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Care and cost effectiveness of the clinical care coordinate/patient care associate nursing case management model

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CARE AND COST EFFECTIVENESS OF THE CLINICAL CARE COORDINATOR/PATIENT CARE ASSOCIATE NURSING CASE MANAGEMENT MODEL

by

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DISSERTATION

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ABSTRACT

CARE AND COST EFECTIVENESS OF THE CLINICAL CARE COORDINATOR/PATIENT CARE ASSOCIATE NURSING CASE MANAGEMENT MODEL

Rosalind W. Harper

This study examined the impact of a nursing case management model on variables related to the process of nursing care delivery and costs of care. Pre-case management, charge nurses, RNs, and LVNs performed total patient care without clerical support. The model designed for the study restructured the charge nurse role to that of an expanded practitioner called a Clinical Care Coordinator (CCC). CCCs were paired with nurse extenders called Patient Care Associates (PCAs) who were cross-trained clerks and nurses aides. CCCs were operationally accountable for unit activities, collaborative supervision of RNs and LVNs performing total patient care and overall management of a caseload of patients. PCAs performed clerical and clinical activities as assigned by CCCs. Case management was defined as a case method of assignment in which CCCs are accountable for achievement of designated patient care outcomes for a caseload of patients across an episode of illness, transcending unit/setting boundaries.

The study was carried out on a 26-bed medical unit in a community hospital and involved analysis of data collected pre-post implementation of the CCC/PCA model. Dependent

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variables used existing work sampling, direct care sampling, nursing risk management, home health referral, and costing data from the study site. Descriptive data were analyzed using chi-square statistics.

Study results demonstrated that the CCC/PCA model was care effective. On day shift, CCCs spent significantly more time in direct care activities and significantly less time on indirect care clerical and unit-related activities. On evenings, CCCs spent significantly more time in communication on behalf of the patient. Home health referrals increased and nursing risk management events declined but not significantly. Direct care sampling revealed that the percentage of direct care RN time received by patients increased significantly. On evenings, significantly more RN time was spent communicating with patients. Significantly less time was spent in observational rounds. The CCC/PCA model was more cost effective in terms of total costs/patient day, labor costs/patient day, labor costs/unit of workload, and production inefficiency costs which annualize the dollar cost of having RNs perform non-nursing activities.

DEDICATION

This dissertation is dedicated to the memory of

B. Courtney West

ACKNOWLEDGEMENTS

I wish to extend my appreciation to a few of the many people who supported me in the process of completing this study. I am especially indebted to Dr. Susan Neidlinger, my advisor, who believed in this project and provided a supportive and nurturing environment, helpful advice, and occasionally gentle prodding when needed. I am also grateful to Dr. Ginger Carrieri-Kohlman for believing in me and providing encouragment at critical times during the course of the doctoral program.

Within the practice environment, I am especially grateful to Nancy Madsen, MSN, who believes that nurses make a critical difference in hospitals and creates a supportive environment for intrapreneurs wherever she goes. Special thanks to Dr. Holly DeGroot and Barbara Brantley at Catalyst Systems for their willingness to share their expertise about work sampling. At Sutter Solano Medical Center, I am indebted to Linda Grix, a reference librarian who can find even the most obscure references, and to Floyd Potes, who provided much need logistics and technical support. Finally, my thanks to Cheryl Dew and Lori Munekawa, who provided valuable clerical support with figures and tables.

Finally, I am pleased to end the contest with my 16 year-old daughter Courtney, who bet that she would graduate from high school before I completed doctoral studies. It was a very close call!

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CHAPTER ONE

THE STUDY PROBLEM

The introduction of the prospective payment system of reimbursement by diagnostic related groups (DRGs) in 1983 has had a dramatic impact on the organization and delivery of patient care services in hospitals. The prospective payment system has been associated with lower hospital occupancy rates and shorter lengths of stay despite apparent increases in patient severity of illness (Jones, 1989). Responding to the need to maximize limited reimbursement, hospitals have emphasized improved production efficiencies in order to discharge patients within DRG length of stay limits. At the same time, high vacancy rates for registered nurses have led to experimentation with less costly alternative care givers as well as alternative care delivery models (American Hospital Association, 1989).

Nursing case management, a case method of assignment of a group of patients over the course of their illness episode, is being offered as one means to emphasize the appropriate use of resources to achieve optimal patient outcomes within a specified period of time. Despite a proliferation of case management descriptions in the nursing literature, the impact of nursing case management on the provision of nursing care in acute care hospitals is largely unknown because it has not been widely studied.

Purpose of the Study

The purpose of this study is to examine the impact of a nursing case management model on variables related to the process of nursing care delivery and the costs of care on one medical-surgical unit in an urban community hospital.

Significance of Study

Nurses comprise a significant portion of a hospital's labor force. Determination of efficient combinations of nursing skill-mixes and the optimal use of nursing personnel are important components of cost and care-effectiveness. The introduction of a case management system that is effective in producing optimal patient outcomes and efficient in terms of the utilization of personnel would be of national interest because many hospitals are exploring case management as a care delivery modality. In a 1989 survey of 987 nursing administrators throughout the United States, 3% reported the use of a case management system in 1989 while 54% projected the transition to nursing case management by 1992, reflecting the association of case management with cost-effective care (Wake, 1990).

Of 113 research studies published in the health services research literature from 1980-1989, 46.6% pertained to nursing care delivery approaches, 58.4% to cost/quality of care, and 16.8% to health care delivery environment. Early 1980's studies emphasized all-RN or primary nursing comparisons at a time when RN's were available in sufficient

quantities to meet hospital demands. Consistent with the nursing shortage, later studies featured the effect of DRGs, costs of care and various characteristics within the work environment (manager characteristics, turnover, job characteristics) but no studies measuring the effects of alternative care delivery approaches were published (Ingersoll, Hoffart, & Schultz, 1990).

Case management is designed to facilitate (1) interdisciplinary collaboration to achieve desired patient outcomes within the DRG length of stay limits, (2) coordination of post-hospital community care to optimize patient recovery, and (3) cost-effective resource utilization (Zander. 1988). While the effectiveness of nursing case management in shortening length of stay and reducing costs has been reported for selected DRG populations (Zander, 1988), systematic study of the outcomes of nursing case management have been reported in only one study (Brett & Tonges, 1990).

Ideally, achievement of expected DRG patient lengths of stay should be accompanied by optimal patient outcomes such as reductions in hospital readmission rates, decreases in numbers of high risk events that could prolong patient stays and increased frequencies of referrals to community resources. Moreover, case management should be achieved through efficient personnel utilization so that the costs of nursing case management do not offset savings achieved by

more efficient patient management.

This study was designed to bridge these existing knowledge gaps by examining the impact of nursing case management on patient related outcomes of care and the costs of care delivery. The impact of introducing non-professional nurse assistant roles and redistributing care giver activities in transitioning to nursing case management was also explored.

Background of Study

The evolution of care delivery modalities have reflected the often conflicting desires for the professionalization of nursing against economic pressures for cost-effective care and the dilution of nursing skill-mixes as briefly summarized in the following historical review of nursing.

1895-1920: Hospital Nursing at the Turn of the Century

The early twentieth century was a period of tremendous growth in health care services brought about by the development of advances in medical technology, an industrialized society, and urbanization.

During this period, a certificate as a trained nurse offered a number of occupational choices. About 54% of graduate nurses worked as private duty nurses in the community while the remainder were divided between teaching, administration or supervision in hospital schools and public health nursing (Bullough & Bullough, 1964, p.148).

The case method of delivering nursing care was practiced by private duty nurses in the community. Under this method, the nurse assumed individual accountability for the total planning and care of one or more individual patients. Receiving referrals from physicians or placement through registries, private duty nurses cared for patients in their homes. Because severe illnesses such as typhoid and pneumonia were followed by long periods of convalescence, private duty nurses had ample opportunity to know their patients and families well (Reverby, 1983).

In contrast, nursing in hospitals was largely performed by untrained or in-training probationers "in preference to trained nurses or nursing attendants since they were the cheapest source of labor" (Maggs, 1983, p.10). A typical day might see a first and second year probationer assigned to assist a "staff nurse" (a third year student) to manage 20 patients from 7 AM to 9 PM. At night, one staff nurse would have the assistance of a probationer between two wards (Maggs, 1983, p. 119).

Although the term functional nursing was unknown at the time, work on nursing units was routinized and systematized such that all tasks were performed at certain times of the day and each task was assigned fixed expected completion times. Where nurses once observed patients "as time passed by", now nurses became "users of time" (p. 106). Tasks such as taking of temperatures, administering medicines,

delivering and collecting urinals, washing backs, and delivering meals were ritualistically performed at prescribed periods of the day under the watchful eye of the ward sister, who regulated the work flow. By breaking up the day into a series of rigid, routine activities, the ward sister was able to "manage" the care of patients efficiently. Deviations from routine were punished, even if they meant assisting a patient by "serving between times" (p. 107).

1920-1940: Nursing in an Era of Economic Uncertainty

The second quarter of the twentieth century saw the beginning of a long struggle for nursing professional recognition in the midst of social and economic upheavals. The inability to control the output of nurses and the influence of job design theories emphasizing efficiency and task specialization were important factors in perpetuating the functional nursing care delivery system.

Growth of Hospital Nursing

By 1925, hospitals had been largely transformed from places of disrepute to institutions of community respectability and had vastly increased their numbers to over 6000 (Starr, 1982). As the numbers of hospitals increased, so too did the number of hospital-based nursing schools from 15 in 1880 to 2155 by 1926 (Moloney, 1986,p.88).

With the entry of the United States into World War I,

the demand for nurses jumped to roughly four times the numbers of nurses than were available; a demand that was met in part by training aides through the Red Cross. While actively opposed by professional nursing organizations, volunteer aides served overseas until forced to stand aside by an influx of trained nurses (Bullough & Bullough, 1964).

After World War I, nursing leaders attempted to blunt the impact of an oversupply of nurses by focusing their efforts on setting educational standards. Calls to emphasize training rather than the production of nurses were also echoed by influential leaders such as Mary Adelaide Nutting who published a book titled A Sound Economic Basis for Schools of Nursing in 1926. Criticizing the reluctance of hospitals "entrenched in tradition" to reverse practices of maintaining low educational standards to assure a plentiful supply of applicants, Nutting argued that hospitals were "defeating any rational educational scheme" through long working hours and insufficient allocation of funds to hire qualified teachers (Nutting, 1926 p.317).

With public and federally supported hospitals hiring graduate nurses rather than opening new training schools, small hospitals began to capitalize on the fact that graduate nurses could be hired for the same or less wages than students and began to close their doors. As a result, hospital employment of trained general duty nurses grew from 4000 in 1929 to 28,000 in 1937 and by 1941 almost half of

the 173,000 nurses were working in institutions in some capacity (Bullough & Bullough, 1964, p. 185).

Organization of Hospital Environments

Within the hospitals, nurses were able to achieve a greater sense of legitimacy. Continued improvements in medical therapeutics created an environment where nurses were expected to carry out many technical tasks previously performed by physicians such as operating oxygen tents and mechanical beds, and administering intravenous injections (Phillips, 1949). Moreover, hospital employment increased nurses authority with patients. More sophisticated equipment and complicated medical regimens created a unfamiliar environment for patients and they depended on nurses to guide them through the confusing routines and organizational constraints. As patient advocates inside the hospital, nurses could more legitimately restrict their activities to nursing tasks and leave laundry, mending, cooking, and child care to others (Melosh, 1983, p. 165).

Functional Nursing in Hospitals

Despite these gains nurses in hospitals existed in highly structured, rigid environments that were strongly influenced by the "scientific management" principles popular at the time. In the 1920's, 1930's, and early 1940's, the mechanization of industry after industry with the industrial revolution led to wholesale restructuring of organizations. Based on the work of Frederick Winslow Taylor, "scientific

management" principles evolved from industrial time and motion studies designed to reduce work to it's most minute and specific increments and then restructure it to produce maximum efficiency (Taylor, 1916, p. 17).

Time and motion studies reinforced the functional division of labor by task. Wards were divided into "services such as treatments, medications, temperatures, charting, and general care to patients" (Larson, 1932, p. 403). The graduate nurse in charge of the ward made out student assignments and managed the flow of activity. Students learned each service, one at a time. Thus, as a medication nurse, the student learned to pour and pass medications by being assigned to that service for all the patients on the ward.

While functional nursing was unarguably efficient, it was not considered conducive to student learning because the activities were disassociated from patient conditions and expected results. Thus, the student giving a fever reducing medicine was not the same nurse who experienced the resulting lowered temperature (Larson, 1932).

Introduction of Case Method Assignments on Nursing Wards

As early as 1932, the case method of assignment was introduced as a means of organizing patient care to enhance student learning. By assigning each student to the complete care of groups of four to five patients, the case method emphasized the correlation of theory with practice instead

of the functional methods focus on "ensuring that the necessary work will always be completed" (Larson, 1932, p. 403). Benefits to the patient included more individual care, better understanding, and more effective care. "We are certainly not slighting the patient in our emphasis on educating the nurse" (Perry, 1938, p. 190).

Over time, the case method was tried as an assignment method for graduate nurses as well as students (Nielsen, 1949). However, the accomplishment of many tasks with few nurses under the functional method continued to be most associated with efficiency during a period when efficiency in the work environment was valued. Despite the obvious advantages of the case method for patients, it would not become the care delivery model of choice for staff nurses until the advent of primary nursing.

Former private duty nurses familiar with the case method who later found work in hospital care were quoted as decrying "the loss of personal independence created by a division of labor that reduced the art and science of nursing to a series of tasks perceived as less skilled work" (Melosh, 1983 p.164). However, given the harsh economic times, this author is in agreement with Hegyvary (1982) when she states:

> Nursing was responding to immediate societal needs and may have had little choice in some decisions about manpower and organization. It's subservient role was

reinforced by the medical profession and hospital administration, as well as by the low status of women in society. The only significant move toward advancing the profession was occurring in a few universities (p.8).

1940-1970: Development of the Nursing Team

The advent of World War II vastly increased the demand for health care workers. The resulting critical shortage of nurses served as a catalyst for the development of a variety of levels of nursing personnel and ushered in a new nursing care delivery system that came to be known as team nursing.

Supply and Demand of Nurses After World War II

The post-war demand for hospital nurses was fueled by three major factors. First, advances in wartime medical therapeutics moved from the front lines to hospitals, creating new specialties such as intensive care for medicine and nursing and creating the need for care givers who could carry out complex technical functions as well as routine nursing tasks (Melosh, 1983).

Second, the rapid growth of the fledgling insurance industry increased the demand for nurses by creating a ready supply of patients to fill hospital beds. Third, in 1947, the passage of the government sponsored Hill-Burton act financed construction for specialized hospitals, clinics, and existing hospital modernization which greatly increased the bed capacity thereby creating dramatic increases in

nursing care requirements. The combination of a reduced supply and an increased demand for registered nurses was reflected by hospital vacancy rates that rose from 14.6% in 1953 to a record high of 23.2% in 1961 (Buerhaus, 1987, p.269).

Post-war Skill-mix Debates

The expansion of health care services coupled with the nursing shortage served as catalysts for a debate over the skill-mix requirements for nursing during this period. Esther Lucille Brown emphasized the importance of a collegiate education to upgrade the quality of nursing practice. She called for the development of auxiliary personnel to work as part of the nursing team to free registered nurses to act as care givers for the more critically ill (Brown, 1948).

In the same year Eli Ginzberg, an economist who chaired the Committee on the Function of Nursing, called for two levels of nursing personnel. Pointing out that nursing had become an inexpensive commodity because it developed during a period when few other occupational choices were available for women, Ginzberg suggested that the number of nurses be limited to fewer, better educated professionals and that Licensed Vocational Nurses (LVNs) be used for simpler nursing tasks (Committee on the Function of Nursing, 1948).

Taking a somewhat different approach, a study by Mildred Montag in 1951 described an educational program to

prepare a "nursing technician" in community colleges to supplement the professional nurse at the bedside. The goal of this program was to provide a level of nurse able to function more broadly in complex hospital environments than the LVN, but restricted to nursing care situations that were "largely repetitive and routine", under the direction of the nurse with "professional preparation" (Montag, 1951, pp. 4-6).

As hospital-based diploma nursing schools were pressed to expand facilities and hire better qualified teachers, many opted to close their doors or switch to lower cost practical nursing programs. Nurses aides, trained through the war effort and displaced from hospitals by RNs and LVNs, sought entrance to these programs as a means of joining the nursing team by upgrading their skills. As a result, the number of LVNs swelled from 30,000 in 1950 to over 125,000 by 1954 (Bullough & Bullough, 1964, p. 197).

The locus of RN education shifted. By 1972, associate degree and diploma schools together accounted for 86% of all graduates with 15% prepared by baccalaureate programs and 4% achieving graduate degrees (Channing, 1979, p. 6).

Evolution of Team Nursing in the Hospital Setting

In some of the earliest articles published about team nursing, Brooks (1948) described the need to reevaluate the way nurses were assigned given the influx of paid auxiliary workers who could perform less complex skills, and Phillips

(1949) discussed the concept of "learning to work with and through others" (p. 505). Emphasizing "patient-centered" care, the registered nurse team leader utilized team conferences to gather information for a written plan to guide patient care and assigned care based on the individual needs of the patient and the qualifications of the available nursing personnel (Germaine, 1971).

With the registered nurse in a leadership position as the leader of a group of care givers providing care to patients, it was theorized that the fragmented, uncoordinated care characteristic of functional nursing would be eliminated (Kron, 1961). The operational assumptions underlying the model were that (1) a team could provide better care than a variety of individuals because the abilities of each team member would be utilized, (2) a nursing team conference was critical to gather information about the patient, and (3) a written plan of care was necessary to guide patient care based on the individual needs of the patient and the qualifications of the nursing personnel (Kramer, 1971). Unlike functional nursing where the head nurse had exercised centralized authority, the registered nurse under team nursing was viewed as having the responsibility and authority to plan, direct, supervise, teach, and evaluate nursing care in a decentralized work environment (Germaine, 1971).

Factors Influencing Team Nursing in the Practice Setting

The decade of the 1960's was marked by rising hospital costs, increased specialization in the work environment, and competing expectations. Styles, (1978) used the word consumerism to describe the prevailing attitude emerging after the depression era of the 1930's that "caring is a business; health is an industry" (p. 29). The focus on the economics of health care was due in large measure to soaring health care costs. From 1927 to 1945, hospital costs per patient day increased 25%. By comparison, costs per patient day rose more than 250% between 1945 and 1960 (Kalisch & Kalisch, 1978, p. 601). Improved medical technology in the form of sophisticated diagnostic equipment, advances in surgical techniques such as heart surgery, and the development of wonder drugs contributed to higher costs as did the rise of special care units such as coronary care and neurosurgery units requiring larger numbers of better educated nurses.

In response to rising health care costs, the federal government established Medicare and Medicaid programs to underwrite basic health coverage for people over 65 years and the financially needy under the Social Security Act of 1965 (Starr, 1982). According to Buerhaus (1987), this allowed hospitals to hire more RNs to fill existing vacancies by passing on a significant portion of their costs to the government. In 1961, at a time when nurses earned 70

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cents for each dollar earned by teachers, hospital vacancy rates for RNs peaked at 23.2%. After 1966, hospital RN vacancy rates declined to 9.3% as RN wages began to rise relative to teachers (p.268).

Role Confusion in the Work Environment

Although hospital vacancy rates dropped, nursing team leaders were feeling confused about their role expectations. Some nursing leaders envisioned new expanded roles for nurse clinicians, clinical specialists and clinical nurse practitioners aiding physicians in community health promotion and health prevention (Cleland & Zagornik, 1971). In contrast, organized medicine called for hospital nurses to function under licensed medicine as "physician's assistants" responsible for the medical care of patients with auxiliary workers replacing nurses (Kron, 1976).

While Styles (1978) observed that the array of educational programs (LVN, ADN, RN (diploma), BSN and masters) for nursing led to a "blurring of preparation, competencies, roles, licenses, rewards, and public recognition." (p.31), she also asserted that the practice environment contributed to the problem by not establishing clearly delineated roles for nurses with better educational preparation.

Studies of the period found that team leaders spent more time in communication with other team members about the patient rather than with the patient. Cristman & Jelinek

(1967) estimated that only 25-50% of nursing skills were used daily. The degree of nurses frustration during this period was reflected by hospital turnover rates that were often in excess of 100% during a twelve month period (Lysaught, 1970, p. 35).

1970-1980: The Rise of Primary Nursing

The combination of high hospital RN vacancy rates, frustration with the work environment and nursing's movement toward better educated nurses contributed to an environment that was well suited to the introduction of primary nursing as an alternative care delivery model to team nursing. Economic RN supply and demand forces in the 1970s helped make primary nursing a reality in the 1970's but blunted it's momentum by the mid 1980's.

Economic Factors Favoring Primary Nursing

By the mid 1970's, the national economy was reeling under inflation rates that soared to double digits by 1979. Efforts to control inflation had led to the imposition of wage and price controls which slowed RN wage increases. With RN salaries little more than LVN salaries, nursing administrators were more than eager to hire RNs because they could perform a wider range of services than LVNs and were thus a more productive source of labor (Buerhaus, 1987).

Hospitals, mindful of high vacancy rates, attempted to address the environmental sources of job dissatisfaction by allowing more participative management between nursing

directors and hospital administration and within nursing itself. These changes fostered the addition of more non-nursing personnel to perform clerical and other tasks, and the germination of primary nursing (Buerhaus, 1987).

The Evolution of Primary Nursing in the Practice Environment

Early efforts to restructure nursing from the team concept of delivering care through others lead to a model emphasizing primary interactions between nurses and patients at the Loeb Center for Nursing and Rehabilitation in New York's Montefiore Hospital. There, nurses were accountable for the day-to-day care of their patient caseload, and attendant messengers provided non-patient supportive services (Hall, 1969). Within hospital inpatient settings, Manthey later operationally defined primary nursing as encompassing assignment by case method, one person being responsible for the care of a patient 24 hours a day, and the acceptance of individual responsibility for patient care decision-making (Manthey, 1980).

Expected benefits of primary nursing included greater individual responsibility and accountability of nurses (Hegyvary, 1977), more cost-effective care (Marram, Flynn, Abaravich, & Carey,1976), increased patient continuity, less fragmentation of patient care and faster patient recuperation (Cicatiello, 1976). Advantages for nurses included greater job satisfaction, improved rapport between nurse and patient, and improved relationships with ancillary

departments (Cicatiello, 1977), greater autonomy in the practice setting and greater collaboration with physicians (Donahue, Weiner, & Shirk, 1977).

