementation phase (July through September 1995) that remained on the unit at the time of data collection were interviewed. The subjects were asked to comment on their perception of the organizational management processes during that time and at the present time. This provided some indication if the process components had improved, decreased or remain unchanged in these environments over time (Appendix I-Professional Staff Interview). Because the time period between the study period and the data collection was two years, professional staff turnover resulted in only 10 interviews.

Since this was a field study, with only two hospitals, it was possible that other factors in the health care delivery system may be responsible for differences detected between the groups. These factors included changes in: reimbursement practices (managed care versus fee-for-service); physician practice patterns (clinical pathways/protocols); increasing use of 23-hour observation status many diagnoses; care delivery in the facilities (movement toward multi-skilled workers), and organizational restructuring initiatives, i.e. changes in management, downsizing, and the like. Other conditions that were not controlled for included interpretation of laboratory data, and use of the emergency department for primary care.

The study was a retrospective review of documented services, events, and clinical outcomes. The potential for incomplete or incorrect data was substantial. This resulted in small sample sizes at both study sites. The stringent selection criteria for the sample could have excluded patients that were different in some systematic manner from those included in the study.

Because the study participants were a convenience sample, it was possible that differences between study groups were related to a number of unidentified variables, weakening the internal validity of the study. For example the lack of matched samples, higher incidence of diabetes mellitus, more co-morbid conditions, longer duration of dialysis, and relatively more acutely ill patients in the experimental group as compared to those in the control group could have masked any potentially measurable differences. Likewise, the sample in the study differs from the greater population, therein further limiting the external validity of the study.

Implications and Recommendations

Consistent with the focus of this pilot study, the implications are twofold: patient related and system related. In terms of patient care and health services resource utilization in an ESRD patient population, the impact of prevention interventions can not be overlooked. In this study these interventions were led and guided by a CNS within an interdisciplinary health team. In addition, this was one of the first studies on case management to actually measure specific nursing interventions related to specific patient outcomes.

The findings suggested that early assessment of signs and symptoms led to the detection and treatment of previously undetected medical problems with these patients.

These findings were documented in the medical record most frequently by the CNS.

Another factor that could have been responsible for the increase in the utilization of resources, greater access to members of the CCM model could have improved communication and, in turn, increased utilization. This is consistent with a recent study of the effectiveness of improving access to primary care services on the utilization of resources for chronically ill patients within the veterans administration system. The findings from this study revealed that for veterans discharged from Veterans Affairs hospitals, the primary care intervention (a form of case management) increased rather than decreased the rate of rehospitalization, at least in the short term for this chronic patient population (Weinberger, Oddone, & Henderson, 1996).

The study design was developed around the fundamental belief that the educational preparation of the CNS in the areas of health promotion, disease prevention, and the focus of the individual in the context of the family render this practitioner the most qualified health professional to serve in the role as "case manager." This statement is not intended to diminish the contributions made by other members of the team including the dietician, and the social worker. However, the role of the physician in the on-going CCM model implementation was diminished in this chronic patient population.

The analysis indicated that the clinical status variable -albumin had a mediating effect on the relationship between health services resource utilization -special procedures and continuity of care -gaps in visits with the dietician and a slight mediating effect on hospital admissions. This suggested that the role of the dietician within the CCM model can have a significant effect on the health services resource utilization outcomes, as well as the clinical outcomes. The clinical outcomes most readily effected was albumin level, and

to a lesser extent hemoglobin and hematocrit. The results of this study of case management suggested that the CNS, the staff nurse, the dietician, and the social worker were the essential health care professionals required to effect outcomes with an ESRD patient population.

Another system related implication is the effect the CCM model had on the organizational management processes of communication, coordination, and collaboration. There was some support for the improvement of coordination and collaboration within the experimental group (patient care unit) with the non-physician practitioners, most of whom were RNs. However, no significant findings were observed related to communication. Again, the concept of "team" is an important factor when organizational management processes were examined. There was reason to believe that the physician member of the CCM model may not have viewed him/herself as a member of the team, and in practice may not be essential to the effectiveness of the model.