Societal Forces Blunting the Advance of Primary Nursing

In 1981, the supply and demand forces were essentially in balance for nurses. Almost 75% of all nurses were actively employed in nursing, only 3% of nurses were leaving the field to pursue other occupations, and the proportion of nurses working in hospitals had remained stable at approximately 65% since the middle 1970's (Aiken, Blendon, & Rogers, 1981, p. 366). By 1986, 24% of hospitals in all parts of the country reported RN vacancy rates at 15% or higher (American Hospital Association, 1987, p. 25).

At the same time, the hospital demand for nurses rose due to an increase in the average age and severity of illness among hospital inpatients, a rise in RN employment in long term care facilities, and flat wage rate structures that did not compensate more for education, experience, or performance, making RN employment advantageous to hospitals (Friss, 1988a).

Impact of Primary Nursing in the Practice Environment

Designers of primary nursing had hoped to resurrect the case method of assignment at a time when RN availability made the ideal possible. However, when the supply of nurses did not keep pace with the demand, primary nursing was often unable to be actualized as envisioned. This was reflected

by a 1981 survey of 118 hospitals showing that only 23 used primary nursing exclusively with the remainder combining it with total patient care (8 hour accountability), team nursing, or functional nursing (Marram van Servellen (1981).

Other implementation problems related to the failure of the designers of primary nursing to clearly articulate roles for the LVNs and aides so integral to team nursing. This was reflected by confusion about whether to operationalize primary nursing only with RNs, or with LVNs as associate nurses. Further confusion arose about whether to confine primary nursing to the day shift when RNs were more prevalent or to encourage nurses on all shifts to be primary nurses (Ciske, 1977).

Finally, discrepancies between the published goals of primary nursing and the realities of the practice setting led to frustration on the part of primary nurses. Shift schedules requiring RN rotation, staff interruptions with ill calls, and staff "floating" to other work areas were cited as barriers to patient care continuity which increased the workloads of primary nurses, leaving them little time to fully perform their roles (Donahue, Weiner, & Shirk, 1977).

1985 and Beyond: Alternative Practice Models

In the mid-1980's, restructuring of hospital reimbursement dramatically altered medical care delivery patterns and set the stage for skill mix changes and alternative care case management models designed to support shorter patient

lengths of stay.

Prospective Payment Impact on Health Care Delivery

In 1983, the federal government restructured the Medicare system from cost-based reimbursement to prospectively set payment rates. Responding to rising health care costs in the 1970's, governmental pressure from insurance carriers, health maintenance organizations, and businesses culminated in the adoption of payment for Medicare patients by Diagnostic Related Groups (DRGs) in an attempt to reduce expenditures (Whiteis & Salmon, 1987). With economic incentives favoring the treatment of short stay procedures on an outpatient basis, hospital occupancy rates dropped. Hospitals began to be used for only the most acute phase of a patient's illness with the result that the overall severity of illness of hospitalized patients increased. At the same time, limits on reimbursement created incentives to shorten patient length of stay. As hospitals attempted to compress sicker patient illness episodes into fewer days, the intensity of the nursing service workload increased.

Nurses working in hospitals and particularly those under primary nursing designed to enrich patient care and enhance job satisfaction expressed disillusionment with increased workloads that had them juggling many levels of responsibility "faster, better, and with the same or fewer personnel" (Tamerius, 1988, p. 42). Perceptions of being

overworked and "burned out" lead many nurses to reduce their work hours (Buerhaus, 1987, p. 273).

As the decade came to a close, over 30% of employed nurses in the United States worked part-time, and flexible scheduling options such as short hour, weekend only, and three day/twelve hour shift workweeks were becoming commonplace (Friss, 1988b). With continuity of patient care in danger of being fragmented by the absence of consistent care givers and an efficiency-driven practice environment threatening to undermine the anticipated benefits of primary nursing, hospitals began to reassess their commitment to primary nursing or to explore ways to modify it (Tamerius, 1988).

Cost Containment-based Practice Approaches

Financial pressures to lower costs of care and support shorter length of stay have led to experimentation with skill-mix changes emphasizing assistant or "extender" roles as a means of "enriching the work environment of the staff nurse" in an effort to maximize the recruitment and retention of scarce supplies of RNs (American Hospital Association, 1989, p. x-xi).

According to the AHA, assistive roles should optimally avoid unnecessary proliferation of categories of direct care givers, avoid confusing reporting relationships, and take into account issues of training, education, job content, assignment, and financing (AHA, 1989).

Within this framework, a number of nonclinical and clinical assistive roles have been developed to relieve staff nurses of tasks perceived as non-nursing and to assist with routine nursing care of patients. Nonclinical personnel roles such as unit assistants or unit attendants have been designed to perform unit related tasks such as stocking supplies, making unoccupied beds, delivering food trays, obtaining supplies from other departments and performing clerical duties (AHA, 1989).

Clinical assistive roles have been developed to provide fundamental skills in meeting hygiene, comfort, and safety needs of patients through an individual assignment within a team of nurses (team-based), or paired with an RN as a partnership in the care of the RN's patient care assignment. One example of a clinical assistive role is the "practice partner" role described by Manthey as an extender to the primary nurse (Manthey, 1989). In this role, technical assistants (either LVNs or Nursing aides) are assigned to primary nurses to carry out delegated tasks. Each practice partner dyad handles the workload previously performed by two RNs. Part of the dollar savings would be used to increase the RN salary rates in an effort to enhance recruitment and retention of registered nurses. (Manthey, 1989).

Case Management Approaches to Nursing Care Delivery

The prospective payment system has encouraged hospitals to "case manage" patient care in an attempt to promote more efficient resource utilization, streamline patient lengths of stay (LOS), and facilitate post hospital care (Etheredge, 1989, p. 2).

Within hospitals, the role of the nurse as case manager is a relatively recent phenomenon dating to the mid 1980's. While the role has been operationalized in various ways, nursing case management is generally conceptualized as similar to primary nursing in terms of 24 hour accountability from admission to discharge but unique within nursing by virtue of having accountability for achieving optimal patient outcomes within a projected length of stay time limit and patient accountability across units or settings.

As employees, RNs are theorized to be in the best position to act as agents of the hospital to facilitate the ongoing coordination, monitoring, and reassessment of services rendered to patients during the course of their hospitalization. Moreover, by virtue of the fact that nurses are with patients for extended time periods, they are able to identify potential complications and subtle trends in patient responses to illness that could potentially impact length of stays (Etheredge, 1989).

One of the best known examples is the case management

model developed at Boston's New England Medical Center. In this approach, RNs on specialty inpatient, ambulatory, and medical-surgical units work as primary nurses in a "group practice" to care for patients of a given case type (Zander, 1988, p. 27). One primary nurse acts as the case manager to oversee the plan of care for the entire episode of a selected patient's illness in conjunction with the patient's attending physician. When the patient is housed on the case manager's unit, the case manager provides direct patient care as the primary nurse. At other times, the same nurse provides care to patients as a primary or associate nurse (Zander,1988).

In their case management role, primary nurses focus on maximizing optimal resource consumption by mapping out a plan designed to achieve optimal patient outcomes within the DRG length of stay for each patient. Responsibility ends with a transfer of accountability to the patient, family, or other health care provider at the conclusion of the patient's hospitalization. (Zander, 1988).

Differentiated Practice/Case Management Roles

Nursing leaders have long advocated greater nursing collaboration with medicine, greater participation in administrative decision making, restructuring of the work environment to institutionalize differentiated practice roles that recognize and reward education and experience, improved non-clinical support functions, and higher wages

for nurses (Styles, 1982).

Since 1964, the American Nurses Association (ANA) has pressed for recognition of a baccalaureate degree for the professional nurse and an associate degree for a technical nurse (Iglehart, 1987). A number of hospitals have been piloting case management roles using BSN's as the case manager/primary nurse and ADN's as the case associate/associate nurse (Hildebrand, 1988, Maklebust, Suchy, VanTassell & Runk, 1988).

In these models the ADN role focuses on care of individuals for a specified work shift and emphasizes safe, competent care in a structured setting guided by established policies and procedures. The BSN role encompasses a broader social and temporal focus that emphasizes care of individuals and families from admission to discharge while functioning in a less structured role that allows for more independent decision making (Primm, 1986). The basis for these differences lies in the fact that BSN graduates have a broader-based education suitable for health and illness promotion and screening, teaching and counseling, and managerial supervision roles (Kramer, 1981).

Expanded nursing case management roles

While BSN/ADN practice models divide the staff nurse role into "differentiated" practice components, other case management approaches call for fewer, better prepared nurses hired into "expanded" roles distinguished by job

descriptions that are not interchangeable with those of staff nurses. In one such case management model at St. Mary's Hospital in Arizona, BSN prepared "professional case managers" manage and monitor the care of selected complex patients during the acute phase of hospital treatment and into the home care setting. Working collaboratively with primary nurses who provide direct patient care in an inpatient setting, professional case managers emphasize stabilization of acute episodes of chronic illness with the goal of linking patients with community resources to achieve long term health maintenance (Ethridge, 1987).

As described above, nursing practitioners have pursued a variety of nursing care delivery models in hospital settings. Each care model evolved within the context of the period in which it originated as a product of the prevailing environmental influences. In Chapter 2, the research literature related to the study of nursing care delivery will be reviewed with particular emphasis on the efficacy of various dependent variables used to study this phenomenon. The conceptual framework used for this study will be presented in Chapter 3 along with a description of the nursing case management intervention used for this study. Chapter 4 will describe research methods. Chapter 5 will summarize study findings and Chapter 6 will review study implications, and recommendations for future research.

CHAPTER 2

REVIEW OF RELEVANT LITERATURE

Research Studies Evaluating Nursing Care Delivery

Studies evaluating care and cost-effectiveness of nursing care delivery models have used a variety of care outcomes as dependent variables. Nurse outcomes such as job satisfaction and turnover, have been dependent measures when the nurse delivering care was the subject of interest. Nursing process outcomes have been used as measures of care-effectiveness as reflected by ratings of the quality of care delivered, documentation of care provided, and utilization of personnel time spent with patients. Patient outcomes, have been used to measure the results of care received by patients. Cost outcomes were included when the costs associated with the provision of care were of interest. Studies emphasizing the nursing process, patient and cost outcome variables of interest to this project are summarized below.

Of the numerous studies carried out since 1975 contrasting various aspects of care under different nursing delivery patterns, only 16 controlled research studies specifically addressed the performance of nursing care activities, patient outcomes of care and cost comparisons with the intent of evaluating the different delivery approaches. In some studies, definitions of care delivery structures were lacking or operationalized in ways that did

not fit traditional categories. In these cases, the studies were grouped by researchers' descriptions. Four categories of comparisons are included: team versus team and functional combinations; primary versus team nursing; variations of primary/team nursing; and nursing case management.

Primary Versus Team/functional Studies

Three controlled research studies by Felton (1975), Hegedus (1980), and Ventura, Fox, & Mercurio (1982) compared primary, functional, or team/functional delivery models as independent variables.

Felton, (1975)

Felton used Donabedian's structure, process, and outcome framework for health care evaluation to study care delivery on two 25-bed pediatric units in a large community hospital. Assuming that structural differences in nursing care organization can influence the process of care delivery, Felton used an experimental-control design to contrast primary and team/functional nursing with respect to care delivery received by patients, nursing activities of the staff, and chart audits reflecting the outcomes of care.

Primary nursing was clearly defined in terms of RN responsibility for care planning, coordination and care delivery for a caseload of six to eight patients for the duration of their unit stay with support from licensed and unlicensed care givers. Team/functional nursing was defined as care delivered to 10-12 patients by a team of LVN and

nurses aides supervised by an RN with some functional activities assigned to specialists among the group. Staffing levels, hours of care provided, and patient census were reported for the seven-month period of the study.

Three instruments were used as dependent variables. The Quality Patient Care Scale (QualPaCS) (Wandelt & Ager, 1970), a 68-item scale based on direct care observation of patients was used to measure different dimensions of care received by patients. These included psychosocial needs of individuals and groups, physical and general needs, communication, and nursing judgment. High instrument interrater reliability and internal consistency measures were reported.

The 84-item Slater Nursing Competencies Scale (Slater, 1967) was used to rate nurse performance on a variety of nurse-patient interactions. Instrument reliability, internal consistency and interrater reliabilities were reported. The Phaneuf Nursing Audit (Phaneuf, 1972), a 50-item instrument, was used to evaluate the quality of care received by patients as reflected by seven categories of nursing functions. The need for reliability and predictive validity of this instrument was acknowledged.

Nineteen staff members from the primary unit and 18 members of the team/functional unit participated in the study with 30 patients randomly chosen for a two-hour observation period. Trained observers watched patients and

their nurses for two-hour intervals and rated behaviors on the Slater and QualPaCS scales. After patient discharge, observers completed the Phaneuf chart audit on the 30 patient records. Mean scores were used to compare units using one-tailed t-tests to determine differences at the .05 level of significance.

Felton hypothesized that mean scores on all three measures would be higher on the primary than the team/functional unit and that scores on the Slater competency scale would increase as nurses progressed from novices to clinical experts. Results of the study supported both hypotheses. Felton concluded that the organizational structure of the primary unit, together with the range of nursing competencies resulted in increased quality of care.

With this study it was difficult to isolate the contribution of the organization of care as opposed to staffing and competencies of care providers. More RN hours were provided on the primary than team/functional unit despite the fact that total staffing hours per patient day were higher on the team/functional unit. Matching census and patient care acuity would have ensured equivalency of the study units as would matching staff competency levels and assigning staff members to groups instead of soliciting volunteers. Finally, reporting the breakdown of salary costs of care associated with experimental and control units could have helped explain study findings.

Hegedus, (1980)

Hegedus also used Donabedian's structure, process, and outcome framework to compare four medical-surgical units in a large urban hospital. A pre-test, post-test control group design without randomization was used to compare two functional nursing units (control groups) with two units that transitioned from functional to primary nursing (experimental groups). Primary nursing was defined as 24-hour accountability for total care of a patient from admission to discharge with functional nursing defined as a system of care delivery by assigned tasks. The research question of interest was whether primary nursing was more effective in terms of the care delivered to patients. The units were matched by size, education, and experience of the nursing staff and by patient population.

Three dependent variables were used as measures of care effectiveness. The QualPaCS scale (Wandelt & Ager, 1970), was used as a quantitative measure of quality of care. A reliability coefficient of 0.96 was reported for this instrument. The second measure was a hospital stress rating scale (Volicer, 1975,) used to detect 49 stress producing events for patients such as not having call lights answered, and not having information provided by the nursing staff. A rank order correlation of 0.93 was reported for this measure. Fifteen percent of the patients on all four units were randomly selected and included in pre measures using

the QualPaCS and Volicer stress scale. Six months after implementation of primary nursing, data were collected again for post measures. The total sample size was not reported, although at least five patients were included from each of the study units. The final dependent variable was a chart audit devised by the agency to assess compliance with care plan documentation. High interrater reliability (97%) and content validity measures were reported for this instrument. A random sample of 25% of patient charts from each unit were audited for pre and post measures.

Tests of significance were reported at the .05 level but data analysis techniques were not revealed. Results of the study showed improvement in QualPaCS and stress scale scores between time 1 and time 2 for the experimental group scores suggesting that patients under primary nursing experienced less stress. The chart audits demonstrated no differences between groups. Hegedus concluded that these results were supportive of primary nursing. At the end of the implementation period Hegedus conducted a job satisfaction survey among 40 nurses which did not reveal significant differences with respect to work satisfiers such as feelings of achievement, growth, or facilitation of creativity. Although an effort was made to randomize patients for selection, this study was limited by a small sample sizes and the failure to disclose observer training and inter-rater reliability scores for the QualPaCS

instrument.

Ventura, Fox, & Mercurio, (1982)

Ventura, Fox, & Mercurio (1982) evaluated the effectiveness of implementing key concepts of primary nursing. Primary nursing was defined as accountability for overall care planning, care giving, and communication of the plan for a caseload of patients. Team/functional nursing was defined as care provided to a group of patients by RN led teams with LVNs administering medication to both teams. A 40-bed primary nursing unit (experimental group) was compared with a 35-bed team/functional unit (control group) of comparable patient mix at a different facility in another region of the country.

The dependent variable was the 25-item Risser Patient Satisfaction Scale (Risser, 1975) measuring attitudes towards nursing. Extensive reliability and internal consistency measures were reported for the instrument. The researchers hypothesized that patient satisfaction scores would be higher under primary nursing. A convenience sample of 21 patients in the control group and 25 patients in the experimental group who had been on study units at least three days participated in the study. The instrument was given to patients 48 hours prior to discharge and collected two hours later. T-tests of independent means at the .05 level of significance revealed no differences between care delivery models.

The most serious flaw in this study was a lack of study unit equivalency. The researchers acknowledged that the study units may have differed not only with respect to region of the country, but also by nursing workload, staffing ratios, and hours of nursing care provided. The researchers also questioned the discriminant validity of the Risser subscales. High intercorrelations suggested that they were measuring the same dimension instead of three different dimensions as intended.

Research Studies Comparing Team and Primary Nursing

Nine studies compared primary with team nursing. Three employed pre-post designs to evaluate the transition to primary nursing.

Pre-post Team-Primary Nursing Studies

Studies by Eichhorn & Frevert (1979), Betz, Dickerson, & Wyatt, (1980), and Hamera & O"Connell (1981) contrasted the transition from team to primary nursing in community settings. These studies were of interest because the present study involves pre-post comparisons of care delivery after a transition to a new care model.

Eichorn & Frevert, (1979)

Eichhorn & Frevert studied two medical and two surgical units pre and post implementation to primary nursing. Primary nursing was operationally defined as having an RN accountable for a caseload of six to eight patients over the

course of their hospitalization with responsibility for care planning, coordination, and evaluation of the plan. Staff nurses worked rotating shifts and participated in direct patient care. Team nursing was not operationally defined.

The QualPaCS scale was used as the dependent variable to compare care delivery quality. Twelve observers were trained for data collection. Observer interrater reliabilities ranged from 60% to 96%. A sample of 34 patients from two medical and two surgical units were each observed for two hours. After the transition to primary nursing, 32 patients were observed for the same period of time. Patient characteristics, methods of patient selection, and duration of data collection periods were not disclosed. T-tests of means were used to compare units at the .05 level of significance. Study results revealed statistically significant improvement after the implementation of primary nursing for the four units as a whole. Analysis by QualPaCS subcategory revealed statistical improvement in all but two categories.

This study was weakened by a number of factors. Team nursing was not operationally defined, making comparisons difficult. Staffing ratios and hours of care provided to patients were not reported raising a question as to comparability of the units. The length of observer training was not defined and interrater reliabilities for the QualPaCS instrument revealed wide ranges. Because the

reliability of the QualPaCS instrument depends on raters' judgment and experience to discriminate among "best", "average", and "poor" care ranges, high levels of observer inter-rater agreement are critically important for the believability of the results.

Finally, this study was carried out in the same institution in which Felton (1975) conducted a team-primary nursing comparison a few years earlier using the same measurement instrument. For this reason, having observers blind to the aims of the study would have been helpful to minimize observer bias.

Betz, Dickerson, & Wyatt, (1980)

Betz, Dickerson, & Wyatt conducted a cost-effectiveness study to compare a 42-bed team (control) unit with a 46-bed team unit that transitioned to primary nursing (experimental). Neither team nor primary nursing were operationally defined, nor were staffing ratios or personnel skill-mixes used to staff the units. Dependent variables were quality and cost. Quality was defined as the degree to which five nursing care objectives (care planning, physical needs, non-physical needs, care evaluation, and provision of support services) were achieved. Costs were defined as total operating expenses and included all levels of personnel (nurses, aides, and unit secretaries) and categories of staffing expense (full-time, part-time, and float personnel). Costs were expressed as costs per patient

day, cost per personnel hour utilized, and cost per nursing hour needed as predicted by a patient classification system's recommended hours per patient day. Outside education and turnover rates were also compiled.

Data were collected at six observations periods: two periods one month apart before the transition to primary nursing and after the transition at months 5, 6, 8 and 12. A random sample of 16 patients on each unit were observed on random weekdays during each data collection month. The length of patient observation was not disclosed. Observer training, interrater reliabilities, and the process of data collection were not reported. Results were presented in raw scores and were not subjected to statistical methods.

Study results showed that costs per patient day were consistently higher before and after implementation of primary nursing on the experimental unit due to higher patient acuity levels. Costs per nursing hour and per personnel hour were comparable. Costs per patient day diminished under primary nursing which was notable in view of the higher patient acuity on this unit. Educational costs and turnover rates on the primary unit were roughly double those on the team unit. Quality scores were higher on the experimental unit both before and after primary nursing but doubled after the transition, suggestive of considerable improvement with primary nursing.

This study was difficult to interpret because tests of

significance were not performed. Thus, it was possible for the results to have occurred by chance alone. A number of factors could have influenced study results. A lack of reliability testing for the quality measure and absent interrater reliability comparisons for the observers seriously weakened the quality score results. Moreover, census figures were not reported. A consistently lower census on the control unit could have inflated the costs compared to the primary unit.

Hamera & O'Connell, (1981)

Hamera & O"Connell conducted a study to capture the quantity and quality of the nurse-patient interaction. The authors' theorized that because primary nursing is designed to produce more individualized and personalized care, nurses having the responsibility for total care of patients throughout their hospitalization would have a greater frequency of contacts with patients and the nature of the interactions would be different. Primary and team nursing were described in general terms but not operationally defined.

The study was conducted on a 30-bed medical unit using a team nursing model over a 6-month period. After a 6-month period of transition to primary nursing, data were collected over a second 6-month period. The same nursing staff and staffing ratios were maintained for both data collection periods thus controlling for staffing and experience levels.

Twelve randomly selected nurse-patient interactions were observed under team and under primary nursing. Three patients dropped out of the study on the team unit leaving 9 patients in the sample.

To measure the quality of each interaction, the number of "nurturant" contacts (defined as situations in which one person extends himself/herself to benefit another), the number of contacts in which the patient was activity involved, and the number of patient-initiated contacts were used as dependent measures. A total of 2,595 hours of observational data were obtained. Data were collected by 11 nurse coders trained in specimen record methodology and randomly assigned to study patients. Coder interrater reliabilities of 95.98% were achieved prior to the study. Data were compared using t-tests of means at the .05 level of significance.

There were no significant differences between patients under team and primary nursing with respect to the frequency of nurturant contacts, number of interactions in which patients were involved with all nursing personnel or with only RNs. When the primary nursing group was adjusted to remove five patients who did not have a primary nurse for longer than three days, the primary nursing group experienced significantly more nurturant interactions with RNs and there was a tendency for a greater proportion of all interactions to be nurturant.