The following recommendations were based on the findings and conclusions of this study:

1) The CCM model was implemented with a focus on the in-patient ESRD patient population. As health care shifts from a hospital-based, acute care focus to a covered-life focus with alternative sites of care, this model needs to be tested across the continuum of care.
2) Replicate a study with a larger patient sample with equivocal groups, over a longer period of time, and in multiple care delivery sites with a prospective data collection approach versus a retrospective medical record review.
3) Explore other components of the conceptual framework, such as functional

status and patient satisfaction.

4) Test the CCM model with different levels of case manager preparation, i.e. baccalaureate or associate degree prepared staff nurse.

5) Continue refining components of the CCM model, i.e. better instruments to assess the levels of communication, coordination, and collaboration.

6) Identification of targeted interventions expected to be linked to selected outcomes.

APPENDICES

Code_____

APPENDIX A
PROFESSIONAL DEMOGRAPHICS

1. Age: _____

2. Practitioner:
   ___ Physician
   ___ RN
   ___ LPN
   ___ Social Worker
   ___ Dietician
   ___ Physician Assistant

3. Gender:
   ___ Male
   ___ Female

4. Education (highest degree level of education)
   ___ MD/DO
   ___ Diploma - Nursing
   ___ AD - Nursing
   ___ BS - Nursing
   ___ MS - Nursing
   ___ BS - non Nursing
   ___ MS - non Nursing
   ___ Other (Please specify _____)

5. What shift do you work in this institution?
   ___ Day
   ___ Evening
   ___ Night
   ___ Day - Evening (7a - 7p)
   ___ Evening - night (7p - 7a)
   ___ Not applicable

6. Do you work:
   ___ Full time
   ___ Part time
   ___ Contingent
   ___ Not applicable

7. Years worked in this institution: _____
8. Years worked in this unit: _____
9. Years in practice since original licensure: _____

Code____

APPENDIX B

PATIENT ACUITY FORM

Indicator	1	2	3
Age	18-60	61-75	76 or >
Co-Morbid Condition	none	1	2 or more
Nutritional Status	no supplements needed for albumin > 3.5	Oral supplements and/or albumin between 2.5-3.5	IDPN/and/or albumin < 2.5
Functional Status	Needs no assist with activities in the unit ambulates independently	Needs some assist activities with washing needs minimal or standby assist with ambulation	Requires total assist with activities requires assist of 1 or more persons to transfer

1 = mildly acute
2 = moderately acute
3 = severely acute

Total_____

Code____

APPENDIX C

PATIENT DEMOGRAPHICS

1. Age: _____

2. Gender:
   ____ Male
   ____ Female

3. Race:
   ____ African-American
   ____ Asian-American
   ____ Caucasian
   ____ Hispanic
   ____ Other

4. Marital Status:
   ____ Married
   ____ Single
   ____ Separated/Divorced
   ____ Widowed
   ____ Significant Other

5. Education:
   ____ Less than High School
   ____ High School Graduate
   ____ Some College
   ____ College Graduate

6. Employment:
   ____ Currently employed full-time (40 or more hours/week)
   ____ Currently employed part-time (less than 40)
   ____ Currently unemployed
   ____ Receiving some form of public assistance

7. Health Insurance coverage: (check all that apply)
   ____ Medicare
   ____ Medicaid
   ____ BC/BS
   ____ HMO
   ____ Other (please specify:_____)

Code____

APPENDIX C (continued)

8. Primary Diagnosis:
   ____ Renal Disease
   ____ Diabetes Mellitus
   ____ Other (please specify:_____)

9. Co-morbid conditions:
   ____ Diabetes Mellitus
   ____ Cardio-Vascular Disease
   ____ TB
   ____ HIV/AIDS
   ____ Cancer
   ____ Hypertension
   ____ Hypotension
   ____ Other (please specify:_____)

10. Duration of Dialysis: _____

APPENDIX D

THE ORGANIZATION AND MANAGEMENT OF COLLABORATIVE CASE MANAGEMENT

Overall Purpose

The questionnaire you are being asked to complete is part of a doctoral dissertation study of the organization and management of the renal unit. The purpose of this study is to examine the organization and management practices of the unit and their relationship to patient and system outcomes of collaborative case management.

Questionnaire Content

The questionnaire you have been given has been adapted from The Organization and Management of Intensive Care Units developed by Shortell and Rousseau (1991). The questionnaire has been used successfully in many other organizational studies and has been extensively pre-tested. This questionnaire is concerned with processes related to communication, coordination, and collaboration as perceived by the Renal Case Management Team. Please keep in mind that only the professional and medical staff who are part of the Team are eligible to participate. It is anticipated that the questionnaire will take approximately 10 minutes to complete. You will also be asked three open-ended questions with an opportunity to extend any additional comments in an interview related to your opinion of the current organizational processes. This interview should take approximately 5-10 minutes.

How You Benefit

Completion of these questions will be of direct benefit in two ways. First, you will be provided with a specific feedback (in aggregate) on your unit's score on each of the measures of interest. Second, you will be provided with a comparison of your unit's score with that of another renal unit in the study. This will enable you to assess your comparative performance related to the measures of interest. The feedback on your unit's scores and the comparison with the other hospital can be used to assess your performance and serve as a basis for continuous improvement of the organization and management of your unit.

Please Keep in Mind

Your participation in this study is voluntary in nature, your position at the hospital will in no way be affected whether or not you participate. You are asked to respond to each question as you believe the situation really exists, not as you think it should be or wish it to be. Responses are confidential; the numbers on the questionnaires are for tracking returns. Analyses will be based on aggregate responses only. Please seal the completed questionnaire in the envelope provided and place it in the designated area on your unit. Thank you for your assistance.

Please note: ANY QUESTIONS WHICH YOU HAVE OR ASSISTANCE NEEDED IN COMPLETING THIS QUESTIONNAIRE SHOULD BE DIRECTED TO:

Linda Everett, MSN, RN
Detroit Medical Center-Grace Hospital
[redacted]

Non-Physician Questionnaire_____

SECTION ONE: RELATIONSHIPS AND COMMUNICATIONS WITHIN THE UNIT

I. For each of the following statements, please circle the number under the response that best reflects your judgment.

Statement	Strongly Disagree 1	Disagree 2	Neither Disagree Nor Agree 3	Agree 4	Strongly Agree 5
Non-physician Practitioner to non-physician Practitioner: These statements refer to relationships between non-physician practitioners.					
1. It is easy for me to talk openly with the non-physician practitioners of this unit.	1	2	3	4	5
2. I can think of a number of times when I received incorrect information from non-physician practitioners in this unit.	1	2	3	4	5
3. There is effective communication between non-physician practitioners across shifts.	1	2	3	4	5
4. Communication between non-physician practitioners in this unit is very open.	1	2	3	4	5
5. It is often necessary for me to go back and check the accuracy of information I have received from non-physician practitioners in this unit.	1	2	3	4	5
6. I find it enjoyable to talk with other non-physician practitioners of this unit.	1	2	3	4	5
7. Non-physician practitioners in the unit are well informed regarding events occurring on other shifts.	1	2	3	4	5
8. The accuracy of information passed among non-physician practitioners of this unit leaves much to be desired.	1	2	3	4	5
9. It is easy to ask advice from non-physician practitioners in this unit.	1	2	3	4	5

Statement	Strongly Disagree 1	Disagree 2	Neither Disagree Nor Agree 3	Agree 4	Strongly Agree 5
10. I feel that certain unit non-physician practitioners don't completely understand the information they receive.	1	2	3	4	5

Non-physician Practitioners - to-Physician Relationships: These statements refer to relationships between non-physician practitioners and physicians.

11. I look forward to working with the physicians of this unit each day.	1	2	3	4	5
12. It is easy for me to talk openly with the physicians of this unit.	1	2	3	4	5
13. I can think of a number of times when I received incorrect information from physicians in this unit.	1	2	3	4	5
14. There is effective communication between non-physician practitioners and physicians across shifts.	1	2	3	4	5
15. Communication between non-physician practitioners and physicians in this unit is very open.	1	2	3	4	5
16. It is often necessary for me to go back and check the accuracy of information I have received from physicians in this unit.	1	2	3	4	5
17. I find it enjoyable to talk with physicians of this unit.	1	2	3	4	5
18. Physicians associated with the unit are well informed regarding events occuring on other shifts.	1	2	3	4	5
19. The accuracy of the information passed among the physicians of this unit leaves much to be desired.	1	2	3	4	5
20. It is easy to ask advice from physicians in this unit.	1	2	3	4	5

Statement	Strongly Disagree 1	Disagree 2	Neither Disagree Nor Agree 3	Agree 4	Strongly Agree 5
21. I feel that certain unit physicians don't completely understand the information they receive.	1	2	3	4	5

General Relationships and Communications: These statements refer to general relationships and communications within the unit.