Failure to find group differences may have been a function of the small sample size. However, the researchers noted that when team nurses are responsible for care planning and are assigned to the same patients day after day, they may be functioning similarly to primary nurses and few differences in performance may be found. Overall, the time patients interacted with RNs over the course of a five day hospital stay averaged 2.25 hours or less than 2% of the total. The small proportion of nursing time spent with patients led Hamera & O'Connell to question whether any nursing care delivery system could have a significant impact on a patient's hospitalization.

Team versus Primary Nursing Studies

Six studies featured comparisons of care under team and primary nursing in research settings.

Jones, (1975)

Jones explored whether primary nursing would be more effective than team nursing in providing planned nursing interventions with kidney transplant patients requiring a great deal of emotional support to cope with the stress of renal disease and transplantation.

Primary nursing was defined as responsibility for the nursing care of a patient throughout the hospitalization on the unit. Duties included admission assessments, care planning, care coordination, and patient teaching. It was not clear whether the role included care giving for assigned

patients. Team nursing was not operationally defined. It was hypothesized that the primary nursing group would exhibit fewer negative behaviors after surgery, fewer post-transplantation complications, shorter lengths of stay, and express more positive attitudes toward the hospitalization.

Nineteen patients (nine in the experimental group and 10 in the control group) were randomly assigned to one of the two groups and observed for three weeks. The groups were comparable with respect to age, sex, and reception of living versus cadaver donors. Nurses ranked each patients behavior using a 31-item behavioral checklist describing different aspects of "negative" behaviors such as dependency, irritability, etc. Patients were also given a 10-item questionaire eliciting feedback about the hospitalization, the nursing unit, and the nursing staff. Data analysis techniques were not described.

Study findings revealed no significant differences in total negative behaviors between groups. Primary nursing had no effect on transplant rejection rates, nor on patient perceptions of the hospitalization or nursing care. Most patients expressed positive attitudes toward the hospitalization, nursing unit where they received care, and the nursing staff. Interestingly, fewer patients in the primary group stated that a particular nurse was interested in them than in the team group. Significantly, the primary nursing group demonstrated fewer complications and shorter

lengths of stay than the team nursing group. A total of three weeks separated length of stay between primary and team groups resulting in a considerable average cost-per-day savings. This study was weakened by a small sample size and by the fact that staffing ratios, skill-mixes, and patient workload levels were not measured, raising concerns about group equivalency. Moreover, primary nurses in the study were volunteers, raising a question as to whether the same results might have been achieved if nurses as well as patients had been randomly assigned to the groups. Failure to measure interrater reliability among the nurses rating behaviors and lack of instrument reliability estimates for the behavioral checklist also weakened the study results.

Despite the methodological problems, Jones reported that the study lent support to the notion that one nurse responsible for care planning and care management over the duration of the patient's stay could facilitate reduced complications and length of patient stay.

Daeffler, (1975)

Daeffler (1975) examined differences between primary and team nursing (independent variables) using omissions of care perceived by patients as the dependent variable. Primary nursing was defined as an RN responsible for a caseload of as many as four patients with responsibility for care planning, care management, and care giving over the

course of the patient's stay. Team nursing was defined as an RN team leader planning and coordinating care with team members (LVNs and Nurses aides) providing care on a shift by shift basis. Daeffler theorized that while the quality of care depends on individual nurses under both models, primary nursing should increase the contact between each patient and at least one RN to provide better patient care continuity. While acknowledging that patients are not qualified to evaluate nursing care, Daeffler argued that they can, nevertheless, be a valuable source of information about nursing practice.

Fifty-two patients on five medical-surgical units practicing team nursing and 30 patients on a primary nursing unit were given a 50-item checklist by the investigator dividing care into one of seven categories including elimination, personal hygiene, dietary needs, rest and relaxation, reaction to therapy, satisfaction with care, and contact with nurses. Instrument reliability was not reported and statistical methods were not described.

Results of the study demonstrated no significant differences except in the dietary category. Comparability of the nursing groups was not established with respect to staffing ratios or patient acuity with the result that primary nurses might have had fewer patients with more time to provide care or less acutely ill patients. The units also might not have been equivalent in that the team subject

sample was pooled from five units whereas the primary nursing group data came from one unit. Failure to report instrument reliability was also a study weakness. Finally, the study would have benefitted from having an unbiased observer blind to the aims of the study administer the behavioral checklist.

Marram, Flynn, Abaravich, & Carey, (1976)

Marram, Flynn, Abaravich & Carey examined the cost-effectiveness of team and primary nursing over a six-week period. Cost-effectiveness was defined as the extent to which a unit could produce outcomes of same quality at less cost or higher quality outcomes at the same cost. Team nursing was defined as collaborative care given to a group of patients by teams of RNs, LVNs, or aides headed by an RN. Primary nursing was defined as RNs, or LVNs acting as primary and associate nurses for care planning and care delivery of patients with aides providing direct patient care. Two medical-surgical units were matched by bed capacity, staffing ratios, mix of nursing staff, and length of stay. Primary nursing had been in place for three years at the time of the study.

Dependent variables were nurse job satisfaction, quality of nursing care records, patient satisfaction with care, and costs of care. Two nurse job satisfaction instruments were administered to 19 staff members on each unit. Reliability was not addressed with either instrument.

Thirty-six patient records from each unit were randomly selected for review by researchers to determine the extent to which nursing assessment was utilized and care was individualized. Interrater reliability of the reviewers was not presented. Patient satisfaction with nursing care was measured by a 25-item survey administered to 59 team unit and 49 primary unit patients by the researchers. Instrument reliability was not disclosed. Direct care costs (salary, benefit, and supply costs) were used to compare the units. Total expenses were divided by the number of beds on each unit to obtain a cost/bed comparison.

Results of the study were difficult to interpret because differences were reported in percentages and not subjected to tests of significance. Minor percentage differences were found in job satisfaction. Patient satisfaction data suggested that patients on both units were satisfied with care although a greater percentage of primary unit patients were satisfied. Unit records were reportedly more individualized on the experimental unit but researcher bias may have been evident on data collection. Primary nursing was about 9% less expensive than team nursing. However, team unit nurses had been employed longer so that cost differences could be largely explained by differences in nurses salary costs rather than the models themselves. Moreover, patient acuity was not addressed so it is difficult to know whether variations in hours of care

provided to patients were due to variations in patient acuity or because one model permitted more efficient use of time than the other. Total expenses were divided by the number of beds on each unit to obtain a cost-per-bed figure for comparison. This cost allocation practice is questionable because it assumes that occupancy rates remain stable and that patients in each bed require the same amount of nursing care. A more useful measure for care delivery comparisons would have been units of service such as nursing hours provided per patient day.

Giovannetti, (1980)

Giovannetti conducted one of the early research studies using the nature of personnel time as a dependent measure of accomplishing the work of nursing. Utilization of personnel time is usually broken down in terms of direct care (time spent with the patient), indirect care (time spent on behalf of the patient away from the bedside), and other categories of activities such as unit-related, professional, and personal time. In this study direct and indirect care time were two of six dependent variables comparing a team and a primary nursing unit with respect to utilization of personnel, job satisfaction, patient satisfaction, quality of nursing care, and costs of care. Operational descriptions of team and primary nursing were developed but not delineated in this publication. Since random assignment of nurses and patients was not possible, units were matched

by census, patient acuity, length of stay, and physical layout.

For direct care sampling, trained nurse observers at the beginning of a shift recorded the time, personnel status, and activity perofrmed by all nursing personnel entering the patient's room. A total of 585 patients were each observed continously for an eight-hour period on one 29-bed team unit and one 33-bed primary nursing unit over seven weeks. Work sampling was used to determine the proportion of time nurses spent in 16 categories of direct care and 14 categories of indirect care. Trained observers documented the activities of each staff member every 10 minutes on all shifts for a total of 76 shifts on the two units.

Patient satisfaction was measured by a 24-item questionaire given to a 78 team nursing and 82 primary nursing patients on the day of discharge. Instrument reliability was not reported. Quality of nursing care was measured by two chart audits evaluating the nursing care process. A total of 257 patient records were reviewed by two trained nurses. No details were provided about instrument reliability and validity. Direct care salary costs were collected for 40 days. Nurse job satisfaction was obtained through two self administered questionaires for which no reliability estimates were reported. The Behrens-Fisher statistic was used to test for differences in mean

minutes of time spent within four categories of patient acuity. Analysis of direct care sampling revealed that significantly more direct care minutes on the day shift were spent with patients under team nursing across all patient acuity levels. On evening and night shifts, there were no significant differences in direct care minutes. Work sampling findings were similar in that nurses on day and evening shifts under team nursing spent a greater proportion of time in direct care activities than did their colleagues under primary nursing. No significant differences were found with respect to quality scores on the chart audits or patient satisfaction scores. Job satisfaction was significantly higher for all levels of nursing staff on the team units. Costs per patient day, per personnel hour, and per bed/day were all higher on the experimental unit.

Giovannetti concluded that while the nursing literature is supportive of primary nursing, this care delivery method may not automatically produce more nursing care to patients. While the study results could have been strengthened by more information about the quality, patient satisfaction, and job satisfaction instruments, the large volume of quantitative data about the nature of personnel time was particularly useful in evaluating the process of nursing care delivery under different organizational structures.

Chavigny & Lewis, (1984)

Chavigny and Lewis chronicled the "contradictory or ambiguous" findings of previous studies comparing team and primary nursing. In an effort to increase the sample size for comparison, the researchers used an epidemologic cohort design which paired 10 nursing units for comparison over 15 weeks. Head nurses and their units were randomly assigned to control (team) or experimental (primary) groups. Primary nursing was defined as accountability for all aspects of care for patients and families from admission to discharge. Team nursing was defined as total care given to a group of patients by a team of various personnel levels, headed by an RN.

Dependent variables included patient care outcomes and care process outcomes. Patient care outcomes included satisfaction with care, knowledge of self-care, length of stay and the frequency of adverse reactions (post-operative complications, patient complaints, nosocomial infections). Patient satisfaction and knowledge outcomes were assessed by giving patients questionaires about their knowledge of self management and satisfaction with nursing services at discharge. A total of 1,212 patients were included in this portion of the study. Quality of the care delivery process was measured using the quantity and nature of direct and indirect care activities, quality of charting, costs for nursing related expenses (treatments, cleaning rooms, and

laundry) and job satisfaction. The nature of personnel time was determined by work sampling over two shifts on each unit for a week. A total of 53 nurses were each observed twice over a 3-month period. During each observation nursing activities were recorded each 15 minutes across all shifts and categorized as direct care (patient contact, treatments, communication with patients) and indirect care (patient centered activities occurring when the patient was not in direct contact with the nurse). Quality of charting was evaluated by audits of 257 randomly selected patient charts. At the conclusion of work sampling, 38 RNs from primary units and 37 RNs from team units completed a job satisfaction survey. Data were analyzed using ANOVA and t-tests of means at the .05 level of significance.

Results of the study demonstrated no significant differences with respect to patient outcomes (length of stay, complications, knowledge of self management and satisfaction with nursing care at discharge). Analysis of the nursing care process data revealed no significant differences in overall time spent with patients on team and primary units, quality of charting, or job satisfaction. However, primary nursing was perceived as significantly more stressful with 73% of respondents reporting that primary nursing should not be adopted as a care delivery modality in the institution.

A major threat to the validity of study findings was

that patients' needs for nursing care might have differed on study units because the study design matched units by estimated degree of similarity and did not measure patient acuity levels. Other weaknesses were that instrument reliability estimates for patient care questionnaires and observer training methods for work sampling were not detailed. Nevertheless, the researchers noted that it was disturbing to find that team nursing tended to promote more patient contact than a method aimed at promoting nurse accountability for patient care.

Wolf, Lesic, and Leak, (1986)

Wolf, Lesic, & Leak conducted a costing study of two team and primary nursing in a community hospital over a six-month period. Team and primary nursing (independent variables), were not operationally described in detail. The nurses were matched with respect to age and educational preparation, but team nurses were twice as experienced. RN ratios averaged 86% on the primary unit and 75% on the team unit. The same hours/workload index staffing standard was budgeted for both units. Actual hours varied with patient acuity.

Dependent variables included patient length of stay, average unit workload index and costs in terms of cost/unit of workload (direct care nursing salary costs/unit of workload), cost per DRG (direct care nursing salary costs for patients with specific DRGs) and cost per patient per

DRG (cost/DRG divided by average length of stay for each DRG). Direct care nursing salary costs were computed by multiplying each unit's average hourly salary for direct caregivers by the budgeted hours of care for that unit. Unit workload index was obtained using a four-level patient classification system. Interrater reliabilities monitoring the patient classification process were consistently in excess of 90%. A total of 34 DRG types were seen on both team and primary units representing 190 patients. The numbers of patients per DRG were matched on study units. T-tests of means were used to compare costs of care at the .05 level of significance.

Results of the study demonstrated that patient acuity and average length of stay were significantly higher on the primary nursing unit but average costs/DRG were not statistically significant. The authors concluded that primary nursing was probably more efficient as evidenced by lower cost/DRG despite higher patient acuity. A regression analysis performed to determine the predictors of cost in this study revealed that nursing workload and ALOS contributed the most with care delivery model not a strong predictor.

Two factors limited this study results. First, not all patients both units were included in the study with the result that they may not have been representative of the populations of the units as a whole. Secondly, the

computation of costs/DRG using budgeted hours of nursing care as opposed to actual nursing hours provided may have under represented costs on the primary nursing unit.

Research Studies Comparing Variations of Team and Primary Nursing

Three research studies compared primary and team nursing with alternative models of nursing practice such as modular and total patient care nursing care delivery.

Steckel, Barnfather, & Owens (1980)

Steckel, Barnfather, and Owens compared two units under primary nursing, three under team nursing, and one under total patient care to determine whether primary nursing increased the quality of care delivered and improved the quality of patient care outcomes. None of the models were operationally defined.

Dependent variables were the QualPaCS scale, patient length of stay, number of complications related to nursing care, patient satisfaction, and the Health-Status Dimension Scale developed by Horn and Swain which measures evidence that the patient's need for air, water, food, and rest-activity-sleep are met. Nursing satisfaction and absenteeism, tardiness, and turnover were also measured for the nurses caring for patients in the study.

A total of 132 patients were randomly selected for the study over a 13-week period. Trained observers rated the quality of care received by the patients, and at patient

discharge the remaining dependent variables were measured. Patient and staff satisfaction instruments were not reviewed, instrument reliability was not addressed and observer training was not detailed.

Primary and total patient care units scored significantly higher than did team units on the overall and subscale QualPaCS categories. No other significant differences were found on any other dependent measures. This study lacked essential elements that would have assured unit comparability such as staffing mix, patient acuity, and staffing ratios. Moreover, instrument reliability measures were not addressed for the health care status dimension scale or the job satisfaction survey and data analysis procedures were not reviewed. These weaknesses were particularly unfortunate in view of the relatively large sample size.

Shukla, (1981, 1983)

Shukla conducted a cost-benefit comparison of team, modular, and primary nursing care delivery systems. The team model was defined as combinations of RNs, LVNs, and nurse aides giving complete care to groups of patients and/or a division of work within a team based on functions, depending upon the skill levels of nurses and patient needs. The modular structure was composed of an RN/LVN mix that was geographically assigned to sub-units called modules. Primary nursing was conceptualized as having one nurse plan

the patient's care for the entire hospitalization providing direct care whenever possible during the course of a shift. Competency of staff members was assessed using the Slater Competency Scale after six months of inservicing in planning care, nursing process, interpersonal skills, leadership, and the operation of the three care structures. T-tests of means revealed no significant differences between units.

Two hypotheses were tested. First, no significant differences were predicted in quality scores between units, given that the quantity and competency of nurses were equivalent. Second, given equivalency of staffing and workload, primary nursing was predicted to cost more than modular or team nursing on the basis of all RN staffing.

Dependent variables included ratings of the quality of the nursing care process using the QualPaCS scale, staff nurse and physician perceptions of nursing care quality, infection rates/month, IV standards compliance, percentages of RN time spent in direct patient care, and cost of care. For QualPaCS ratings, 30 randomly selected patients on each of the three units were observed for three hours by trained observers over 10 months. Instrument reliability and observer training was described but observer interrater reliabilities were not reported. Nurse perceptions of quality were obtained with a 47-item self-administered questionaire eliciting information about physical care, emotional care, nurse-physician relations, discharge

planning, and administration of care. 80% response rates were obtained on each of the study units. Instrument reliability was not presented. Fifteen physicians completed a 39-item questionaire using the same categories as the nursing instrument. Infection rates were collected for all patients on study units over a 10-month period. Compliance with IV standards was obtained by performing chart reviews on 30 randomly selected patients from each unit. To measure utilization of personnel time, work sampling data wre collected on study units over two weeks. Direct care observations of nurses were performed at random times during day and evening shifts. Trained observers proceeded from one unit to the next and repeated the sequence for a total of 200 trips reflecting 5,600 observations. On each trip, activities were categorized as direct, and indirect care by level of nursing personnel.

Data were analyzed at the .05 level of significance using ANOVA procedures for mean QualPaCS scores, t-tests of means for nurse and physician perceptions of quality and infection rates. Mean proportion scores were used to compare IV standards and work sampling data.

Results of the study revealed that the team and modular units provided significantly more direct care time to patients than did the primary unit. Mean total scores on the QualPaCS measuring perceptions of quality were not significantly different on the three units nor were subscale

comparisons. Physician perceptions of quality demonstrated no significant differences except in discharge planning where scores were significantly higher on team, modular, and primary nursing units respectively. Nurse perceptions of quality were comparable as were infection rates on all units. The IV audits revealed no differences between the modular and primary unit, but the team unit significantly outperformed both primary and modular units. Total costs of care/patient day and direct care costs/patient day compared over an 11-month period revealed that the RN model of primary nursing was almost $2/patient day more expensive than the team model. Shukla concluded that the modular structure was the most cost-effective care delivery model.

This study was well designed well controlled. The only possible weaknesses were small sample sizes for patient perceptions of quality and a lack of reported interrater reliabilities for trained observers collecting QualPaCS data.

Glandon, Colbert, & Thomasma, (1989)

Glandon, Colbert, and Thomasma used the Medicus patient classification system to compare care delivery systems (team, modular, total patient care, and primary nursing), bed size, and percent RN staff using cost data compiled from 62 hospitals over a three-month period.

Dependent variables were care delivery costs expressed as dollars per patient day, RN dollars per patient day, and

total nursing dollars per unit of workload which calculates cost by acuity weighted patient days to normalize the effects of acuity. Statistical measures were not reviewed but comparisons were reported at the .05 level of significance. This study is notable in that it represents the most comprehensive information on nursing costs by care delivery model from a multi-hospital data set. Study findings suggested that nursing care delivery model, unit size, and percentage of RN staff all significantly influenced nursing labor costs per day. Care delivery comparisons revealed that team nursing proved to be the least costly by all three cost measures followed by modular, total patient care, and primary nursing. Primary nursing and total patient care units were more costly in terms of nursing dollars/patient day and RN dollars/day because they provided a greater proportion of RNs. Smaller units and units with high percentages of RNs were the most costly.

The authors concluded that variables such as care delivery models and unit size can have an identifiable cost impact and suggested that for a unit of a given size, a change from primary nursing to total patient care could lower total nursing care costs, RN dollars/patient day, and nursing dollars/unit of workload without impairing a unit's ability to manage patients with higher acuity.

Research Evaluating Nursing Case Management

Only one research study of a hospital-based nursing case management approach has been published to date (Brett & Tonges (1990). This study involved an evaluation of the ProACT case management model on a 32-bed surgical/orthopedic unit in an urban community hospital. The clinical case management (CCM) role was operationally defined as an expanded role in which the CCM is accountable for managing the entire hospitalization of a caseload of patients from pre-admission to discharge. The primary nurse role was defined as managing direct care of a caseload of patients during their hospitalization on the unit. LVNs were described as acting in an associate nurse capacity under the supervision of an RN to provide direct care in the primary nurse's absence. Other support roles included nurses aides, support service hosts (SSH) to distribute water, make beds, etc. and pharmacy technicians to obtain and prepare medications, change IV tubing, and order pharmacy supplies.

The study involved three two-month data collection periods: pre-case management at time 1; five months after the implementation of case management at time 2; and eight months after case management at time 3. Dependent variables included quality of care (nursing process and patient outcome criteria achievement, frequency of incidents (nursing errors)/patient day and infections/patient day), patient satisfaction, staff satisfaction, and costs of care.

Twenty-five patients charts were reviewed for nursing process and patient outcome criteria achievement by QA personnel at each data collection period. Interrater reliabilitites of 90% were reported. Patient satisfaction was measured by a structured interview of satisfaction with support services, a survey of nursing services at discharge, and the 25-item Risser patient satisfaction with nursing instrument adapted by Hinshaw and Atwood in 1982. Reliability measures were only reported for the Risser scale. Sample sizes were not disclosed. Job satisfaction was measured by a 23-item survey of RNs and LVNs. A Chronbach's alpha coefficient for this instrument was .9357 (n=42). Costs of care were reported in hours/patient day, total labor costs/patient day, and labor costs/nursing hour. For nursing care hours, head nurse and clerical hours were excluded but 40% of case manager and 53% of pharmacy technician hours were included, representing the portion of tasks previously performed by RNs before case management. Actual length of stay was compared with expected length of stay for patients within three categories of DRGs.

Data were analyzed using a one-way ANOVA for patient and job satisfaction scores. Quality scores were given in percentages and not compared statistically. Costs of care were presented in dollars. Results of the study revealed no significant differences in patient satisfaction and nurse job satisfaction. Quality indicators were comparable from

T1-T3. Costs of care declined from T1 to T3 despite the greater number of hours of care provided, suggesting that the case management model was less costly to operate because of skill-mix reductions of RNs. Finally, length of stay data revealed a 10% reduction for patients with selected DRGs.

The study was limited in a number of respects. Sample sizes, when disclosed, were small. Reliability and validity of patient satisfaction and job satisfaction instruments was lacking. Moreover, observers collecting the quality of nursing process and outcome criteria data may not have been blind to the aims of the study, thus potentially biasing the results of the quality of care results. Most importantly, not all clinical care manager time was included in the total labor costs, with the result that the true costs of operating the case management model may have been higher than reported.

Summary of Research Literature Findings

Patient satisfaction, the quantity and quality of the nursing care process and patient outcomes of care have provided different perspectives with which to compare nursing delivery models. Because each study varied with respect to how care delivery models were defined and operationalized, comparisons could often not be made easily. Without clearly defining each practice pattern, outcome measures such as patient satisfaction and direct care

received by patients may not measure the care dimensions intended to be measured.