22. I get information on the status of patients when I need it.	1	2	3	4	5
23. Physicians are readily available for consultation.	1	2	3	4	5
24. When a patient's status changes, I get relevant information quickly.	1	2	3	4	5
25. Non-physician practitioners have a good understanding of physician goals.	1	2	3	4	5
26. Physicians have a good understanding of non-physician practitioner objectives.	1	2	3	4	5
27. In matters pertaining to patient care, non-physician practitioners call physicians in a timely manner.	1	2	3	4	5
28. Non-physician practitioners have a good understanding of physicians' treatment plans.	1	2	3	4	5
29. Non-physician practitioner care plans are well understood by physicians in this unit.	1	2	3	4	5

Statement	Very Dissatisfied 1	Dissatisfied 2	Neither Dissatisfied or Satisfied 3	Satisfied 4	Very Satisfied 5
30. Overall, how satisfied are you with the communications in this unit? Circle the appropriate response.					
(a) non-physician practitioner -to-non-physician practitioner	1	2	3	4	5
(b) physician-to-physician	1	2	3	4	5
(c) between non-physician practitioners and physicians	1	2	3	4	5
(d) between patients and unit non-physician practitioners	1	2	3	4	5
(e) between patients and unit physicians	1	2	3	4	5
(f) between patients' families and unit non-physician practitioners	1	2	3	4	5
(g) between patient's families and unit physicians	1	2	3	4	5

SECTION TWO-PART A: MANAGING DISAGREEMENTS BETWEEN NON-PHYSICIAN PRACTITIONERS

II-Part A: Consider what happens when there is a disagreement or conflict between unit non-physician practitioners.
Based on your experience in this unit, how likely is it that:

Statement	Not at all Likely 1	Not so Likely 2	Somewhat Likely 3	Very Likely 4	Almost Certain 5
1. All points of view will be carefully considered in arriving at the best solution of the problem.	1	2	3	4	5
2. All the non-physician practitioners will work hard to arrive at the best possible solution.	1	2	3	4	5
3. The non-physician practitioners involved will not settle the dispute until all are satisfied with the decision.	1	2	3	4	5
4. Everyone contributes from their experience and expertise to produce a high quality solution.	1	2	3	4	5

SECTION TWO PART-B: MANAGING DISAGREEMENTS BETWEEN NON-PHYSICIAN PRACTITIONER AND PHYSICIANS

II-Part B: Consider what happens when there is a disagreement or conflict between unit non-physician practitioners and physicians. Based on your experience in this unit, how likely is it that:

Statement	Not at All Likely	Not So Likely	Somewhat Likely	Very Likely	Almost Certain
	1	2	3	4	5
1. All points of view will be carefully considered in arriving at the best solution of the problem.	1	2	3	4	5
2. The non-physician practitioners and physicians will work hard to arrive at the best possible solution.	1	2	3	4	5
3. Both parties involved will not settle the dispute until all are satisfied with the decision.	1	2	3	4	5
4. Everyone contributes from their experience and expertise to produce a high quality solution.	1	2	3	4	5

SECTION THREE: COORDINATION MECHANISMS WITHIN THE UNIT

III-Part A: Various strategies and procedures can be used to coordinate patient care activities within a unit. In your unit, to what extent do each of the mechanisms listed below effectively contribute to the coordination of staff activities and the quality of patient care? Circle the appropriate response below. Please circle "8" if your unit does not use the mechanism.

Statement	Not at all Effective 1	Slightly Effective 2	Moderately Effective 3	Effective 4	Very Effective 5	NA (Not Used Here) 8
a. Written rules, policies, and procedures?	1	2	3	4	5	8
b. Written plans and schedules?	1	2	3	4	5	8
c. Unit directors' efforts to coordinate member activities?	1	2	3	4	5	8
d. One-to-one communication between staff?	1	2	3	4	5	8
e. Written treatment protocols?	1	2	3	4	5	8

BETWEEN THIS UNIT AND OTHER HOSPITAL UNITS

III-Part B: Various strategies and procedures can also be used to coordinate patient care activities between your unit and other hospital units (e.g., operating room, emergency room, general medical/surgical floors, lab, respiratory therapy, etc.). In your unit, to what extent do each of the mechanisms listed below effectively contribute to the coordination of your unit's activities with other hospital units? Circle the appropriate response below. Please circle "8" if your unit does not.

Statement	Not at all Effective 1	Slightly Effective 2	Moderately Effective 3	Effective 4	Very Effective 5	NA (Not Used Here) 8
a. Written treatment protocols?	1	2	3	4	5	8
b. Written rules, policies, and procedures?	1	2	3	4	5	8
c. Written plans and schedules?	1	2	3	4	5	8
d. One-to-one communicati on between unit staff and members of other units?	1	2	3	4	5	8

SECTION ONE: RELATIONSHIPS AND COMMUNICATIONS WITHIN THE UNIT

I. For each of the following statements, please circle the number under the response that best reflects your judgment.

	Statement	Strongly Disagree 1	Disagree 2	Neither Disagree Nor Agree 3	Agree 4	Strongly Agree 5
Physician-to-Physician Relationships: These statements refer to relationships between physicians.						
1.	It is easy for me to talk openly with the physicians of this unit.	1	2	3	4	5
2.	I can think of a number of times when I received incorrect information from physicians in this unit.	1	2	3	4	5
3.	There is effective communication between physicians across shifts.	1	2	3	4	5
4.	Communication between physicians in this unit is very open.	1	2	3	4	5
5.	It is often necessary for me to go back and check the accuracy of information I have received from physicians in this unit.	1	2	3	4	5
6.	I find it enjoyable to talk with other physicians of this unit.	1	2	3	4	5
7.	Physicians in the unit are well informed regarding events occurring on other shifts.	1	2	3	4	5
8.	The accuracy of information passed among physicians of this unit leaves much to be desired.	1	2	3	4	5
9.	It is easy to ask advice from physicians in this unit.	1	2	3	4	5

Statement		Strongly Disagree 1	Disagree 2	Neither Disagree Nor Agree 3	Agree 4	Strongly Agree 5
10.	I feel that certain unit physicians don't completely understand the information they receive.	1	2	3	4	5
Physician-to-Non-Physician Practitioner Relationships: These statements refer to relationships between physicians and nurses.						
11.	I look forward to working with the non-physician practitioners of this unit each day.	1	2	3	4	5
12.	It is easy for me to talk openly with the non-physician practitioners of this unit.	1	2	3	4	5
13.	I can think of a number of times when I received incorrect information from non-physician practitioners in this unit.	1	2	3	4	5
14.	There is effective communication between physicians and non-physician practitioners across shifts.	1	2	3	4	5
15.	Communication between physicians and non-physician practitioners in this unit is very open.	1	2	3	4	5
16.	It is often necessary for me to go back and check the accuracy of information I have received from non-physician practitioners in this unit.	1	2	3	4	5
17.	I find it enjoyable to talk with non-physician practitioners of this unit.	1	2	3	4	5
18.	Non-physician practitioners associated with the unit are well informed regarding events occuring on other shifts.	1	2	3	4	5

Statement		Strongly Disagree 1	Disagree 2	Neither Disagree Nor Agree 3	Agree 4	Strongly Agree 5
19.	The accuracy of the information passed among the physicians of this unit leaves much to be desired.	1	2	3	4	5
20.	It is easy to ask advice from non-physician practitioners in this unit.	1	2	3	4	5
21.	I feel that certain unit nurses don't completely understand the information they receive.	1	2	3	4	5

General Relationships and Communications: These statements refer to general relationships and communications within the unit.