Patient satisfaction with care

Patient satisfaction with care received by patients was used as an outcome variable in a variety of studies (Jones, 1975; Daeffler, 1975; Marram, Flynn, Avarado, & Carey 1976; Giovannetti, 1980; Steckel, Barnfather, & Owens, 1980; Ventura, Fox, & Mercurio, 1982; Shukla, 1981; Chavigny & Lewis, 1984). Study results have largely found no differences or have been conflicting. For example, Daeffler (1975) examined omissions of care as perceived by 182 patients finding fewer omissions under primary nursing. However, a replication by Shukla (1981) which controlled for workload, staffing levels, and staff competency found no significant differences in patient satisfaction with patients tending to report more care omissions under primary nursing.

Ventura, Fox, & Mercurio (1982) suggested that patient satisfaction may not be useful as an measure of nursing care because patients tend to report high levels of satisfaction regardless of the care delivery model, perhaps because they have a desire to please and do not wish to appear ungrateful. Since patients define satisfaction in different ways, the construct is not a unitary phenomenon and may be difficult to define and measure. The authors concluded that, although patient satisfaction is considered an

important criterion of care, "measurement problems render it a relatively insensitive criterion when used to detect potential differences between units under different care modalities" (Ventura, Fox, & Mercurio, 1982, p.230).

Quality of the nursing care process

Studies measuring the quality of nursing care delivery have generally used instruments designed to measure quality of care or hospital quality assurance measures available to the researcher.

The most frequently used measures of the quality of nursing care process are the QualPaCS (Wandelt & Ager, 1970) or the Rush-Medicus Nursing Process Methodology (Jelinck, Haussman, Hegyvary, & Newman, 1974) instruments. Felton (1975), Eichorn & Frevert (1979), Hegedus (1980), and Steckel, Barnfather, & Owens (1980) all reported that primary nursing compared favorably against team or team/functional nursing using the QualPaCS although only Eichorn & Frevert (1979) and Felton (1975) found statistically significant differences. Shukla (1981) replicated the Felton study controlling for differences in staff competency and found no significant differences on all but one of the subscales. The differences may have been due more to selective recruitment and extensive staff development given to primary nurses than to the delivery models themselves. Betz, Dickerson, and Wyatt (1980) used the Rush-Medicus instrument to measure the transition from

team to primary nursing reporting higher scores after the transition. In many of the studies cited, small sample sizes, the failure to control important variables such as staffing levels, patient acuity, and staff competence, and failure to monitor interrater reliability also weakened the believability of the results. A total of five studies used the QualPaCS as a dependent measure but only two studies measured the interrater reliability of the observers and achieved high levels of agreement. Significant differences found in these studies were at risk of a type I error.

Despite these methodological concerns, the QualPaCS and Rush-Medicus instruments showed some consistency in their ability to identify important care delivery components. However, the nature of the relationship between the process of care delivery and the quality of patient care has yet to be clarified. Shukla's work suggested that the complexity of the work environment is such that factors such as staff competency may have a significant effect on quality scores. Moreover, even when high scores suggest that the work of nursing was performed well, the impact on patient outcomes may be inferred but not necessarily assured.

Hospital measures such as quality of documentation (Hegedus, 1980; Giovannetti, 1980; Chavigny & Lewis, 1984), compliance with IV standards (Shukla, 1981, 1983) and frequency of nursing risk management errors or incidents (Chavigny & Lewis, 1984; Brett & Tonges, 1990) have also

been commonly described as measures of nursing care quality. These measures can be effective in evaluating the impact of changes in the workflow process, but do not address the quality of patient care outcomes, which is the ultimate goal of any nursing care delivery system.

Utilization of personnel time

A number of studies used work sampling methodologies to measure utilization of personnel time as one of a number of dependent measures of the efficiency and effectiveness of nursing care delivery (Giovannetti, 1980; Shukla, 1983; Chavigny & Lewis, 1984).

Based on probability sampling, work sampling assumes that the activity observed at any one instant continues for that entire observation period. The rationale for this approach is that random samples of a given population have the same characteristic patterns of distribution as the whole population. Randomness of the sampling is assured when patient care and other nursing unit activities occur infrequently and when observers vary the location of the starting points of their rounds (San Joaquin General Hospital Report, 1976). Work sampling as a study method gained acceptance after Abdellah and Levine reported their experience adapting industrial work sampling techniques to the study of nursing activities (Abdellah & Levine, 1954).

Giovannetti (1980) used work sampling to measure the minutes of direct and indirect care time spent by different

classifications of nursing and medical personnel on one team and one primary nursing unit. Shukla (1983) used the work sampling methodology described by Abdellah and Levine to measure nursing productivity in terms of direct care time. Different levels of nursing personnel were randomly observed to categorize nursing activities as direct, indirect, and professional activities. Chavigny & Lewis (1984) observed the quantity and nature of personnel time as one of many variables evaluating the nursing process. On each of 10 pairs of primary and team nursing units, direct care activities were categorized as patient contact, nursing treatments, and communication with patients. Indirect care activities consisted of those on behalf of patients. Unit-related and personal time were also measured.

Compared to the quality of provided care and patient satisfaction measures, the utilization of personnel time has proven to be the most objective means of quantifying the process of nursing care delivery in measurable terms. Time spent in the delivery of care can not necessarily be equated with the quality of the nurse-patient interaction. However, the proportion of direct and indirect care time spent with patients and the delineation of care activities provided by different levels of nursing personnel can lead to inferences about the degree to which nurses are devoting their efforts toward patient care, which is a necessary ingredient for the delivery of quality care.

Patient Care Process and Care Outcomes

Both patient care process and patient care outcomes have been used as dependent measures. The primary patient care process measure used to evaluate care delivery is time measured in minutes of direct care received by patients (Giovannetti, 1980; Hamera & O'Connell, 1981;). Direct care time received by patients is derived from direct care sampling observations of patients. Unlike work sampling in which the focus observation is the nursing staff, direct care sampling emphasizes direct care activities derived from patient care observations. Charge nurse and RN categories are collapsed into one group to obtain the total minutes of RN time received by patients. Individual percentages of each activity reflect a proportion of direct care activities as a whole. As noted above, minutes of direct care RN time received by patients is not intended as a sensitive measure of the quality of nursing care delivery but can be considered a precursor of quality.

Patient outcomes of care have included physiological measures such as perceived hospital stress (Hegedus, 1980), health status dimension scores (Steckel, Barnfather, & Owens, 1980), infection rates (Shukla, 1983; Brett & Tonges, 1990), and patient complications of care (Jones, 1975; Steckel, Barnfather, & Owens, 1980). Because any of these measures could be affected by a wide variety of factors other than nursing care delivery, they are not particularly

sensitive measures of the effectiveness of nursing care delivery. A number of studies have used length of stay as an outcome measure of care delivery (Jones, 1975; Steckel, Barnfather, & Owens, 1980; Chavigny & Lewis, 1984; Wolf, Lesic, & Leak, 1986). Length of stay is likely to be affected by a number of factors external to nursing care delivery. For example, physician practice patterns, payor source and patient/family preferences can all influence the ability to place a patient at various levels of post-hospital care within rehabilitation, skilled nursing, residential care, or home care.

Costs of Care

Most studies evaluating patient care delivery used nursing care costs as an outcome of patient care. Five studies used patient days for costing out nursing care but included different categories of expense. Betz, Dickerson, & Wyatt (1980) used cost/personnel hour needed (projected workload), cost/personnel hour used (actual workload), and total cost/patient day as dependent measures. Costs of all personnel contributing to unit operations were used including those of the head nurse and unit secretaries. Giovannetti (1980) expressed costs in three ways: total costs/patient day, costs/bed/day, and direct care expenses/patient day (salary, overtime, an benefit costs of direct caregivers). Shukla (1983) expressed costs as total costs/patient day and direct care personnel costs/patient

day. Glandon, Colbert, and Thomasma (1989) expressed costs as total nursing labor costs/patient day, RN cost/patient day, and total nursing labor cost/unit of workload, which normalizes the effect of patient acuity to create a "standard" patient. When costs/unit of workload were compared, the type of care delivery model was a significant factor. Cost/unit of workload is the most sensitive cost measure because it factors in the effect of patient acuity as well as patient census.

CHAPTER THREE

CONCEPTUAL FRAMEWORK AND CCC/PCA MODEL

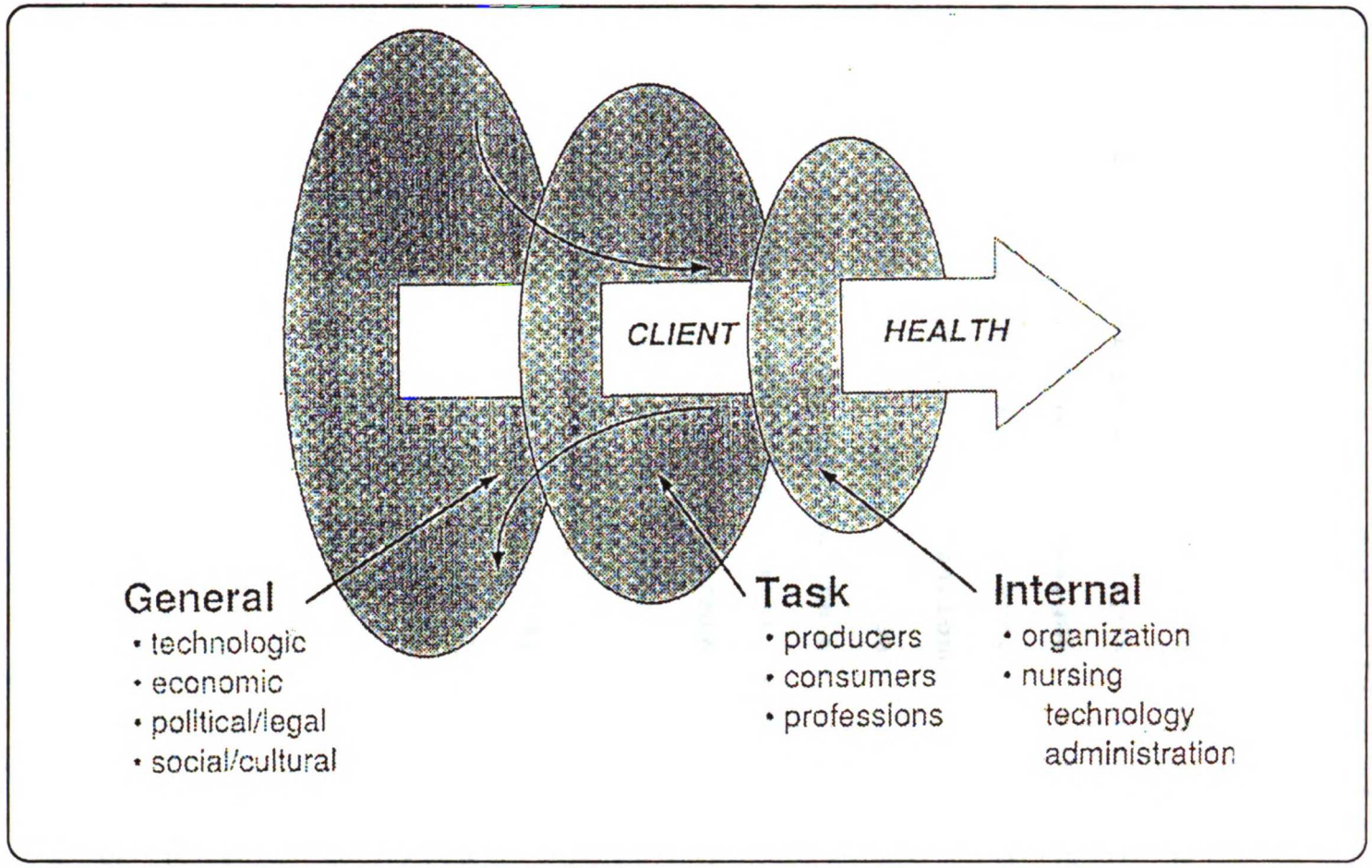
Nursing Administrative Practice Perspective

Donaldson and Crowley (1978) define health, nursing, and environment as the four domains of nursing. The Nursing Administrative Practice Perspective (NAPP) advanced by Neidlinger and Miller (1990) is a conceptual framework that expands on these domains. Central to the NAPP are the domains of health and client which span internal, task, and general health environments germane to nursing administrative practice in health care organizations.

Nursing technology, the work of nurses, is depicted as surrounding the client/health core of the model and illustrates the relationship between nursing and the patient/client in achieving health goals within an organization. The contribution of nursing administrative practice in defining, influencing, and supporting the work of nursing is bounded by the limits of the organization. Nursing technology and nursing administrative practice are depicted within an internal organizational environment which is itself embedded in the broader task and general health care environment as shown in Figure 1.

The task environment, is defined as "those entities or agents outside the organization having the most direct influence on nursing administrative practice: consumers, producers, and professions" (p. 44-45). The outermost

Figure 1
Nursing Administrative Practice Perspective



Source: Neidlinger, S., & Miller, M. (1990). Nursing care delivery systems: A Nursing Administrative practice perspective. Journal of Nursing Administration, 20 (10), 43-49. (Used with permission).

sector, the general environment, includes "elements outside the organization that may indirectly, or at times directly, affect the internal environment and the delivery of nursing care" (p.45). Included are social/cultural, political/legal, economic, an technologic components. Transsecting these dimensions are the domains of client and health, which serve as unifying themes spanning all environmental sectors. The NAPP is designed to be useful for practicing nursing administration, evaluating nursing practice within the context of organizational systems, and linking nursing care delivery with the broader environment.

This perspective will be used as the conceptual framework for the present study because it illustrates the interrelationships among various environmental influences having a direct bearing on this project.

Client Domains for the Study

In the hospital environment, the domain of person is embodied by patients, physicians, and other health care providers requiring services of nurses. Each client group is characterized as having needs and expectations that may link with nursing.

As primary beneficiaries of nursing services, patients and physicians are to some degree affected by the hospital's desire to provide needed services within a shorter length of time in order to remain viable under the prospective payment reimbursement program. Once permitted to enter the hospital

days in advance of surgery, patients are now often admitted early in the morning of the procedure, subject to an accelerated post-operative recovery period, and expected to complete their recovery at home. Faced with a shorter, more intensive hospitalization, patients and their admitting physicians are in increasing need of nursing care delivery systems that support communication, collaboration, and continuity to ensure that patients are discharged at their safe level of functioning.

Health Domains for the Study

In the NAPP, the authors envisioned the domain of health as central to the mission of health care consumers as well as the producers and professions that train, license, and influence health care providers. Measures of health will vary among constituents. In the hospital environment under study, market share, and the efficiency and cost-effectiveness of services provided are viewed as essential to the viability of the hospital.

Within the nursing department subsystem, care-effectiveness is the most essential measure. Defining characteristics of healthy medical-surgical nursing units include the appropriate utilization of nursing personnel and resources and the achievement of the nursing care process within length of stay limits appropriate to each patient's diagnosis. For patient and physician consumers, measures of health include the achievement of optimal patient care

outcomes arising from the hospitalization and coordination of available community resources post-hospitalization.

General and Task Environmental Influences on the Study

Neidlinger and Miller (1990) describe organizations as complex entities with multiple consumers. Organizational groups are in constant interaction with, and dependent upon, all sectors of the environment for survival. As an exploration of the impact of redesigning nursing care delivery, the nursing case management model implemented within the study site required numerous task linkages with professional and organizational groups including:

* Meetings with the nursing bargaining unit representatives of the California Nurses Association to establish wage and salary scales for the case management intervention.
* Informal interviews with nursing administrative colleagues at local hospitals to assess the utilization, job skills, training, and salary structures for nurses aides as potential candidates in nurse extender roles.
* Collaboration with the study site's corporate personnel department to establish new categories of personnel for CCC and PCA roles.
* Consultation with the Medicus Corporation to incorporate the new case management roles within the framework of staffing and productivity standards.

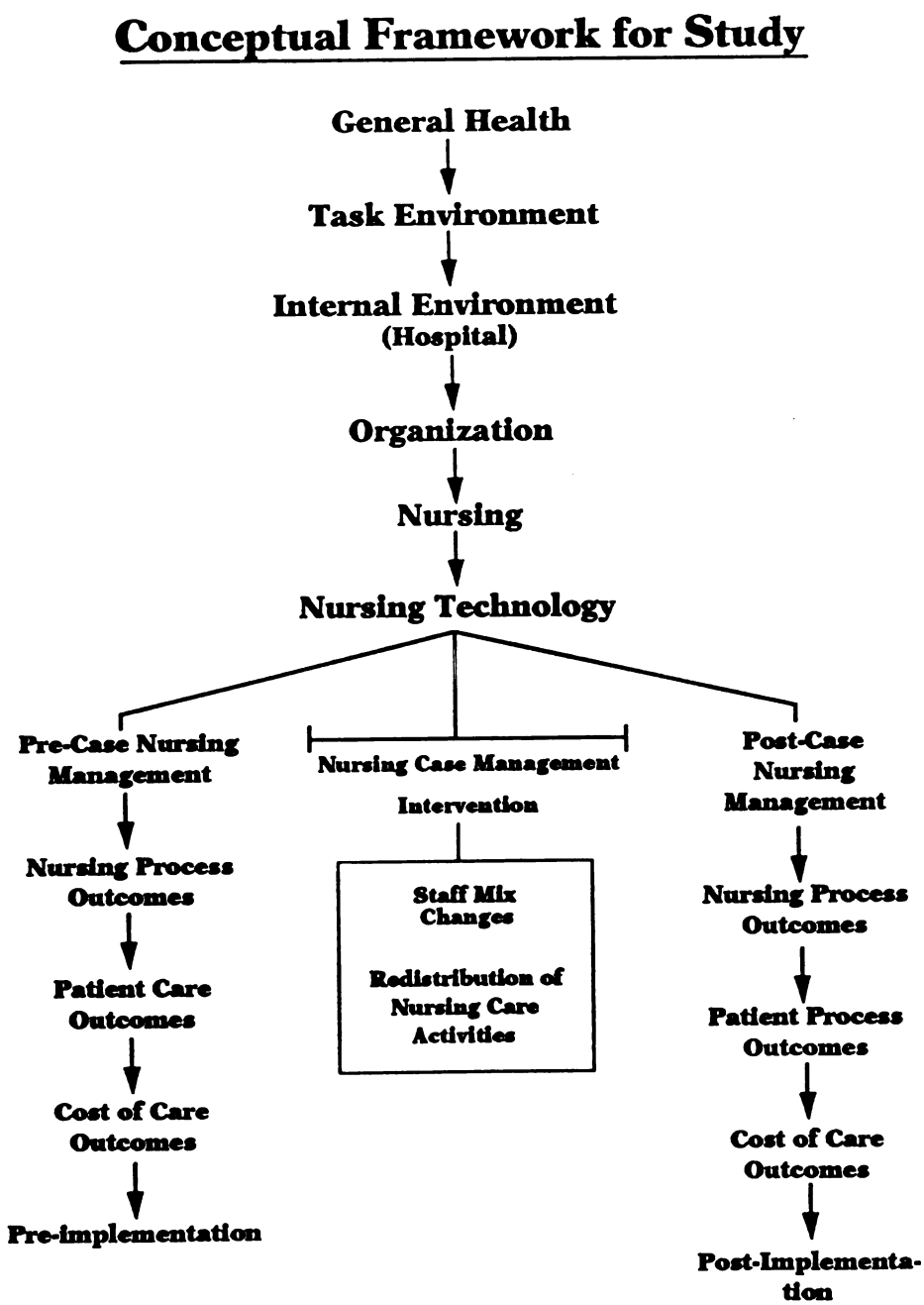
Internal Environmental Influences on the Project

Within the organization, the infrastructure between nursing technology, the work of nursing, and nursing administrative practice is pivotal. Neidlinger and Miller envisioned NAPP within the context of an open systems framework. Organizations receive inputs (raw materials), participate in a production process (practice patterns), and produce outputs (services). Within this study, project inputs consisted of baseline data related to the existing nursing care delivery pattern as reflected by nursing process, patient care, and costs of care outcomes. The production process consisted of implementation of the Clinical care coordinator/Patient care associate intervention. Post-implementation nursing process, patient process, and cost outcomes are the end products of the model summarized in Figure 2.

Clinical Care Coordinator/Patient Care Associate Model

The nursing care model developed for this project was conceived following a review of the broader socioeconomic, technological, and cultural forces in the health care environment described in the conceptual framework. The particular influences of interest for this study included shortage-based projections for RNs, calls for professional practice models, various efforts to recruit and retain RNs, and trends toward the use of nurse extenders to perform non-nursing tasks. A nursing case management focus was chosen

Figure 2
Conceptual Framework for Study



for the project because it provided a managed care framework consistent with hospital efforts to care for patients within the length of stay guidelines set by the Medicare system. The major premise underlying the project was the desire to have the "right people doing the right things" so that care delivery would be both care and cost-effective. This was thought to be achievable by 1) maximizing the contribution of nursing experts in planning and coordination of care, 2) matching nursing personnel skills with the tasks suitable to their ability, and 3) introducing an unlicensed care giver to supplement care givers in the performance of clerical as well as basic clinical tasks.

Project Phases

The project consisted of three phases illustrated in Table 1. The first phase was a preliminary planning phase in which the skeletal structure of nursing case management was introduced in the study site. This phase included budget, wage and salary, and job classification restructuring to include the new roles within the hospital environment. This planning was articulated with the Medicus patient classification system (PCS) installation so that work flow data collected to validate the predictive ability of the PCS could also serve as a baseline measure of nursing care labor distribution prior to nursing case management. Phase II consisted of the initial implementation of the Clinical care coordinator (case

Table 1

CCC/PCA Project Phases

Phase I: Preliminary Planning	Date of Completion	
	Projected	Actual
Literature review of nursing care delivery models		12/89
RN interviews about case management ideal roles		12/89
Literature Review/phone survey of extender roles		09/89
Wage/Salary classificaton of PCA role	Fall/89	12/90
Case manageament assumptions built into budget	03/90	11/90
Wage/Salary classification for case manager role	11/89	03/90
Union contract Extension Agreement for PCAs	03/90	05/90
Staffing reorganization for CCC/PCA roles	01/90	06/90
Bargaining unit contract for CCCs	03/90	08/90
Development of job descriptions for PCA & CCCs	03/90	08/90
Introduction of Medicus patient classification system	05/90	06/90
Work and Direct Care Sampling for Medicus validation	04/90	04/90
Phase II: Introduction of CCC/PCA Model		
Hiring of PCAs	04/90	06/90
Orientation of PCAs	05/90	08/90
Addition of PCAs to staffing	06/90	09/90
Hiring of Clinical Care Coordinators (case managers)	03/90	07/90
Orientation of CCCs	05/90	12/90
Addition of CCCs to staffing	07/90	10/90
Phase III: Evaluation of CCC/PCA Model		
Restudy of medical unit; work sampling/direct care sampling	07/91	07/91
Process measure evaluation: (HH referrals; risk management events, patient process outcomes)	06/91	06/91
Outcome evaluation: costs of care	06/91	06/91

manager) role in the study setting. This phase involved inservicing of all staff members on the new roles and reorganizing staffing patterns to incorporate the Patient care associate (nurse extender) role on a daily basis. Phase III consisted of the evaluation phase of the study during which nursing process, patient process and cost outcomes of the CCC/PCA model were measured.