22.	I get information on the status of patients when I need it.	1	2	3	4	5
23.	Non-physician practitioners are readily available for consultation.	1	2	3	4	5
24.	When a patient's status changes, I get relevant information quickly.	1	2	3	4	5
25.	Non-physician practitioners have a good understanding of physician goals.	1	2	3	4	5
26.	Physicians have a good understanding of non-physician practitioners objectives.	1	2	3	4	5
27.	In matters pertaining to patient care, physicians call non-physician practitioners in a timely manner.	1	2	3	4	5
28.	Physicians have a good understanding of non-physician practitioners' treatment plans.	1	2	3	4	5

Statement		Strongly Disagree 1	Disagree 2	Neither Disagree Nor Agree 3	Agree 4	Strongly Agree 5
29.	Physician care plans are well understood by non-physician practitioners in this unit.	1	2	3	4	5

		Very Dissatisfied 1	Dissatisfied 2	Neither Dissatisfied or Satisfied 3	Satisfied 4	Very Satisfied 5
30.	Overall, how satisfied are you with the communications in this unit? Circle the appropriate response.					
(a)	non-physician practitioners-to-non-physician practitioners	1	2	3	4	5
(b)	physician-to-physician	1	2	3	4	5
(c)	between non-physician practitioners and physicians	1	2	3	4	5
(d)	between patients and unit non-physician practitioners	1	2	3	4	5
(e)	between patients and unit physicians	1	2	3	4	5
(f)	between patients' families and unit non-physician practitioners	1	2	3	4	5
(g)	between patient's families and unit physicians	1	2	3	4	5

SECTION TWO-PART A: MANAGING DISAGREEMENTS BETWEEN PHYSICIANS

II-Part A: Consider what happens when there is a disagreement or conflict between unit physicians. Based on your experience in this unit, how likely is it that:

		Not at all Likely 1	Not so Likely 2	Somewhat Likely 3	Very Likely 4	Almost Certain 5
1.	All points of view will be carefully considered in arriving at the best solution of the problem.	1	2	3	4	5
2.	All the physicians will work hard to arrive at the best possible solution.	1	2	3	4	5
3.	The physicians involved will not settle the dispute until all are satisfied with the decision.	1	2	3	4	5
4.	Everyone contributes from their experience and expertise to produce a high quality solution.	1	2	3	4	5

SECTION TWO PART-B: MANAGING DISAGREEMENTS BETWEEN PHYSICIANS AND NON-PHYSICIAN PRACTITIONERS

II-Part B: Consider what happens when there is a disagreement or conflict between unit physicians and non-physician practitioners. Based on your experience in this unit, how likely is it that:

		Not at All Likely	Not So Likely	Somewhat Likely	Very Likely	Almost Certain
		1	2	3	4	5
1.	All points of view will be carefully considered in arriving at the best solution of the problem.	1	2	3	4	5
2.	The physicians and non-physician practitioners will work hard to arrive at the best possible solution.	1	2	3	4	5
3.	Both parties involved will not settle the dispute until all are satisfied with the decision.	1	2	3	4	5
4.	Everyone contributes from their experience and expertise to produce a high quality solution.	1	2	3	4	5

SECTION THREE: COORDINATION MECHANISMS WITHIN THE UNIT

III-Part A: Various strategies and procedures can be used to coordinate patient care activities within a unit. In your unit, to what extent do each of the mechanisms listed below effectively contribute to the coordination of staff activities and the quality of patient care? Circle the appropriate response below. Please circle "8" if your unit does not use the mechanism.

Statement		Not at all Effective 1	Slightly Effective 2	Moderately Effective 3	Effective 4	Very Effective 5	NA (Not Used Here) 8
a.	Written rules, policies, and procedures?	1	2	3	4	5	8
b.	Written plans and schedules?	1	2	3	4	5	8
c.	Unit directors' efforts to coordinate member activities?	1	2	3	4	5	8
d.	One-to-one communication between staff?	1	2	3	4	5	8
e.	Written treatment protocols?	1	2	3	4	5	8

BETWEEN THIS UNIT AND OTHER HOSPITAL UNITS

III-Part B: Various strategies and procedures can also be used to coordinate patient care activities between your unit and other hospital units (e.g., operating room, emergency room, general medical/surgical floors, lab, respiratory therapy, etc.). In your unit, to what extent do each of the mechanisms listed below effectively contribute to the coordination of your unit's activities with other hospital units? Circle the appropriate response below. Please circle "8" if your unit does not.

Statement		Not at all Effective 1	Slightly Effective 2	Moderately Effective 3	Effective 4	Very Effective 5	NA (Not Used Here) 8
a.	Written treatment protocols?	1	2	3	4	5	8
b.	Written rules, policies, and procedures?	1	2	3	4	5	8
c.	Written plans and schedules?	1	2	3	4	5	8
d.	One-to-one communication between unit staff and members of other units?	1	2	3	4	5	8

Code_____
Start Date: _____
Stop Date: _____

APPENDIX E
CONTINUITY OF CARE ASSESSMENT FORM

During this three month period indicate the number and type of practitioner seen for care/service related to health care recorded in the medical record. Check all that apply.

Practitioner
How many times primary practitioner seen:

___ Physician ___ Social Worker

___ Dietician ___ Other (Specify:_____) Nurses & Technicians*

How many times non-primary practitioner seen:

___ Physician ___ Social Worker

___ Dietician ___ Other (Specify:_____) Nurses & Technicians*

*All Nurses & Technicians in the Center are considered "primary."

Indicate the number, duration and kind of "gaps"in care/service related to health care recorded in the medical record.
Gaps in Care/Service Defined:
Minimum requirement: Physician every month
Social Worker every month
Dietician every month
Nurse every visit

Gap	Month/ Date	Practitioner	Service	Duration	Reason*
1					
2					
3					
4					
5					
6					

*1=hospitalized
2=other (specify)
Example:

Gap	Month/ Date	Practitioner	Service	Duration	Reason*
1	8/95	SW	Social Serv.	1 month	1
2	9/95	Dietician	Nutrition	1 month	2 - missed appointment/no reason

Code_____
Start Date: _____
Stop Date: _____

APPENDIX F
PREVENTION INTERVENTIONS ASSESSMENT FORM

INTERVENTION	MEASURE	COMPLETED Y/N July (Jan.)	Aug. (Feb.)	Sept. (Mar.)
Primary				
Adequacy of Clinical Therapies (Monitoring):				
Nutrition/Anemia	Hemoglobin			
	Hematocrit			
	Albumin Level			
	Pre-Dialysis BUN			
Routine Medication Regime	Documented			
Adequacy of Dialysis	Urea Reduction Ration >65%			
Prevent/Slow Complications		July (Jan.)	Aug. (Feb.)	Sept. (Mar.)
Renal Bone Disease	Calcium Level			
Osteodystrophy/Osteopenia	Phosophorous Level			
	PTH (quarterly)			
Patient/Family Teaching/Counseling Indicators:		Ordered/Completed Y/N or N/A* July (Jan.)	Aug. (Feb.)	Sept. (Mar.)
Clinical Therapies	Documented			
Health Promotion	Documented			
Self-Care	Documented			
Secondary		Ordered/Completed Y/N or N/A*		
Implementation of Specific Protocols If *Indicated (Monitoring)*:		July (Jan.)	Aug. (Feb.)	Sept. (Mar.)
Nutritional Support	Dietary Supplements			
	IDPN			
Medications During Dialysis	Documented			
Renal Bone Disease (Mobility)	Rehab Consult			
Tertiary		Ordered/Completed Y/N or N/A*		
Life Style Changes: Patient/Family/Community		July (Jan.)	Aug. (Feb.)	Sept. (Mar.)
Psychosocial Assessment	Multidisciplinary Care Plan Reflects Modality Review			
Social Support Involvement:	Social Work Intervention			

*NA = Completed within the previous year or

Code____

Start Date: _____
Stop Date: _____

APPENDIX G

CLINICAL STATUS OUTCOMES FORM

Clinical Status	**Measure**	JULY (JAN.)	AUGUST (FEB.)	SEPTEMBER (MAR.)
		Level	Level	Level
Nutrition	Albumin			
Anemia	Hemoglobin			
	Hematocrit			
Adequacy of Dialysis	Urea Reduction Ratio> 65%			