Description of Nursing Case Management Roles

Clinical Care Coordinator (case manager)

The nursing case management model designed for this study involved the creation of an expanded role by converting the role of the charge nurse to that of a case manager called a Clinical Care Coordinator (CCC). The rationale for this approach was that charge nurses, already accountable for the day to day operation of a nursing unit, were the best suited for the role of an inpatient-based case manager by virtue of their credibility with the nursing staff, existing collaborative relationships with physicians, and clinical expertise. Conferring accountability for the achievement of optimal patient outcomes within appropriate length of stay guidelines was a natural extension of their line authority and a means of enriching their clinical role with patients.

An expanded role for fewer, better prepared clinicians was theorized as more desirable than using staff nurses as case managers for three reasons. First, the nursing case

management role requires specialized skills. Considerable ongoing education about Medicare reimbursement, physician practice patterns, and guidelines for patient placement within the community is necessary for optimal case management. Training even selected staff nurses to be equally proficient in these skills seemed unrealistic. Second, physicians and other care providers tend to seek out the charge nurse for information rather than deal with staff nurses who are less available because they are providing direct care to 4-6 patients. Therefore, having charge nurses serve as the primary contact tends to minimize role confusion in the work environment. Finally, the creation of fewer expanded roles for nurses is consistent with shortage-based projections for RNs and compatible with the nursing professions' desire to create more professional roles to support recruitment and retention of clinical experts (Friss, 1988b). Institutionalizing a higher-paid line role provides master clinicians the incentive to stay in the practice setting because they have legitimate authority in the work environment and are financially compensated for accepting the greater responsibility.

Role expectations of the CCCs include the initiation of discharge planning, development of a long term plan of care based on the patient's admitting nursing diagnoses, designation of expected patient care outcomes at discharge and ongoing coordination of care with physicians and other

health care workers. Line management duties include direct supervision of nurse extenders called Patient care associates, coordination of patient assignments with the nursing staff and, at times, direct care of selected patients as dictated by census and patient admission/discharge patterns. Providing the CCCs with control over patient coordination, the flow of patient care, and the allocation of unit personnel and material resources consolidates authority in one role and potentially eliminates the need for an assistant level position in the administrative hierarchy, thus flattening management layers.

To accommodate manageable patient caseloads on the study unit, the charge nurse role on the day shift is split between two CCCs halving the unit caseload geographically. Thus, each CCC oversees the care of between 8-13 patients throughout their hospital stay. At shift change, each CCC turns over his/her caseload to an evening shift counterpart so that a total of 16 hours of case management is provided in each 24-hour period. This arrangement was created because 8 hours of case management was not deemed sufficient to deal with the intensity of nursing services required in a 24-hour day. Nearly one-third of the patients are admitted to the study unit between the hours of 3 PM and 11 PM, necessitating planning and coordination on that shift. Typically, CCCs act as primary contacts for those patients admitted on their shift. Thus, the primary CCC for a

patient admitted on the evening shift will be one of the two CCCs on that shift with the day counterpart supporting continuity of care. Smaller units may only require one evening CCC to support two day care coordinators. See Figure 3 for a comparison of the CCC/PCA model with a traditional charge nurse hierarchy.

Patient Care Associate Role

To facilitate role flexibility for the care coordinator in a work environment that can be non-routine and non-repetitive, each nursing care coordinator is paired with a nurse extender called a Patient care associate (PCA). The (PCA) is a certified nurses aide cross-trained by the CCC to perform clerical duties. PCAs perform basic nursing tasks such as baths and patient positioning, clerical duties such as phone reception and transcribing physician orders, and non-clinical unit support functions such as transporting patients, restocking supplies, cleaning equipment, etc. as assigned by clinical care coordinators.

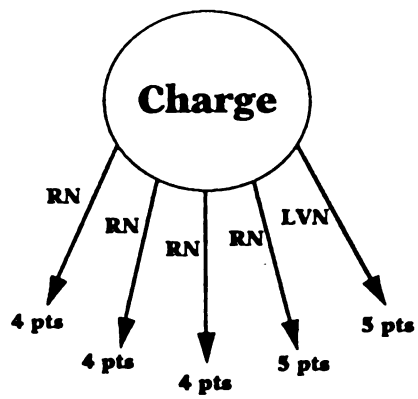
Creation of an extender role to the CCC has three major advantages. First, it affords the CCC the flexibility to reallocate personnel resources in response to changing circumstances within the unit (eg, admissions, discharges and sudden patient acuity changes). Second, the PCA role creates a category of cross-trained care giver that is theoretically more productive than nurses aides or unit clerks individually. Third, the addition of a nurse

Figure 3
Comparison of traditional charge nurse hierarchy with the CCC/PCA Model

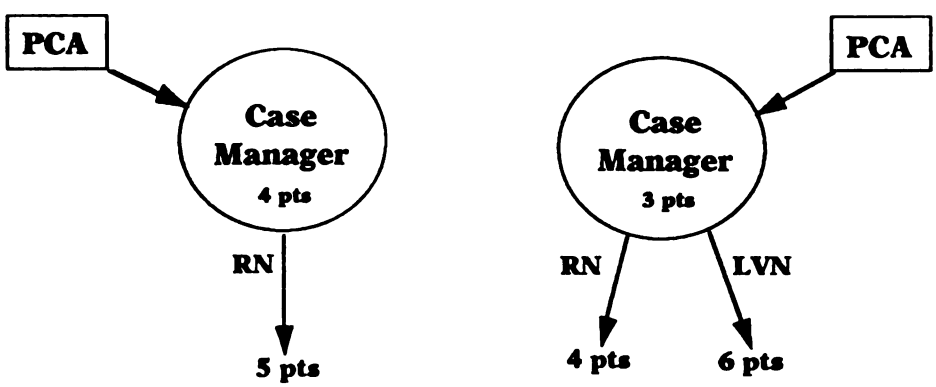
Care Delivery Structure

Existing Traditional Model - Day Shift

Census 22
Acuity 1.3
Medicus 6.4
Actual Staff = 6



Nursing Case Management Model - Day Shift



extender legitimizes the division of labor expectation that RNs perform activities requiring their clinical judgment and critical thinking skills while unlicensed assistants perform "non-nursing" tasks. Finally, the addition of an unlicensed assistant minimizes encroachment of less qualified nurses performing activities performed by professional nurses.

Pairing the CCC with the PCA is different from the practice partner concept developed by Manthey (1989) as an extension to primary nursing. Practice partners links an unlicensed assistant to assist an RN in the delivery of direct patient care. However, in order to maintain similar staffing profiles a larger RN caseload of patients may be required. In contrast, the CCC/PCA model links the nurse extender only to the CCC. The patient caseload of staff nurses does not rise with this model because the CCC/PCA dyad assumes responsibility direct patient care of some patients as needed. Normally the CCC assigns his/herself the least acute patients, ideally those to be discharged or patients to be admitted.

Role of Registered Nurses

Registered nurses provide direct care to the same patients over the course of their workweek which enables greater familiarity with patients and easier coordination with case managers. To eliminate potential role confusion that can occur with CCCs and staff nurses overlapping responsibility for assuming accountability for patients, RNs

have 8-hour responsibility for the provision of direct patient care with case managers assuming 24 hour accountability. Operationally, this means that care coordinators oversee the plan of care and collaborate with RNs and LVNs to ensure that the plan of care is followed. All staff members revise the plan of care daily as dictated by patient responses to nursing interventions. This arrangement was established to maintain patient care continuity while addressing the realities of a part-time work force. Staff nurses focus their efforts toward providing safe, competent, comprehensive nursing care within the time limits of their working day for the duration of their workweek without the stress of attempting to maintain 24-hour accountability when unavailable.

LVN Role

LVNs perform total patient care for their assigned patients under the supervision of an RN for those activities (IV medications, etc.) not within the LVN scope of practice. Assigned to the care of less complex patients, the LVN role emphasizes the delivery of safe, competent nursing care while carrying out the established patient care plan. LVN's are expected to use the care coordinator as a clinical consultant in assessing changes in patient care condition and evaluating patient responses to nursing interventions.

Cost effectiveness of the CCC/PCA model

The CCC/PCA model was designed to be budget neutral. Just as with the practice partner concept, matching the CCC with a PCA costing less than half as much permits savings to be used to enhance the salary level of the case managers, thus rewarding career oriented nurses. It was theorized that the combination of fewer, better prepared, experienced clinical experts linked with a relatively larger complement of staff nursing colleagues had the potential to create practice opportunities in roughly similar proportions (70-30) to the supply of graduates of community and university educational programs. Friss suggests that this type of staffing arrangement will be more productive than having more nurses with lesser ability being paid the same regardless of responsibility and performance (Friss, 1988b).

As described above, the CCC/PCA model also met all of the desirable characteristics of the clinical and non-clinical assistant roles outlined by the American Hospital Association (American Hospital Association, 1989). To avoid creating a proliferation of additional care givers, two categories of care givers (clerks and nurses aides) were combined. Confusing reporting relationships were avoided by having the PCA act as a nurse extender only to the CCC. Finally, the availability of health care workers with certified nurses aide, ward clerk, or medical technology backgrounds created a pool in the local community from which

to choose qualified applicants.

CCC/PCA Comparisons with Other Case Management Models

As discussed in chapter one, a number of care delivery models have been described as inpatient "case management" models. Largely evolving from primary nursing, they differ from primary nursing in a number of qualitative ways, depending on how they are actualized in the inpatient environment. See Figure 4 for a comparison of care delivery approaches described as inpatient nursing case management models.

One difference between primary and case management is in the selection of practitioner. In models such as the St. Mary's (Arizona) or the ProACT model (New Jersey), case managers are expanded practitioners and not staff nurses. For this reason, they are generally considered part of "fixed" staffing and not part of the variable staffing component dependent on patient census and acuity. When the case manager is in an expanded role, the emphasis is on care planning for designated patient populations and the achievement of patient outcomes of care for those patients. Primary nurses in these models emphasize the process of care delivery by providing direct care to all patients in their caseload.

Alternatively, in case management models featuring staff nurses, such as the New England design, the staff nurse plays the role of case manager for selected patients

Figure 4

A Comparison of Case Management Care Delivery Approaches

	St. Marys (Arizona)	New England Med Ctr (Boston)	Harper-Grace Hospitals (Detroit)	ProAct (NJ)	CCC/PCA
Case Manager Role	Expanded	Staff Nurse	Differentiated Practice	Expanded	Expanded
Collaborative Likage with Physicians	Not Necessarily	Yes	Unknown	Yes	Yes-Limited
Patient Populations by DRG	Selected	Selected	Unspecified	All patients admitted by service	All patients admitted by service
Accountable across units/ settings	Hospital based transcends settings	Unit based/can transcend units	Unit based	Unit based can transcend units	Unit based can transcend units
Patient Outcome Driven	Yes	Yes	Unknown	Yes	Yes
Use of Recovery Paths Designating L.O.S. Timeframes	No	Yes	Unspecified	Yes	Few to Date
Underlying Care Delivery Model	Primary Nursing	Primary Nursing	Primary Nursing	Primary RNs LVN Associate	Total Patient Care
Case Manager excluded for variable staffing Component	Yes	No	No	Yes	Yes
Case Managers Serve As direct Caregivers for Some Patients	No	Yes	Yes	No	Yes
Case Managers Responsible for Unit governance activities	No	No	No	Sometimes act as Charge Nurses	Yes
Link to Administrative Hierarchy	Not Specified	CM Reports HN	CM Reports to HN	Reports to HN Collaborative Link to Ass't HN	CCC Takes place of Charge and AHN - reports to Admin. Director

and primary nurse for all others. In this type of approach, the differences in primary and case management roles relate more to the nature of collaboration with physician practices than on the actualization of the role of the nurse. In differentiated practice models, role differentiation is based on the educational preparation of the caregiver with the baccalareate nurse acting as the case manager/primary nurse and associate degree nurse performing the associate nursing role.

Another distinguishing characteristic between primary nursing and case management lies in the geographical boundaries of the case manager role. Primary nurses are traditionally unit-based. In contrast, case managers in models such as the St. Mary's design are hospital-based but transcend hospital boundaries to care for selected chronically ill patients requiring close followup in the community. This approach is more consistent with community-based case management role definitions. In most other acute care designs, case managers are unit-based and may venture across inpatient/outpatient hospital settings but not into the community.

A third difference relates to the service nature of case management. Case managers work collaboratively with selected diagnostic groups of patients linked to physician practices, which are in turn organized by service. Thus, patients having a total joint replacement would be followed

by physicians in the orthopedic service. In hospitals where patients may be admitted to any of a number of medical-surgical units, case managers work with selected patients of a specific physician/service and follow those patients across inpatient units. In hospitals where patients are admitted by service, case managers tend to work with all patients since they come from a homogeneous group. In contrast, primary nurses are not usually assigned by service but care for all patients on a given unit.

The model designed for this study is more like a case management than a primary nursing model of care but embodies characteristics of both. It is most similar to the ProACT model in that the case manager is in a distinct, higher paid, expanded role than the staff nurse and is always staffed, regardlesss of patient census and acuity. Other similarities include the fact that patients are admitted by service, case managers work with all patients in the service and the fact that case managers are hospital-based and generally serve patients in one unit.

One final similarity is that the case manager role in both models is linked administratively to the unit governance. In the ProACT model, case managers run the unit as charge nurses when they work their weekend rotation. They are positioned administratively between the assistant and head nurse level and are directly accountable to the head nurse. In the CCC/PCA model, CCCs are operationally

responsible for running the unit on a daily basis and contribute to the unit governance through supervision and evaluation of subordinates. They are administratively responsible to the Director of Patient Care Services who oversees two units.

Despite these similarities, the CCC/PCA role differs from the ProACT model in three respects. Administratively the CCC role is unique in that it combines the roles of case manager and charge nurse and includes some supervisory functions such as input into staff performance appraisals thus eliminating the need for the assistant head nurse role. The elimination of an administrative layer between the staff nurse and unit director makes the CCC/PCA model less labor intensive than the ProACT model which is comprised of caregivers, case managers, assistant head nurses and a head nurse for each unit. Another difference relates to the fact that the underlying care delivery model in the ProACT approach is primary nursing, while total patient care is practiced in the CCC/PCA model. Case managers in the ProACT model do not have administrative authority over primary nurses on a daily basis, nor do they perform direct care activities, instead, sharing a caseload with primary nurses who deliver patient care. In contrast, CCCs administratively supervise the nursing staff, oversee care planning collaboratively with staff nurses providing direct care, and also provide direct care to selected patients.

One final difference concerns the use of tools used to monitor the progress of patients. In the ProACT model, predetermined recovery paths are used to measure patient progress against expected outcomes. In the CCC/PCA model, the care coordinator tailors discharge outcomes to the patient's medical and nursing diagnosis while participating in recovery path development with physicians.

CHAPTER 4

EXPERIMENTAL DESIGN AND METHODS

This evaluation study involved a pretest-post test design. Data were collected over a four-month period prior to the introduction of a nursing case management model. The study intervention, the CCC/PCA model (independent variable), was then implemented on a medical-surgical unit over a four-month period. Post-implementation data were collected over a four-month period for comparison with pre-test data.

Research Setting

The study site was a 110-bed, urban, not-for-profit community hospital in the western region of the United States. Part of a system of hospitals, the study site payor mix is approximately 60% MediCare and 18% MediCal with the remainder contractual, private, and self-pay patients. The study unit was a 26-bed medical-telemetry unit.

Dependent Variables for the Study

Dependent variables for this study consisted of: nursing process outcomes, patient process outcomes and costs of care. A summary of dependent variables and timelines for data collection appears in Table 2.

Nursing Process Dependent Variables

To measure the effectiveness of the nursing process under nursing case management, data related to the use of personnel time, frequency of risk management events and

Table 2

Dependent Variables and Data Collection Time Lines

Variable	Pre Intervention Data Collection	Intervention	Post Intervention Data Collection
NURSING PROCESS VARIABLES			
Percent of direct, indirect, unit-related, and personal time	Time 1 April - May 1990 (work sampling)		Time 2 July 1991 (work sampling)
Percent of Activities related to coordination/ communication of care	Time 1 April-May 1990 (work sampling)		Time 2 July 1991 (work sampling)
Frequency of risk management events	Time 1: 1990 Jul Aug Sept Oct (4 month average)		Time 2: 1991 Jul Aug Sept Oct (4 month average)
Frequency of Home Health Referrals	Time 1: 1990 Jul Aug Sept Oct (4 month average)		Time 2: 1991 Jul Aug Sept Oct (4 month average)
PATIENT PROCESS VARIABLES			
Percent of direct care RN time received by patients	Time 1 April-May 1990 (Direct care sampling)		Time 2 July 1991 (Direct care sampling)
Percentage of RN Time in communication/rounds with patients	Time 1 April-May 1990 (Direct care sampling)		Time 2 July 1991 (Direct care sampling)
COSTS OF CARE OUTCOMES			
Total costs/patient day	Time 1: 1990 Jul Aug Sept Oct (4 month average)		Time 2: 1991 Mar April May June (4 month average)
Labor costs/Patient Day	"		"
Labor costs/Unit of workload	"		"
Production inefficiency costs	"		"

CCC/PCA Model Implementation Transition Period Nov 1990 - Feb 1991

frequency of home health referrals were used as dependent measures.

Utilization of personnel time

The utilization of personnel time was used as a dependent measure with the nurse as the unit of analysis to evaluate the effectiveness of the nursing case management intervention in redistribution of the nursing workload. Data were obtained from work sampling studies which categorized minutes of time spent by category of activity and level of personnel. Specific variables of interest included:

1. Utilization of nursing staff time. Nursing staff time was expressed as time spent on four categories of activity: direct, indirect, unit-related, and personal time. Data were presented as a percentage of category minutes divided by total minutes for all four categories. Of particular interest were the percentages of Clinical Care Coordinator (case manager) and Patient Care Associate time spent on direct, indirect care and unit-related activities since the case management model was designed to change existing work flow patterns. It was hoped that case managers on day and evening shifts would spend more direct care time with patients and less time on unit-related and clerical activities.

2. Utilization of case manager time devoted to activities related to the coordination and communication of care. Of 12 direct care, 4 indirect care, and 7 unit-related activities, three specific activities relate to care coordination and communication. These are "communication with patient and family", "communication about patient", and "shift report". It was hoped that these activities would reflect the contribution of the CCCs in case management coordination and communication of care with and on behalf of patients.

Frequency of nursing risk management events

Risk management events for this study are defined as nursing medication errors, treatment errors, IV errors and patient incidents such as falls with potential to adversely affect patients. The number of risk management events/month were divided by the number of discharges in the same month to compute a risk management frequency. The frequency of risk management events was used as an indication of the effectiveness patient care delivery with the nursing staff as the unit of analysis. While it was recognized that each of these events, by themselves, could be related to factors other than the type of nursing care delivery structure in place, it was thought that more focused attention on prevention of patient complications and management of each patient's hospital progression under the CCC/PCA model might result in a reduced pattern of nursing errors.

Frequency of home health referrals

The number of referrals made to all home health agencies per month were computed as a percentage of monthly discharges. In this case the unit of analysis was the nursing staff, specifically the CCCs who are charged with initiating the referral process on admission. It was hoped that nursing case management would result in more home health referrals as a byproduct of more efficient patient management and greater attention to post hospital care needs.

Patient Care Process Variables

Patient care process outcomes used data from direct patient care sampling with the patient as the unit of analysis. The two patient time measures consisted of:

Percent of direct care RN time spent with patients.

The minutes of direct care time patients spent with RNs was calculated by summing RN (CCC and RN) minutes as a proportion of total direct care minutes by all categories of care givers. It was thought that nursing case management would support more frequent nurse-patient interaction.

Percentage of time patients involved in assessment/communication with RNs

The minutes of direct care time patients were observed communicating with RNs and the time spent in nursing rounds, checks and symptom observation of patients were presented as a ratio of total direct care minutes. The CCC/PCA model was

designed to support nurse-patient interactions for care management.

Cost of Care Outcomes

Four dependent variables to measure costing outcomes were used in this study.

Total costs/patient day

Total costs included labor costs plus all other equipment (medical and non-medical), supply, maintenance, and purchased services needed to operate a unit. Total costs, obtained from monthly financial expense reports, were divided by the total number of patient days for study units to obtain the percentage of total costs/patient day. Although it was hoped that nursing case management would influence total costs/patient day by the more efficient use of unit resources, it was recognized that costs might tend to increase as more patient activity was compressed into a shorter period of time.

Labor costs/patient day

Labor costs were defined as all personnel costs associated with unit operations including salary, overtime, and benefits (sick, vacation, orientation, inservice, paid educational leave) for all levels of nursing personnel including the administrative director and clerical support staff. Casual staff (per diem) and registry costs were also included. Total labor costs per month were divided by the number of patient days in the month to obtain labor

costs/patient day. This measure served as an indication of the personnel costs to operate a unit.

Labor costs/unit of workload

Labor costs/ workload index consisted of all labor costs as defined above divided by the unit's workload index. Workload index was calculated by multiplying the appropriate category weights by the number of patients in each patient classification category and summing over all categories. The workload index represents the unit census, weighted by the patient acuity mix. As patient acuity goes up with sicker patients requiring more nursing care, labor costs would be expected to rise concomitantly. Conversely, declining patient acuity should result in a declining need for nursing resources. Because patient acuity plays a significant role in driving labor costs, labor costs/unit of workload were expected to be the most sensitive cost indicator.

Production inefficiency costs

Production inefficiency costs were defined for this study as the annualized dollar costs of non-nursing activities performed by licensed nursing staff. For the purposes of this study "non-nursing" activities were defined as order transcription, housekeeping tasks, clerical activities, errands off the unit, and checking and/or restocking of supplies. Dollar costs for production inefficiency comparisons were derived from work sampling

data pre-post case management. For this calculation, licensed personnel minutes spent on non-nursing activities were converted to full-time equivalents (FTE's) and multiplied by average salary costs of RNs, and LVNs to obtain dollar costs associated with production inefficiency.

Ideally, productive nursing staffs should be spending as little time as possible on unit-related clerical and other "non-nursing" tasks. Thus, the dollar cost of time spent on non-nursing tasks can be viewed as a measure of production inefficiency.

Definitions

The following are definitions of important study concepts:

Nursing unit: a geographically defined area in a hospital where patient care is provided 24 hours a day by nursing personnel.

Total patient care: a case method of assignment of nursing care in which RNs and LVNs are responsible for total care of patient caseload for the duration of their shift.

Primary nursing: a case method of assignment in which designated RNs have 24-hour accountability for a caseload of patients on a given unit with assistance from RNs and LVNs as associate nurses. Responsibility for the nursing process during the patient hospitalization is the focus of primary nursing.

Nursing case management: a case method of assignment of

nursing care in which selected RNs are accountable for the achievement of designated patient care outcomes for a caseload of patients, transcending unit/setting boundaries. Patient care outcomes within designated time frames are the point of reference across the entire episode of illness.

Patient acuity: Estimates of patients' need for nursing care. The sicker the patient, the greater the need for nursing and the higher the average patient acuity.

Workload index: A unit census, weighted by patient acuity. Calculated by multiplying the number of patients in each of six categories (I-VI) by relative acuity values for each category and summing over all categories.

Unit acuity: Average patient mix, obtained by dividing the unit workload index by the classification census.

Hours per workload index (HPWI): A staffing standard reflecting the number of nursing hours provided per day based on the workload index. Calculated by dividing the total nursing care hours provided in 24 hours by the total unit workload index for the same period. Because HPWI normalizes the effects of patient acuity, it can be used as a productivity index to compare staffing standards across nursing units.

Hours per patient day (HPPD): A staffing standard reflecting the total nursing hours provided per day based on patient census. Calculated by dividing the total nursing care hours provided over 24 hours by the actual census for

the same period. HPPD is less reflective of nursing workload than HPWI because it does not factor in the impact of patient acuity.

Staffing skill-mix: The average percent distribution of RNs, LVNs, and Nurses aides (NA) provided for unit staffing over a given period of time.

Direct care activities: Activities which are patient centered and performed in the presence of the patient and/or family.

Indirect care activities: Activities which are carried out away from the patient but are performed on behalf of the patient.

Unit-related activities: Activities and tasks necessary for the general management, coordination, and organization of the nursing unit, but not specific to individual patients.

Personal activities: Activities not directed toward patient care or unit management. For specific categorizations of direct care, indirect care, unit-related, and personal activities, see Appendix 1.

Problem Statement and Research Questions

Nurses comprise a significant portion of a hospital's labor force. Determination of efficient combinations of nursing skill-mixes and the optimal use of nursing personnel are important components of cost and care effectiveness. Nursing case management is designed to emphasize the appropriate use of resources to achieve optimal patient

outcomes within a specified period of time (Zander, 1988). The purpose of this study was to examine the impact of a nursing case management model, achieved by changes in staff-mix and redistribution of labor, on the utilization of personnel time, patient care process outcomes and costs of nursing care delivery. This study sought to examine the impact of the CCC/PCA model compared to the pre-case management model at the study site with respect to the:

1. Utilization of personnel time spent in direct, indirect, unit-related, and personal activities.
2. Frequency of CCC time related to coordination and communication of care.
3. Frequency of nursing staff risk management events.
4. Frequency of home health referrals.
5. Proportion of direct care RN time received by patients.
6. Proportion of direct care time patients are involved with RNs in activities such as communication and observational rounds.
7. Costs of care delivery.

Study Sample

Nursing Staff Sample

Utilization of personnel time data were obtained from work sampling studies performed in April-May, 1990 and repeated in July, 1991. The 1990 data were used to delineate the distribution of labor prior to nursing case

management. 1991 work sampling data reflected the contribution of nursing case management. During each 4-day work sampling period, all nursing staff members on the study unit excluding the administrative director comprised the convenience sample. Because nurses are permanently assigned to the medical unit, it was anticipated that many of the same nurses would participate in work sampling at time 1 and again at time 2.

Patient Sample

The patient sample for outcomes related to time spent with RNs consisted of a convenience sample of patients present on study units over the four-day period in April-May, 1990 and the four-day period in July, 1991 when direct care sampling was performed.

Pre-post Study Unit Comparability

With a pre-post design and the use of a non-randomly selected comparison sample of patients on the units under study, establishing comparability of the unit pre- and post-case management is important to minimize any mediating influences. To detect differences in other variables likely to be mediators of a treatment effect, patient days, discharges, age, gender, and mix of patients by medical diagnosis, and payor mix were compared pre-post case management.

The costing literature suggests that patient acuity is a strong predictor of nursing workload. In turn, nursing

workload, computed from census and patient acuity data, drives nursing care hours needed for patient care and forms the basis of personnel salary costs. Since these factors may affect cost comparisons, they were monitored in this study along with average daily census and staffing hours devoted to patient care expressed as actual hours per workload index (HPWI) and hours per patient day (HPPD). It was hoped that the study unit's acuity, workload index, and staffing HPWI would be comparable in pre and post periods so that the patient need for nursing resources was comparable at the two points in time.

Likewise, characteristics of the nursing staff likely to affect average costs pre-post case management such as educational levels, years of service, productive costs (overtime and registry) and non-productive costs (educational leave/inservice education, orientation, vacation, holiday and sick hours) were compared before and after nursing case management.

Instrument Reliability and Validity

Reliability/Validity of Work/ Direct Care Sampling

The work sampling methodology used to determine utilization of personnel time pre-post case management is an objective and reliable methodology developed under two three-year Department of Health, Education, and Welfare (DHEW) funded grants and is known as the San Joaquin methodology (U.S. Department of Health, Education, &

Welfare, 1978).

To refine the work sampling methodology, the San Joaquin validation study distilled and regrouped 97 activities into 11 sub-categories of direct care activities, four indirect care, and six unit-related activities. To test the categories, four units were studied for five days over a period of 10 days. Data were used to determine the pattern of work activity of different levels of care givers.

The direct care sampling methodology used in this study was devised in the San Joaquin study to determine patients' needs for nursing care. Direct care sampling differs from work sampling by focusing exclusively on direct care activities derived from direct patient care observations. Charge nurse and staff nurse categories are collapsed into one RN category and the individual percentages of each activity reflect a proportion of direct care activities as a whole. As a test of validity in the San Joaquin study, direct care sampling data were compared with data obtained by continuous observation of 12 randomly selected patients over 12 days. Agreement of 91% was obtained.

In a later phase of the San Joaquin study, observations made around the clock at 10-minute intervals on two units were compared with 7.5 minute observations on two other units for a period of 10 days. Researchers concluded that the observation of 12-15 patients at 10-minute intervals was more comfortably performed than shorter time spans which

permitted little slack time for observers. Study results also revealed that the average direct care time obtained in direct care sampling was consistent with the average direct care time experienced with work sampling. From direct care sampling the minutes of care required by different acuity categories of patients was determined.

To obtain estimates of equivalency observers practiced work and direct care sampling on study units. Interrater reliabilities of 92% were achieved. A paper and pencil test of 50 direct care sampling activities achieved 95% observer agreement (San Joaquin General Hospital Report, 1976).

Reliability and validity measures for study data collection

For the current study, stability of the work and direct care sampling instruments was achieved by test-retest procedures. A total of nine volunteer observers were given a one eight-hour training session, three days prior to the beginning of each work sampling data collection period. Observers remained blind to the aims of the study and were only told that they would be observing activities performed by the various care givers for the purpose of validating staffing requirements for the Medicus patient classification system. For the first four hours of training, observers reviewed all indicators in each of the direct care, indirect care, unit-related and personal categories of activities. The remainder of training was devoted to practicing work and direct care sampling with the project director available to

validate categorization of activities. At the completion of training, test-retest procedures involving a paper and pencil test were administered to newly-trained observers.

An estimate of equivalency, or the degree to which observers using the same instrument to measure the same phenomena at the same time yield consistent results, was obtained by having the paper and pencil test results of observers compared for interrater reliability.

In both work flow sampling periods, all observers achieved interrater reliabilities over 90%. Ten observers in the pre-case management period achieved a group average of 92% on the paper and pencil test following the eight-hour training period. In the post-case management study period, 7 observers received identical training. Four of the observers had collected data one year earlier. Two of the remaining three observers were new to the data collection process but not new to the hospital. All were staff nurses. An average interrater reliability of 94% was achieved in the paper and pencil test.

Content validity was achieved by having charge nurses and staff nurse observers act as a panel of experts to validate the relevance of the work and direct care sampling indicators for their setting and patients. Examples of types of patient activities appropriate to each category were reviewed and agreed upon by the group.

Medicus Patient Classification Reliability

Prior to the start of the initial work/direct care sampling data collection period, two day shift charge nurses received two hours of training in the appropriate selection of the 36 indicators that comprise the instrument. At the conclusion of training, inter-rater reliability estimates were obtained by having staff members classify the same three patients for comparison. Interrater reliabilities of over 95% were achieved. In the intervening months, the remainder of the staff nurses on the day shift were taught to classify patients, achieving interrater reliabilities that varied between 75% and 90%. In the post-case management work flow sampling period, the same two charge nurses (now called clinical care coordinators) were asked to review each nursing staff members patient classification rankings and achieved 90% agreement.

Stability of the Medicus tool was determined by test-retest procedures. During both data collection periods on the first day of the study, six patients were randomly selected for reclassification by the study site's nursing quality assurance coordinator within four hours of the original classification to confirm that the same nursing care hour requirements were indicated. All patients were placed in the same patient category type.

Predictive validity of the Medicus PCS

The purpose of a patient classification system is to predict staffing requirements. Therefore, evidence supporting the predictive validity of a patient classification system is valuable for establishing system credibility. In this study, predictive validity of the Medicus tool was established by comparing patient classification results with actual minutes of observed care. When the average minutes of nursing care delivered to patients categorized as types I-IV are close to the ranges predicted by the Medicus tool, predictive validity is assured.

Direct care sampling provided supportive evidence of the predictive validity of the Medicus patient classification system in both pre (April-May, 1990) and post (July, 1991) case management data collection periods. As demonstrated in Table 3, the average minutes of care increased as patient acuity increased from categories 1-4. Predictive validity is achieved when the average minutes of care received by patients in each patient type category are discreetly different. Discreet differences were found in the pre-case management period for the four types of patients seen on the study units although only a few patients were represented in the higher acuity categories (3 and 4). In the post-case management data collection period, the ranges were again discreetly different for categories 1-

3 but not between category 3 and category 4 patients. With only one category 4 patient in the study, the minutes of care required may not have been representative because of a low sample size.

Medicus staffing projections are based on the assumption that patients in different categories will require different ranges of nursing care hours. During both direct care sampling periods, the predicted hours of care slightly overestimated the actual hours provided on study units at higher acuity levels. Overall, actual hours were close to the predicted ranges for the most frequently seen patients (categories 1-3) on the study unit. These results suggest that staffing resources provided during both data collection periods were close to expected ranges.

Table 3

Actual Versus Predicted Hours of Care for Medicus Patient Activity Categories

Pre Case Management

Patient Category	Average Number of Patient in Sample	Average Minutes of Care/Patient Category Over Study Period	Medicus Predicted Nursing Care Hours Required	Actual Hours of Care Provided/24 Hour Period
1	3.8	59.7	0-4	2.24
2	17.5	106.1	4-7	3.92
3	1.9	176.9	7-10	6.40
4	1.0	220.0	10-14	7.84

Post Case Management

Patient Category	Average Number of Patients in Sample	Average Minutes of Care/patient Category Over Study Period	Medicus Predicted Nursing Care Hours Required	Actual Hours of Care Provided/24 Hour Period
1	1.0	35.0	0-4	1.36
2	9.4	129.1	4-7	5.44
3	12.0	161.1	7-10	6.72
4	1.0	165.0	10-14	6.88

Data Collection Methods

Dependent Variables Related to Utilization of Personnel Time and Direct Care Time with Patients

For this study during each pre and post-case management work sampling period, 10 shifts (4 day, 3 evening, and 3 Night) over consecutive four-weekday periods were chosen for observation.

During each study period, observers wore street clothes so they would not be confused as care givers and stationed themselves at the far end of the units so that they would remain unobtrusive when not making rounds. At the beginning of each study shift, observers introduced themselves to staff members at shift report and explained that they would be observing the pattern of activity on the unit for the purpose of validating the Medicus patient classification system. Care givers were also told to perform their duties at their normal pace so that activities would reflect typical unit patterns.

To gain high confidence in the time estimates for infrequently occurring activities, 10-minute intervals were chosen for observation periods. For each staff observation period, a trained observer physically located each staff member in the unit, made a "snapshot" observation, determined the specific subcategory of direct, indirect, unit-related or personal activity for each action, and placed the data on the work sampling form shown in Appendix

2. This set of work sampling observations, determined the pattern of work activities on each unit. To ensure randomness of the observations, the observers selected a different staff member at random to start each set of rounds.

During the same 10-minute interval used for direct care sampling, a second trained observer made random observations of each patient to determine which direct care activity, if any, the patient was involved in and indicated the number and levels of staff engaged in the activity. See Appendix 3. From these direct care sampling data, the pattern of direct care activities was derived. To ensure the randomness of data collection, the observer chose a patient room at random to begin each set of rounds.

Work and direct care sampling data were subjected to three separate edit checks for accuracy and completeness by study observers, the study coordinator, and work sampling nurse consultants prior to data entry. Direct care sampling data were edited to exclude newly admitted, transferred, or discharged patients physically present on the study unit less than four hours. The loss of some direct care time means that direct care sampling "percent of total time available" is normally a lower percentage from work sampling "percent of direct care time". However, direct patient care sampling results are normally consistent with work sampling findings with respect to the relative contribution of direct

care activities.

Study data were then entered into a microcomputer using EVALISYS patient classification/nursing activity software to generate study reports.

Risk Management Data Ccollection

Four months of pre-case management statistics (July-October, 1990) related to the frequency of nursing staff risk management events were obtained from the quality assurance coordinator and compared with a four-month period (March-June, 1991) after the 4-month CCC/PCA implementation period. For each study month, the numbers of nursing medication errors, IV errors, treatment errors, and patient falls were summed and divided by the total unit discharges/month to obtain a risk management percentage. Monthly percentages of risk management events/discharges were averaged over the four study months to obtain a single risk management percentage for pre-post comparison.

Home Health Referrals Data Collection

The number of home health referrals made to the home health coordinator by the nursing staff were collected over the months of July-October, 1990 and March-June, 1991. Monthly statistics were obtained from the home health coordinator and divided by the number of discharges/month to obtain a monthly frequency of referrals/discharges. These data were averaged over each four-month data collection period to obtain a single score for pre-post comparison.

Cost Outcomes

Costs of care were computed from existing patient classification, and financial reports. Each patient in the study was classified by staff nurses on the day shift using the Medicus type VI patient classification instrument. These data were entered into an optical scanner connected to a computer to calculate daily unit acuity and nursing workload calculations. Sixteen weeks of average daily census, unit acuity and unit workload index statistics comprising 9 biweekly (14-day) pay periods were used to compare the four-month period pre-case management (July-October, 1990) to the four-month period (March-June, 1991) after the four-month CCC/PCA implementation period. These data were matched with biweekly patient day and total paid salary costs from finance department productivity reports to obtain labor costs/patient day and labor costs/unit of workload. Monthly personnel utilization reports detailing productive (regular, overtime) and non-productive (vacation, holiday, ill time, orientation, education) time and registry costs were also compared over pre-post study periods. Total unit expenditures were compiled from monthly revenue/expense reports summarizing the breakdown of all unit costs.

Human Subjects

Direct Care Sampling Data

The procedures used for pre and post-case management work and direct care sampling were consistent with those

used with administrative studies performed in numerous nursing departments without hospital institutional review board (IRBs) review. After presentation to the Associate Hospital Administrator, the work flow study proceeded without presentation to the study site institutional IRB. Subsequently, the UCSF Committee on Human Research reviewed and approved the project to involve human subjects. The approval is included in Appendix 4.

A number of measures were taken to ensure confidentiality of patients during these work flow studies. For direct care sampling of patients, observation of patients was involved, but the observations were made from a distance without undue interruption of care or intrusion of the nurse/patient interaction. Before sampling began, an information card which explained the study purpose and process was placed in each patient room on all study shifts. The nursing staff were also given an orientation to the study process. Any concerns about the study were relayed to the study coordinator who was available at the beginning of study shifts to answer questions. Patients wishing to be exempt from the study were excluded from participation. Human subjects were identified by initials and room number on direct care sampling collection forms for ease of identification by observers. Study data were secured in a locked location away from patient care areas. After computer analysis aggregate data about patient interactions

with nurses were reported in terms of minutes of time spent on various care activities categorized by level of nursing personnel. Because direct care observations concern only the task interactions of nurses and patients, the raw data direct care sampling collection forms, were they to become known, would not be in any way damaging to the human subjects.

Risk of disclosure of confidentiality was the only potential risk to patients for this study. Direct care sampling raw data identifying patients by initials and room numbers was and will continue to be locked in a secure location away from study units and also destroyed after one year. Numerically coded records of length of stay data were secured in a locked location away from study units and destroyed one year after completion of the study. These and all other sources of study data were reported in aggregate form to protect individual patients from identification.

Patients who participated in direct care sampling were not expected to benefit directly from the work flow analysis results. However, future patients admitted to medical-surgical units in the study institution may benefit directly from this study if nursing case management is found to contribute to better coordination and communication of care, fewer risk management events, improved frequencies of home health referrals, and lower costs of care.

Nurse Participation in Work Sampling

Staff members participating in work sampling were informed of the study process in staff meetings in advance of the study. Observers were chosen from among staff RN and LVN volunteers so that only regular unit nurses were observing their colleagues.

Data Analysis Techniques

Data analysis for the eight research questions involved statistical and non-statistical comparisons. Interval level data were obtained with this study but parametric tests such as t-tests of independent means were not considered suitable for data analysis. For work sampling, individual nurses were randomly observed at 10 minute intervals over 4 days. Each subject contributed more than one score to the distribution of scores. The activity noted with each sampling was assumed to be continuous for the entire 10-minute period. From these data the minutes associated with each activity were summarized over the data collection period. Hence, each activity reflected the cummulative contribution of all RNs, LVNs, and PCAs. Likewise, for direct care sampling, the data did not represent minutes of time for each patient in the sample, but reflected the cummulative minutes across all patients. For these reasons, the data were subjected to nonparametric tests using chi-square in data analysis. Chi-square analysis was chosen because the data met the four main assumptions required for

this type of comparison. Nominal level variables (before/after case management and category of activity) were involved, data were in the form of independent frequency measures, sample sizes were adequate in that expected frequencies in each cell totaled at least 10, and dependent and independent variables had a sound theoretical basis for comparison.

Research questions related to the utilization of personnel time and direct care time spent with patients were subjected to chi-square tests of independent proportions to test the null hypothesis of no difference between groups. Because many dimensions of the same phenomenon were be tested, confidence levels were set at the .01 level of significance.

Research questions related to the frequencies of nursing staff risk management and home health referrals were subjected to chi-square tests of independent proportions at the .05 level of significance.

The research question related to the costs of care used actual dollar comparisons which were not subjected to tests of statistical significance.

Study Limitations

Study limitations fell into four main categories. First, the pre-post design did not allow sufficient control to determine whether other intervening variables could have produced the study results. Thus, although the pre and post

periods were found to be largely comparable in terms of patient acuity, nursing workload, patient demographics and the characteristics of the nursing staff, a better controlled design such as a control group comparison design could have helped to distinguish whether the results were due to the intervention or would have been achieved anyway. This type of design could have also ruled out the threat that study results could have been achieved by the Hawthorne effect instead of the CCC/PCA intervention.

The second limitation involves the generalizability of the results given the use of a single unit in a single hospital. A variety of factors such as physical layout, treatment regimes, nursing skill level, and attitudes of physicians and hospital personnel can all affect the success of a new care delivery model. Moreover, data obtained from patient classification instruments and work sampling studies are by their very nature specific to the individual institution and it's unique characteristics. Thus, even in well controlled work flow studies with large sample sizes it cannot be assumed that the data generated will be generalizable to another institution even though units typically exhibit some similarities in the range of time spent in categories of activity. Nevertheless, the ability to use multiple study sites would have strengthened the validity of the results if similar patterns of activity were found.

A third limitation relates to the fact that a four-month period prior to case management was compared with a four-month period after the initiation of the CCC/PCA model. An entire year would have been more representative of unit events. Thus, for example, variations in staffing related to seasonal vacations would have been minimized with a larger data base, thus enabling labor costs to be more accurate. Likewise data collection over an entire year would have helped ensure that risk management and home health trends were truly representative of unit activity. Moreover, a four-month implementation period for the case management model proved to be too short a time frame. Eight months to one year would have ensured that the nursing staff were proficient in their new roles thus providing a "snapshot" of work flow activity that had stabilized.

The fourth limitation relates to the insensitivity of some of the dependent variables used for this study. While nursing process outcomes related to the utilization of personnel time provided objective quantitative data, the subcategories of direct, indirect, and unit-related activities thought to be most closely associated with evidence of case management activity may have been too discrete to capture the complexity of the case management process in it's entirety.

Likewise, dependent variables related to the effectiveness of the care delivery process may not have been

sensitive enough indicators. The percentage of risk management events could have been influenced by a variety of factors other than the case management model. Some of these include staffing hours provided, skill-mixes and years of service of nursing personnel, changes in the mix of patients and, perhaps most importantly, variations in nursing intensity produced by admission and discharge patterns that included as many as 4-8 patients admitted and or discharged within a span of four hours on the day shift.

The frequency of home health referrals was also thought to be a reasonably sensitive measure of the degree to which case management might influence managed care. However, in this study admission patterns had a greater than intended effect in that the percentage of uninsured patients rose dramatically as reflected by a 5% jump in the "other" category. These patients proved more difficult to place in home care within the community because many home care agencies were not reimbursed for the services. Hence, the total pool of possible home care patients declined in the post-case management period which may have skewed the results of this variable.

CHAPTER 5

STUDY RESULTS

Characteristics of the Study Sample

Patient Characteristics

The unit of analysis for pre-post comparison was the nursing unit. For this reason, unit admission patterns and patient characteristics were monitored for comparability. The four month period after nursing case management (July-October, 1990) proved to be similar to the pre-case management period (March-June, 1991) in terms of patient days, discharges, and composition of the patient population in terms of age, gender and payor source. Unit admission patterns were also similar. The same eight medical diagnoses most prevalent in the pre-case management period were the most represented on the study unit in the post-case management period. See Table 4.