Vascular/ Prosthetic Access Problems	**Measure**	JULY (JAN.)	AUGUST (FEB.)	SEPTEMBER (MAR.)
	Frequency			
	Clotting			
	Infection			
	Pseudoaneurysm			
	Stenosis			
	Recirculation			
	Swelling/ Erythema			
	Other:	_____	_____	_____
		_____	_____	_____

Code____
Start Date: _____
Stop Date: _____

APPENDIX H
HEALTH SERVICES RESOURCE UTILIZATION FORM

	July (Jan.)		August (Feb.)		September (Mar.)	
	Date	Reason	Date	Reason	Date	Reason
ED Visits						

Key: ED Visit: Reason: 1) Access Device 2) Infection 3) DM Complications 4) Fatigue/Malaise
5) Other (specify)

Code____
Start Date: _____
Stop Date: _____

APPENDIX H (Continued)

	July (Jan.) Date Adm	D/C	Reason	August (Feb.) Date Adm	D/C	Reason	September (Mar.) Date Adm	D/C	Reason
Hospital Admissions									

	Date	Reason	Date	Reason	Date	Reason
Special Procedures						

Key:
Hospital Admissions: ICD-9-DC Code
Special Procedure: 1) Transfusion 2) Angioplasty 3) Catheter Insertion 4) Biopsy 5) Other (specify)

CODE____

APPENDIX I

PROFESSIONAL STAFF INTERVIEW

Since February-July 1995, in your opinion, do you think that the organizational management processes of **communication, coordination, and collaboration** among professional staff on this unit have:

_____Increased. If so, please explain: _____

_____

_____Decreased. If so, please explain: _____

_____

_____Remain unchanged. If so, please explain: _____

_____

Other Comments:_____

_____

_____

_____

APPENDIX J
INSTITUTIONAL REVIEW BOARD APPROVALS

Wayne State University
Human Investigation Committee

Behavioral Institutional Review Board
University Health Center, 8C
4201 St. Antoine Blvd.
Detroit, MI 48201
(313) 577-1628 Office
(313) 993-7122 Fax

Notice of Protocol Exempt Approval

TO: Linda N. Everett, MSN, RN, CNAA
Nursing (Doctoral Candidate-University of Michigan)
Grace Hospital
[redacted]
Detroit, Michigan 4[redacted]

FROM: Peter A. Lichtenberg, Ph.D.[redacted]
Chairman, Behavioral Institutional Review Board

SUBJECT: Exemption Status of Protocol # B 07-32-97(B03)-X; "A Conceptual Framework for a Collaborative Case Management Model"

SOURCE OF FUNDING: No Funding Requested

DATE: August 20, 1997

==========

The research protocol named above has been reviewed and found to qualify for exemption according to paragraph #2 of the Rules and Regulations of the Department of Health and Human Services, CFR Part 46.101(b).

Since I have not evaluated this proposal for scientific merit except to weigh the risk to the human subjects in relation to potential benefits, this approval does not replace or serve in the place of any departmental or other approvals which may be required.

APPENDIX J
(Continued)

MERCY HOSPITAL

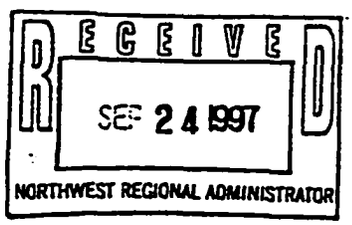
A member of Mercy Health Services

A member of Henry Ford MERCY Health Network

5555 Conner Avenue
Detroit, Michigan 48213-3499

(313) 579-4000

September 23, 1997



Linda Everett, MSN, RN, CNAA
Regional Administrator, Northwest Region
Detroit Medical Center
Grace Hospital
[redacted]
Detroit, Michigan [redacted]

Re: Approval Request for Research Study, "The Organization and Management of Collaborative Case Management"

Dear Ms. Everett:

I am pleased to inform you that the Mercy Hospital IRB has approved your project, "The Organization and Management of Collaborative Case Management." We are requesting that you provide the IRB with a status report three months following implementation of the study.

We are looking forward to your first status report.

Sincerely,

[redacted]

Daniel Kenaan
Chairperson, IRB

cc: Diana Chamberlain
Inger Pound
Raquel Villarruel

BIBLIOGRAPHY

BIBLIOGRAPHY

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