Unit Characteristics

Likewise, those unit characteristics likely to affect cost comparisons were similar in the pre (July-October, 1990) and post (March-June, 1991) data collection periods summarized in Table 5. In the post period, average daily census was slightly higher but unit acuity was lower resulting in an identical average workload index. Thus, the patients' need for nursing care was comparable before and after case management. Targeted staffing hours were set at 4.6 HPWI. Actual staffing hours provided were 4.36 in the

Table 4:

Patient Characteristics Pre - Post Implementation of the CCC/PCA Model

	Pre July - October 1990	Post March - June 1991
Patient days	631	646
Discharges	119	118.5
Average age	67	65.5
% Male	44.2%	42.58%
% Female	55.8%	57.43%
% MediCare	64.95%	61.98%
% MediCal	19.35%	18.0%
% Other	15.7%	20.0%

Eight Top Admitting Medical Diagnosis Pre - Post Implementation of the CCC/PCA MODEL

	Pre July-October 1990	Avg # Cases/Mo	Post March-June 1991	Avg # Cases/Mo
1.	CHF	10.0	CHF	11.25
2.	Cancer	7.5	Renal Failure	5.25
3.	Renal Failure	4.5	Pneumonia	5.0
4.	Pneumonia	4.2	Asthma	4.5
5.	CVA	4.25	Cancer	4.0
6.	Chest Pain	4.0	Chronic Airway OBS	3.25
7.	Chronic Airway OBS	3.25	Chest Pain	2.5
8.	Asthma	3.0	CVA	2.0

Table 5

Unit and Nursing Staff Characteristics Pre-Post CCC/PCA Model Implementation

Unit Characteristics:	Pre July-October 1990	Post March-June 1991
Average Daily Census	20.35	21.28
Workload Index	27	27
Unit Acuity	1.26	1.22
Target Hours/Workload Index (HPWI)	4.60	4.60
Actual HPWI	4.36	4.63
Actual Hours/Patient Day	5.36	5.66
Nursing Staff Characteristics:		
Number of RNs on Staff	14	19
Number of LVNs on Staff	5	7
Number PCAs on Staff	0	4
Average Years Service	10.2	7.8
% BSN/Diploma - AD	0%/100%	5%/95%
Nursing Personnel Average Salary Costs $/hr	$16.09	$15.35 (after 6% raise 9/90)
RN Average Salary Cost	$19.80	$20.03
LVN Average Salary Cost	$12.39	$14.30
PCA Average Salary Cost	0	$11.72
Actual 24 Hour Staffing by Category:		
% RN	76.5	72
% LVN	20.5	15
% AIDE	3.0	13

pre-case management period and 4.63 in the post-case management period. This translated to a slightly higher average staffing HPPD after nursing case management.

The characteristics of the nursing staff were similar in terms of educational levels. The ratio of both RNs and LVNs utilized in staffing daily was reduced to introduce the patient care associate position. Average years of service declined with the departure of 6 staff members and the addition of 11 new ones, including 4 PCAs. In all cases, lower salary costs associated with less senior new employees were negated by higher base salary levels that accompanied a 6% tenure step increase for all RNs in September, 1990. Average salary cost/hour comparisons for all nursing personnel revealed that dollar costs declined slightly after nursing case management despite higher staffing hours per patient day and higher average RN and LVN salaries. This finding can be explained by the addition of lower cost PCAs.

Answers to Study Research Questions

Nursing process dependent variables related to the utilization of personnel time were derived from the pre (April-May, 1990) and post (July, 1991) CCC/PCA model work sampling data collection periods. Work sampling observations every 10 minutes over four days in the pre-case management period achieved the equivalent of 2,484 individual staff observations. In the post case management period, the sample size consisted of the equivalent of 3,443

individual staff observations.

Nurses generally average between 30-40% of their time in direct care activities, while spending another 30-35% in indirect care. Unit-related time often represents about 15-18% of total time and personal time averages about 12%. Personal time for nurses under a bargaining unit contract would minimally consist of approximately 10% of the overall work day although 12% is probably a more realistic percentage. This is equivalent to about 30 minutes for a meal break and two 15 minute coffee breaks during a given day or evening shift. Night shift personal time is usually underestimated as non-productive time and is often imbedded in other activities such as charting (Sutter Solano Medical Center, 1990).

What is the Effect of Nursing Case Management on the Utilization of Personnel Time?

Research question 1 sought to explain any differences in utilization of nursing staff time by category of direct, indirect, unit-related, and personal time. In the pre-case management period, the charge nurse was operationally responsible for RN and LVN colleagues providing total patient care to a caseload of patients. Usually RNs supervised LVNs while the charge nurse coordinated care for the unit. Work sampling data validated this pattern of activity.

The breakdown of direct, indirect, unit-related and

personal categories of time prior to the CCC/PCA model are shown in Table 6. On the day and evening shifts RNs and LVNs spent close to one-half of their time in direct care activities. The day shift spent almost twice as much time as the evening shift on indirect care activities and both groups spent about 15% performing unit-related activities. Personal time on the PM shift was higher suggestive of a slower pace. Charge nurses on the day shift managed the desk in the absence of clerical personnel, spending less than 10% of their time in direct care. Almost 80% of their time was equally distributed between indirect care and unit-related activities. On evenings, the proportion of charge nurse direct care time increased to 30% at the expense of unit-related activities which is typical of units staffed with one less person. Day and evening shift charge personnel had lower than the average 12% personal time. Both groups stated that they felt harried and pressed for time to complete their daily activities. If one assumes that it is desirable for the staff with the highest level of expertise, education, and skill to maximize their involvement with patients and minimize their involvement in clerical and non-clinical unit-related activities, then this pattern of activity suggests poor utilization of personnel with the most flexibility and versatility. On the night shift, there is no charge nurse and usually only two RNs with one LVN. As would be expected, relatively less time

Table 6

Work Sampling: Pre-Case Management Average Percent of Time by Category of Activity, Shift, and Staff Level

UNIT: 3rd FLOOR

TYPE OF UNIT: MEDICAL SURGICAL

SHIFT: Day	CHG RN	RN	LVN	NA	FLOAT	WC
Direct Care	9.0	47.4	47.4	65.3	72.4	0.0
Indirect Care	44.3	27.6	31.1	16.8	0.0	0.0
Unit-related	37.6	14.5	12.8	5.3	27.6	0.0
Personal	9.0	10.5	8.7	12.6	0.0	0.0

SHIFT: Evening	CHG RN	RN	LVN	NA	FLOAT	WC
Direct Care	30.5	56.3	52.8	0.0	52.8	0.0
Indirect Care	38.3	15.6	16.9	0.0	12.5	0.0
Unit-Related	20.8	14.8	14.5	0.0	34.7	0.0
Personal	10.4	13.3	15.7	0.0	0.0	0.0

SHIFT: Night	CHG RN	RN	LVN	NA	FLOAT	WC
Direct Care	0.0	34.7	35.0	0.0	31.8	0.0
Indirect Care	0.0	40.3	31.7	0.0	0.0	0.0
Unit-Related	0.0	20.4	21.7	0.0	68.2	0.0
Personal	0.0	4.6	11.7	0.0	0.0	0.0

was spent in direct care as some patients are sleeping for a portion of the night. Indirect and unit-related activities consumed more time in preparation for the next day.

Post-case management percentages of time by category, activity, shift, and staff level are shown in Table 7. For RNs and LVNs, the general pattern of activity remained similar to that before the CCC/PCA model. A somewhat higher percentage of time was spent in unit-related and personal time but the differences were not remarkable. The pattern of activity did change on the evening shift in that indirect care time increased at the expense of direct care time. This finding was welcomed because indirect care activities such as planning and documentation of care were expected to assume more importance under nursing case management. Likewise, it was hoped that the night shift pattern of activity would favor more direct observation of patients at the expense of unit-related activities with the addition of one PCA starting work at 6AM to assist with clerical and basic AM care activities. These anticipated findings did occur in the intended direction as unit-related activities dropped about 5%.

The major change in labor distribution was seen in the role of the case manager (clinical care coordinator). Under the CCC/PCA model, the CCC oversees a caseload of 10-15 patients from admission to discharge. On a daily basis, the CCC assumes responsibility for direct care of the least

Table 7

Work Sampling: Post-Case Management Average Percent of Time by Category of Activity, Shift, and Staff Level

UNIT 3RD FLOOR

TYPE OF UNIT: MEDICAL

SHIFT: Day	CCC	RN	LVN	FLOAT	PCA	OTHER
Direct Care	31.6	44.0	45.8	94.8	30.0	0.0
Indirect Care	25.9	26.7	25.8	1.7	26.8	0.0
Unit-Related	31.4	17.2	14.8	1.7	33.3	0.0
Personal	11.1	12.1	13.5	1.7	9.9	0.0

SHIFT: Evening	CCC	RN	LVN	FLOAT	PCA	OTHER
Direct Care	27.9	41.6	33..2	45.7	29.9	0.0
Indirect Care	42.9	31.3	33.2	23.9	37.8	0.0
Unit-Related	17.5	15.4	16.8	15.2	2.05	0.0
Personal	11.7	11.7	16.8	15.2	11.9	0.0

SHIFT: Night	CCC	RN	LVN	FLOAT	PCA	OTHER
Direct Care	0.0	39.4	36.3	43.3	17.6	0.0
Indirect Care	0.0	34.3	39.7	16.7	0.0	0.0
Unit-related	0.0	16.9	14.7	38.3	70.6	0.0
Personal	0.0	9.4	9.3	1.7	11.8	0.0

acute subset of 2-4 patients. Although some CCC's prefer to perform basic care activities such as baths as part of their overall patient assessment, most assign at least some basic direct care activities to the PCA so they can devote their time to activities requiring greater clinical expertise. This anticipated pattern of CCC/PCA activity did occur. CCCs on the day shift spent a significantly higher percentage of time in direct care after the introduction of case management. This increase came at the expense of indirect care and unit-related activities which occupied significantly less time under nursing case management. Personal time also increased suggestive of a better pattern of individual caretaking.

The detailed breakdown of work sampling subcategory activities by level of personnel and shift are summarized in Appendices 5A-5D. Prior to the CCC/PCA model, the charge nurses largely coordinated unit activities and were often stationed near the desk in the absence of clerical personnel. The few direct care activities involved patient assessment and communication with the patient on rounds. Much of the available time was devoted to indirect care activities such as transcription of orders, and supportive unit-related activities such as errands and stocking supplies, clerical, and housekeeping tasks. After the CCC/PCA model, clerical activities were shifted to PCAs who spent much of their time transcribing orders, charting,

communicating with others, or in reception functions on the unit. PCA direct care time was spent on basic nursing activities such as patient hygiene, patient transport, vital signs, and specimen collection, which allowed the CCCs to devote more of their direct care time communicating with the patient/family, and in medication/IV administration. This pattern of activity suggests that the CCC/PCA model on the day shift was effective in redirecting the time of clinical experts toward activities requiring nursing judgment and expertise.

A similar pattern of activity was expected on the evening shift. Overall, the CCC spent slightly less time in direct care and about 5% more time in indirect care activities. The percentage of unit-related time diminished by about 3%. Personal time increased somewhat, which suggested a pace that permitted more break time. Within the indirect care category, CCCs spent about 5% more time charting and 7% more time communicating about the patient with others and about 15% less time transcribing orders. Within the unit-related category, shift report consumed about the same amount of time as before, but other unit-related activities such as stocking supplies declined. As with the day shift, PCAs spent about 60% of their time on indirect care clerical activities such as order transcription, unit-related functions (clerical activities, housekeeping, stocking supplies), and 30% in basic direct

nursing care.

While the direction of the change was less dramatic than on the day shift, the data showed that CCCs consistently assigned unit-related clerical tasks to PCAs leaving them more time for patient related activities.

A series of chi-square tables were set up to compare pre-post case management (row variable) by work sampling subcategories of activity (column variable). Observed frequencies, expected frequencies, and overall cell totals were produced for each 2x2 comparison along with chi-square results and associated p values. These raw data tables are presented in Appendix 6.

A summary of proportions (in minutes), chi-square results, and comparable p values are shown in Table 8. As discussed above, the proportion of day shift direct care minutes/total minutes was significantly greater under the CCC/PCA model while indirect care minutes/total minutes and unit-related minutes/total minutes were significantly less after the introduction of this model. None of the evening shift differences approached statistical significance. When day and evening shifts were combined, the post-case management period did prove to result in significantly greater direct care time and significantly less indirect care time on the strength of the day shift findings. Unit-related differences were not significant. These data suggest that the major effect of restructuring under the

Table 8

Work Sampling: Utilization of CCC Time Pre-Post Study Periods

Case Manager Utilization of Personnel Time	Proportion In Minutes		Chi - Square	df	p value
Day Shift	**Pre**	**Post**			
Direct care/total min	48/525	335/1060	95.4381	df=1	p < 0.0000*
Indirect care/total min	233/525	275/1060	53.9619	df=1	p < 0.0000**
Unit-related/total min	198/525	333/1060	5.9740	df=1	p < 0.0145**
Personal/total min	48/525	118/1060	1.2772	df=1	p < 0.2584
PM Shift					
Direct/total min	157/513	143/513	0.7961	df=1	p < 0.3722
Indirect/total min	197/513	220/513	1.9554	df=1	p < 0.1620
Unit-related/total min	107/513	90/513	1.6083	df=1	p < 0.2047
Personal/total min	53/513	60/513	0.3580	df=1	p < 0.5496
Days/PMs Combined					
Direct/total min	205/1038	478/1573	36.0907	df=1	p < 0.0000*
Indirect/total min	430/1038	495/1573	26.6644	df=1	pc < 0.0000**
Unit-Related total min	305/1038	423/1573	1.8096	df=1	pc < 0.1786
Personal/total min	101/1038	178/1573	1.4856	df=1	pc < 0.2229

* Significant increase from pre to post period
**Significant decrease from pre to post period

CCC/PCA nursing case management was a redistribution of labor which favored the case manager more direct care time with patients with less emphasis on certain indirect and unit-related activities.

Is the Frequency of CCC Activity Related to Coordination and Communication of Care Different Under Nursing Case Management?

The second research question asked specifically whether patterns of coordination and communication of care differed under nursing case management. Answers to this question can be found by analyzing the utilization of case manager time in Appendices 5A-D by reviewing Table 9, which summarizes the chi-square statistical comparisons. Within the categories of direct, indirect, and unit-related activities, three specific subcategories address coordination and communication of care. These are "communication with patient and family", "communication about the patient", and "shift report". It was hoped that CCCs would spend more time in these activities in order to facilitate patient discharge within the expected length of stay guidelines. On the day shift, time spent in communication with the patient/family declined 9% while communication about the patient declined 2%. Shift report increased 2%. None of these differences were statistically significant. On the evening shift, all three categories of time spent in coordination and communication activities increased, with

Table 9

Work Sampling: Pre-Post Comparisons of CCC Time Devoted to Coordination and Communication of Care

	Proportion in Minutes		Chi-Square	df	p value
Day Shift	Pre	Post			
Communication with patients & family/direct care minutes	15/48	75/335	1.3743	df=1	p < 0.2411
Communication about patient/indirect care minutes	100/233	110/275	0.3308	df=1	p < 0.5652
Shift report/unit-related minutes	90/198	160/333	0.2392	df=1	p < 0.6248
PM Shift					
Communication with patient & family/direct	33/157	37/143	0.7334	df=1	p < 0.3918
Communication about patient/indirect care minutes	13/197	50/220	19.8406	df=1	p < 0.0000*
Shift report/unit-related minutes	60/107	57/90	0.2392	df=1	p < 0.3747
Days/PMs Combined					
Communication about patient/indirect care minutes	113/430	160/495	3.7556	df=1	p < 0.0526

*Significant time increase from time 1 to time 2

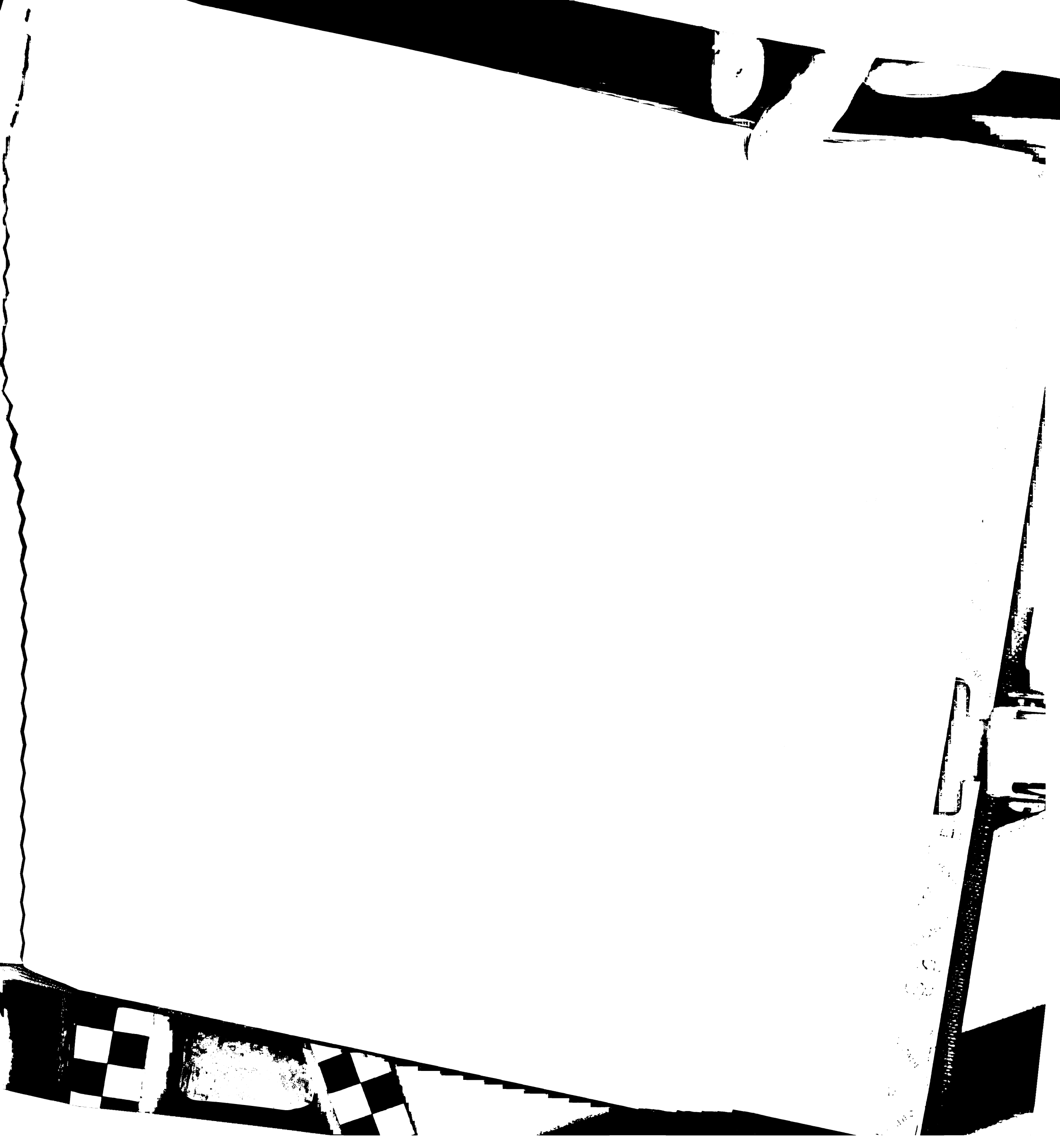
communication about the patient increasing significantly after nursing case management. When the day/evening shifts were combined, this category did not demonstrate significant differences.

Does Nursing Case Management Affect the Frequency of Risk Management Events?

The percentage of nursing medication errors, IV errors, treatment errors and patient falls were summed by month and divided by the number of patient discharges to obtain a risk management error rate/discharge. The four-month period pre-case management (July-October, 1990) was compared with a four-month period after the transition to the CCC/PCA model (March-June, 1991) and shown in Table 10. There were no significant differences in error rates between pre-post data collection periods. These results could be interpreted as validation that the reduction in skill-mix accompanying the redistribution of labor under the CCC/PCA did not lead to a concomitant rise in nursing staff errors.

Does Nursing Case Management Affect the Frequency of Home Health Referrals?

The volume of referrals for home health follow up per month were divided by the number of unit discharges to obtain an average monthly frequency over four months (July-October, 1990). These frequencies were averaged to obtain one four-month average score. The same computational method was used to obtain a four-month average score covering a



four-month period after the nursing case management transition period. These data are shown in Table 10. The percentage of referrals increased by 4.5% after the introduction of nursing case management which was not a statistically significant difference.

What is the Impact of Nursing Case Management on the Amount of Direct Care RN Time Received by Patients?

The categorization of direct patient care sampling data by shift and by level of personnel was used in this study to examine patterns of activity pre-post-nursing case management. Ten minute observations over the 10 study shifts produced the equivalent of 10,848 patient observations in the pre-case management period compared with 11,232 patient observations in the post-case management period. The data summarizing the breakdown of direct patient care activities by level of personnel and shift are presented in Appendices 7A-7D. Appendix 8 presents the 2x2 chi-square tables for direct care sampling.

For direct care sampling, charge nurse and RN categories are collapsed into one group enabling comparisons of RN time spent with patients compared to total direct care minutes of all care givers. On the day shift, 68% of RN direct care time was spent with patients after the CCC/PCA model as opposed to 52% direct care time before this model. This difference proved significant at the .01 level. On the evening shift, 57% of RN direct care minutes were spent with

Table 10

Frequencies of Risk Management Events and Home Health Referrals
Pre-Post Case Management

Time 1

		July	Aug	Sept	Oct	4 Mo Avg
1990 Pre-Case Management	Events	5	12	5	8	30
	Discharges	131	117	104	123	475
		3.8%	10.3%	4.8%	6.5%	6.3%

Time 2

		March	April	May	June	4 Mo Avg
1991 Post Case Management	Events	9	8	7	3	27
	Discharges	112	130	114	118	474
		8.0%	6.2%	6.1%	2.5%	5.7%

Chi - Square = 0.142, df = 1 P < 0.40 NS

Time 1

Home Health
Referrals/Discharges

		July	Aug	Sept	Oct	4 Mo Avg
	Events	31	40	25	37	133
1990 Pre Case Management	Discharges	131	117	104	125	475
		23%	34%	24%	30%	28%

Time 2

		March	April	May	June	4 Mo Avg
1990 Post Case Management	Events	31	40	25	37	133
	Dischages	112	130	114	118	474
		28%	32%	47%	23%	32.5%

Chi - square = 1.21, df = 1 P < 0.30 NS

patients before and after nursing case management. When day and evening shifts were combined, direct care RN time spent with patients was significantly greater after nursing case management on the strength of the day shift findings. A summary of chi-square results is shown in Table 11.

Does the Percentage of Time Patients are Involved in Direct care activities such as Communication and Observation by RNs Differ Under Nursing Case Management?

Within the 12 subcategories of direct care, communication with patient/family and nursing rounds/checks/symptom observation were activities thought to be most associated with nursing case management. RN time spent with patients devoted to these activities on the day shift revealed no significant differences pre-post case management.

On the evening shift, however, significantly more time (nearly 9%) was spent in communication with patient/family after introduction of the CCC/PCA model. In contrast, significantly less time (7.5%) was devoted to nursing observational rounds. When day and evening shifts were combined, significant differences in observational rounds were found on the strength of the evening shift data.

Does Nursing Case Management Affect Care Costs?

For all cost comparisons, a four-month period prior to nursing case management (July-October, 1990) was compared with a four-month period after the four-month introduction

of nursing case management (March-June, 1991). In both data collection periods, costs were obtained by averaging data from nine biweekly (14-day) pay periods. These dollars were divided by either patient days or unit of workload covering the same pay periods. Costing results are summarized in Table 12.

Total costs/patient day

Total costs included labor costs plus all other equipment (medical and non-medical), supply, maintenance, and purchased services needed to operate the unit. Total costs were obtained from monthly financial reports detailing all categories of unit expense. Four months of pre-post case management total costs were divided by patient days to obtain dollar costs/patient day. The four-month average total cost to run the study unit pre-case management was $163.30/patient day compared with $166.88/patient day in the post-case management period. Factoring out the 6% RN raise from the salary portion of total costs, post-case management total costs were $159.70/day. There were no outstanding changes in medical, supply, or purchased services to account for the $3.60/patient day difference over the comparison months. While it was hoped that nursing case management would result in more efficient use of unit resources and less cost expenditures, it was also anticipated that total unit costs might rise as more activity was compressed into a shorter patient length of stay.

Table 11

Direct Care Sampling: Pre-Post Comparisons of RN Time Spent in Direct Patient Care and in Specific Sub-Categories of Direct Care Activity

	Proportions in Minutes	Chi - Square	df	p value
Day Shift	Pre Post			
Direct Care/total minutes	663 828 1269 1207	68.3831	df=1	p < 0.0000*
Communication with Patient & Family/ Direct Care minutes	82 102 663 828	0.0026	df=1	p < 0.9597
Observation/Direct Care minutes	35 37 663 828	0.3646	df=1	p < 0.5460
PM Shift				
Direct Care/total minutes	440 663 758 1159	0.0557	df=1	p < 0.8134
Communication with Patient & Family/Direct Care minutes	23 93 440 663	20.8380	df=1	p < 0.0000*
Observation/Direct Care minutes	43 16 440 663	26.8582	df=1	p < 0.0000**
Days/PMs Combined				
Direct Care/total minutes	1103 1491 2047 2366	37.4149	df=1	p < 0.0000*
Communication with Patient & Family/Direct Careminutes	105 195 1103 1491	7.5075	df=1	p < 0.0061
Observation/Direct Care minutes	78 53 1103 1491	15.6287	df=1	p < 0.0001**

*Significant increase pre-post
**Significant decrease pre-post

Table 12
Cost Comparisons Pre-Post Case Management

	Pre-Case Mgt (July - Oct 1990)	Post-Case Mgt (March - June 1991)
Personnel Utilization	Hours	Hours
Overtime Hours	585	262
Orientation Hours	416	349
Education Hours	798	625
Vacation Hours	2027	982
Holiday Hours	482	429
Sick Hours	421	469
Average Registry Costs	$ 6,521.44	$ 2,576.89
Total Paid Personnel Dollars	$42,387.33	$42,999.56
Average Daily Census	20.35	21.28
Unit Activity	1.26	1.22
Workload Index	27	27
Dollars/Patient Day	$ 148.06	$ 145.97
Dollars/Workload Index	$1,547.00	$ 1,586.00 (with 6% raise) $ 1,518.00 (without 6% raise)
Total Unit Costs/Patient Day	$ 163.30	$ 159.70 (without 6% raise)
Production Inefficiency Cost	$50,048.80	$38,519.91

Labor costs/patient day

Labor costs were defined as all personnel costs associated with unit operations including salary, overtime, and benefits cost (sick, vacation, orientation, inservice, paid educational leave) for all levels of nursing personnel working on the study unit including registry and casual staff. The administrative director and clerical support staff (Patient Care Associates) were also included in total labor costs.

In the pre-case management period, personnel dollars totaled $42,387.33 or an average of $148.06/patient day. In the post-case management period, $42,999.56 were spent on personnel costs, or an average of $145.97/patient day. Thus, personnel costs were approximately $2/patient day less after nursing case management, despite the fact that the post-case management dollars included a 6% raise for RNs and higher average RN and LVN registry dollars/hour. The pre-case management period saw higher usage of overtime, vacation, holiday, education, and orientation hours and higher registry costs. During this period, two staff members were on long vacations when the census rose suddenly and stayed high. As a result, more regular staff time was spent in overtime while new hires were in orientation and other needed shifts were staffed with registry personnel. In the post-case management period, higher core numbers of staff eliminated the need for registry and overtime. Ill

time was higher in the post-case management period due to unforseen long-term illnesses of a number of staff members and was not thought to be related to work flow patterns.

Labor cost/unit of workload

Labor costs per patient day do not take into account the fact that some patients may be more acutely ill than others, thus requiring greater resource utilization. Because staffing is allocated by patient acuity, it was thought to be important to consider acuity in any comparisons of dollar labor costs.

The unit of workload is a function of patient census and acuity. The workload index computed by multiplying the appropriate category weights by the number of patients in each category to obtain the study unit workload index. For pre-post study comparisons, the average daily census rose from 20.35 to 21.28 but patient acuity declined slightly from 1.26 to 1.22 with the result that the study unit workload index was identical at 27. This means that the study unit patient workload driving drives personnel costs was comparable in the pre-post case management periods so that any differences were not due to mediating factors of census and patient acuity.

In this study, personnel labor costs were divided by the average workload index to obtain a four-month average labor cost/workload index figure of $1547. This compared with a post-case management average labor cost/workload

index of $1586. These dollar costs included a 6% raise for RNs (72% of total staff). When the RN raise was factored out, post-case management labor costs/workload index totaled $1518. Thus, normalizing for acuity, the nursing case management model was $29/unit of workload less costly than the pre-existing model.

Production inefficiency costs

Production inefficiency costs relate to the annualized cost of "non-nursing" activities performed by licensed personnel. In this study the time associated with specific work sampling subcategories of indirect and unit-related activities were considered "non-nursing" tasks. These subcategories included transcription of orders, housekeeping and clerical tasks, errands off the unit and restocking of supplies. The total minutes associated with these activities were summed for all licensed care givers (Charge RNs, RNs, LVNs), converted to hours, and multiplied by the average personnel salary cost of $16/hr (from Table 2). In the pre-case management period, 8.57 hours/day of licensed staff time was spent in non-nursing activities. Production inefficiency costs equalled $137.12/day for an annual cost of $50,048.80/year. After case management implementation, 6.15 hours/day of licensed staff time was spent in non-nursing activities. This was multiplied by the licensed care giver average salary cost of $17.16 (which incorporated a 6% RN raise) to obtain dollar costs of $105.53/day, or

$38,519.91/year. Thus, under the nursing case management work restructuring, 2.4 hours/day and $11,528 annual savings were achieved by having the PCAs perform the "non-nursing" activities once performed by licensed nursing staff. Factoring out the RN raise would have seen post-case management costs of $35,916 ($16/hour x 6.15 x 365) for an annual savings exceeding $14,000 ($50,048 - $35,916 = $14,132).

CHAPTER 6

STUDY IMPLICATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Discussion of Study Findings

The research presented supports the premise that it is possible to redesign work to create a nursing case management model that is care-effective in terms of the utilization of nursing personnel and patient outcomes of care and cost-effective in terms of the costs of nursing care delivery. Achieving these outcomes did not occur by chance alone, but reflect thoughtful use of the NAPP perspective and it's extension into the institution and clinical unit where the study was conducted.

The CCC/PCA model demonstrated that a work redesign strategy emphasizing having the "right people doing the right things" could be successful in redirecting the flow of work. Under this model, clinical experts were permitted to spend more of their time on activities commensurate with their education and expanded training in managed care. This was evident on the day shift by a dramatic change in the redistribution of labor. Work sampling demonstrated that a significantly greater proportion of case manager time was spent in direct care activities while significantly less time was spent on indirect care and unit-related activities.

On the evening shift, case managers spent a relatively greater proportion of time in indirect care activities on

behalf of patients and less on unit-related clerical activities, although the differences were not significant. The lack of a dramatic change in case manager direct care activity on this shift might be explained by the fact that evening shift charge personnel were already more directly involved in patient care because evening staffing includes one less care giver.

Pairing the case manager with a nurse extender cross-trained in basic clinical and clerical skills also contributed to care-effectiveness. The ability to delegate "non-nursing" clerical and unit-related activities resulted in a reduction of nearly two and one-half hours/day of licensed personnel time spent in non-nursing tasks. This pairing also afforded the care coordinator the ability to be a controller of time rather than to be controlled by daily events. This was evident by the fact that CCC's had enough flexibility in their day to engage in activities such as physician rounds and case management conferences with discharge planners, social workers, and utilization reviewers without being interrupted.

Specific work sampling activities thought to be most directly associated with the effectiveness of the case management role (communication with or about the patient and shift report) did not realize statistically significant differences pre-post case management except on the evening shift where case managers spent significantly greater

indirect care time in communication about the patient. This finding may have been somewhat misleading because patient communication could easily have been imbedded in other direct care activities, thus underestimating actual communication time.

Direct care sampling data consistently paralleled work sampling data and supported the finding that RNs spent proportionately more time in direct care as a function of total care giver minutes devoted to direct patient care. Subcategories of direct care activities thought to be related to case management (communication with patients; observational rounds) did not demonstrate a predictable pattern of activity pre-post case management. Communication with patients/families increased significantly on the evening shift which is probably related to the fact that families visit more in the eventing. Conversely, time spent in observational rounds decreased significantly on evenings. One explanation of this finding might be that the case managers were able to assess patients in the course of communicating with them and thus did not need to round as often.

The CCC\PCA case management model introduced into the study setting was designed to be budget neutral by matching clinical coordinators paid 9% above staff nurse levels with PCAs costing half as much as the base staff nurse rate. The model proved to be more cost-effective than the pre-case

management total patient care model in terms of labor costs/patient day and labor costs/ unit of workload although higher registry usage covering summer vacations contributed to higher labor costs in the pre-case management period. Total unit costs were about $3.50/day less costly after nursing case management. Production inefficiency costs declined by over $11,000/year by having licensed personnel spend less time in "non-nursing" tasks. Factoring out the RN salary raise would have realized savings over $14,000. This finding confirmed the notion that a work design model featuring having the "right people do the right things" could indeed be less costly as well as more efficient.

The cost-effectiveness of the model was not offset by declining care effectiveness as evidenced by no change in the frequency of nursing risk management events. These findings are consistent with the cost and quality outcomes of the Pro-ACT model reported by Brett & Tonges (1990) who also found no increases in risk management events despite reductions in skill-mix to introduce nursing case management under an expanded nursing role.

The experience gained from this study suggests that nursing technology, as defined by Neidlinger and Miller (1990), and not cost containment, ought to drive decision making about the appropriateness of care delivery models for a given acute care setting. The CCC/PCA model appears to be best suited to community hospitals where patients are of

moderate acuity and are not tremendously labile. In the small urban community hospital used for this study, the nursing staff as a whole spent the greatest proportion of time on patient hygiene, medication administration, nutrition and elimination, and vital signs. In a larger urban community hospital offering a wider range ofspecialty services or a tertiary referral center, patients might tend to be less stable and more labile over the course of an illness episode. In these cases, a greater proportion of nursing time would be spent on assessment and observation rounds, vital signs, and treatments/procedures. Because nurses aides would tend to be less productive in these settings by virtue of the fact that their scope of practice is limited to basic care activities, the CCC/PCA model may be less advantageous than a model favoring greater percentages of licensed care givers. This assumption needs to be tested in subsequent work.

Within subsets of medical-surgical units, the CCC/PCA model seemed effective where the majority of patients were elderly and required attentive but basic nursing care, frequent observation for safety, and less complex needs such as positioning, elimination, and nutritional support such as feeding. Units where patients require high degrees of complex care needs such as a variety of treatments for multiple diagnoses, or complex treatments such as chemotherapy administration would seem to be best served by

care delivery models that staff RNs in primary or total patient care roles.

Study Significance

To balance the need for high quality nursing care with cost-effectiveness, there is a continuing need to design and evaluate alternative models of delivering nursing care. The American Nurses' Association (ANA) had identified this need as a priority for nursing research. Case management has been identified as one promising approach to the problem of delivering cost-effective quality nursing care. This study will be most helpful to nursing administrators nationwide by contributing to the database of institutional experiences in alternative care delivery systems. Identification of dollar savings in this model may potentially save significant dollar outlays for untested organizational delivery systems elsewhere.

The nursing process and direct patient care outcomes achieved with large sample sizes using widely accepted work and direct care sampling methodologies also serve as compelling evidence that nursing case management can indeed be structured to facilitate more time spent directly with patients. This evidence is important because any model promising a greater degree of nurse-patient interaction must demonstrate a labor distribution pattern that supports more nursing time with patients or it will not achieve acceptance with nurses. Primary nursing might be considered one

example of this phenomenon because it did not result in more direct care time with patients despite the goal of a more patient-centered model. This may account for the fact that primary nursing was actually implemented in only a small percentage of hospitals.

Finally, this model will contribute to the database of nursing process and patient outcomes used to measure care delivery effectiveness. Hospital work environments embody such enormous complexity and diversity that few, if any, sensitive measurable nursing process and patient outcome variables exist. To the degree that this study confirmed that conclusion, it provided useful information for future researchers.

Recommendations for Future Research

This study demonstrated that nursing case management can be structured in an efficient manner to permit case managers to emphasize managed care activities at the expense of non-nursing tasks. To be considered viable as a case management modality, the CCC/PCA model should be replicated in other work environments to determine if similar results are achieved in terms of utilization of personnel time and the percentage of direct care RN time spent with patients. The the dollar impact of savings in terms of labor costs/unit of workload and savings in production inefficiency time of licensed care givers should also be explored. In replicating the study, a control-group design

would provide a better test of the CCC/PCA model. It would also be important to again match units by unit acuity, actual staffing hours provided, and experience of nursing staff members. The ability to actualize the CCC role using baccalaureate or masters prepared nurses would be optimal as the model was designed for this level of preparation.

In terms of care-effectiveness, future research should focus on the role of the nursing case manager in facilitating managed care and on the development of quality outcomes of patient care. The development of more sensitive dependent variables measuring expected and actual care outcomes at discharge would assist researchers in evaluating the effectiveness of nursing case management. Moreover, refinement of quantitative and qualitative measures of quality such as complications of care after hospitalization or home health nurse perceptions of care of their hospitalized patients would be valuable in evaluating outcomes of care.

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Appendix 1 - Medical - Surgical Definitions of Activities

Page 1

The detailed list of definitions of observed activities to be checked in the appropriate box on the form is as follows:

1. DIRECT CARE - Nursing activities that are patient centered and usually in the presence of patient and/or family.

   1. Communication with Patient and/or Family: Explanation of procedures or treatments, admission orientation to unit, support and assurance, teaching, demonstration, etc. Nursing care plans if patient is involved as a participant in planning. Answering intercom, or call light. Include all patient/family communications on or off unit.

   2. Medications, I.V. (Administering): Oral, injectables, vaginal, rectal, topical, intranasal, etc., IV's or hep lock: starting, adding medications, or another bottle, maintaining flow, making tubing changes, checking or adjusting flow rate, discontinuing. If RN is with patient for teaching purposes, such as teaching patient to give own insulin, #1 (communication with patient/family) is checked.

   3. Nutrition and Elimination: Dietary: delivering and removing tray, assisting patient with tray arrangement, cutting food, feeding, nourishment, forcing oral fluids, tube feedings, intake, giving water. Elimination: urinary output, bowel functions, giving and removing bedpan, emptying, drainage tubes, emesis (anything to do with output directly with or in the presence of the patient). Includes measuring I & O, but not recording it, which is #13.

   4. Patient Hygiene: Bath: complete, partial, assist, tub or shower, back rub or care, incontinent care, any special skin care, grooming, bed making, obtaining linen, linen changing, oral hygiene, AM, PM, or HS care. Gowning, gloving, hand washing.

   5. Patient Transport: Transporting patient to another department or preparing patient for transport (nursing personnel in attendance), discharge, transfer on unit or to another unit. Transporting patient to another area on unit or out of hospital. Preparing patient unit for known admission. (Does not include any bed making). Movement that is non-therapeutic in itself as compared to #6.

   6. Positioning, Exercising: Turning and repositioning, changing bed position, deep breathing and coughing, moving from bed to chair or wheelchair or vice versa. Exercising, active or passive range of motion, swinging legs on edge of bed, assisting or supervising ambulation. Adjusting traction, foot boards, trapeze, etc. The intent is therapeutic as compared to #5.

   7. Assist MD or Other with Patient: Assisting the physician or those from other departments with procedures and treatments requiring the presence of nursing personnel. Examples: assisting X-ray technician position patient for portable chest X-ray; assisting MD with line insertions, intubation, thoracentesis, etc.

   8. Systems Assessment and Symptom Observation - Nursing Only: Assessment of general well-being, anxiety state, pain, circulation, respirations, neuro checks, condition of dressings, tubing, swelling, etc. Include patient safety, restraint, safety of environment.

   9. Specimen Gathering and Testing: Tests usually done on a nursing unit, such as acetone, sugar, ACCU check, specific gravity, guaiac, etc. Include gathering and testing as one observation even though the testing may be done away from the patient, e.g., utility room in Work Sampling or patient's bathroom in Direct Patient Care Sampling. If being done in presence of patient for teaching purposes, check #1 which includes teaching. Include gathering specimens to be sent to the lab (drawing blood, C&S, etc., and holding site for blood gases).

   10. Treatment and Procedures - Nursing Only: Irrigations such as bladder, ostomies, douche; preoperative care, sterile or non-sterile dressings, hot or cold packs, catheterizations, enemas; N/G tube insertion, removal or irrigation, remove or reapply antiembolism stockings, decubitus care; O_2 starting, maintenance or discontinuing. Traction: application, set-up, discontinuing, etc. Suctioning and bagging. Maintenance and/or calibration of patient-related equipment. Includes post mortem care.

   * NOTE: Include activities in preparation for and completion of treatments and procedures. Although these activities are away from the patient, they should be recorded as #10 in Work Sampling. In Direct Patient Care Sampling, only those done in the room will be observed.

   11. Vital Signs: Blood pressure, pulse, respirations, temperature, CVP, apnea monitor. Floor or bed scale weights. Include all numerical readings.

   12. Other: Patient-related errand off the unit, i.e., responding to codes, translation and starting IV's, relief floating.

II. INDIRECT CARE - Activities which are away from the patient but are in preparation for or in completion of direct nursing care.

13. Charting, Checking Chart or Kardex: Chart entries for a specific patient, checking for orders, treatments, etc. Narcotic signout. Checking lab results, totaling I & O's, making entries on nursing care plan, reading non-medication-related references.

14. Communications re: Specific Patient with Others: Include other nursing personnel, MD's and other department members. Nursing care plan development with others. Team conference regarding a specific patient. Telephone calls to or from unit about a specific patient, or consultation with another unit regarding one of their patients.

15. Preparing Medications/IV's: Pouring, setting-up, mixing, additives. Looking up medication in reference book, calculating/checking doses, or checking blood products.

16. Transcribe Orders, Charge Slips: Noting orders, changing Kardex, medication sheet, etc. Specific physician orders which initiate a special request for services from other departments or a unit charge slip, handing copy of orders to patient's nurse.

III. UNIT RELATED ACTIVITIES - Activities and tasks necessary for the general management, coordination, and organization of a nursing unit. Those functions related to the well being of the patient population on the unit, but not specific for a patient.

18. Cleaning, Housekeeping Tasks: Cleaning a discharged patient unit--bed and equipment--by nursing personnel only. Remaking a cleaned unit. Do not include housekeeping personnel. Bagging linen, lining linen hampers, emptying trash, flower care, cleaning isolettes, etc. Cleaning of special equipment for a treatment or procedure should be checked under #10.

19. Clerical: Adding new sheets to charts, assembling new records, preparing diet lists, weight lists, or any other routine unit lists. Updating unit census list, date stamping, etc. Delivering mail and flowers. Having patient sign permit for surgery, etc. Posting lab slips, recopying medication administration record, faxing/xeroxing.

20. Communication with Others - Unit Related: Any work-related communication not related to specific patient. Include telephone calls to or from unit which are unit-related, i.e., bed control, calling for more linen, staffing, etc.

21. Errands Off Unit: Trips to other areas to pick up supplies, medications, equipment, etc., even if for a specific patient. Off unit looking for equipment such as wheel chairs, gurneys, special unit equipment loaned to another department. Making bed for patient off the unit.

22. Shift Reports: Shift-to-shift reports, whether verbal, taped or written, or general supervisory reporting. Giving, making or checking assignment lists, preparing work schedules. Completing productivity report and/or Patient Classification and Perception of Staffing Adequacy forms. Filling out incident/accident reports.

23. Meetings and Inservice: Staff meetings, other organizational meetings, team conferences, on and off unit inservice education programs, evaluations and counselling sessions on or off unit, committee work, etc. Formal student or new employee education or orientation.

24. Supplies, Check, Restock: Checking and reordering of routine unit supplies, paper goods, emergency cart, special unit trays/carts, intershift narcotic count, checking refrigerator temperature.

IV. PERSONAL ACTIVITIES - Personal activities not directed toward patient care or unit management.

26. Personal: Meal time, coffee breaks, socializing not related to work, personal telephone calls, personal activities.

V. OTHER

*** If the observer is unable to reach a decision regarding the above, a check is entered under the appropriate level of personnel and the activity is described briefly on the back of the Work Sampling form or DPC form. The study coordinator should be consulted as to how this observation should be coded.

*** Travel time in hallways is not included in the list. If the staff person is in transit at the time of observation either the person should be followed to ascertain this activity or, if necessary, asked about the purpose of the trip and code accordingly.

Appendix 2 - Work Sampling Data Collection Form

Unit:_____ Unit type:_____

Date MO DAY YR

WORK SAMPLING DATA COLLECTION FORM

Hospital_____

Observer_____

Shift: D E N

Hour ☐☐☐☐ AM PM

Day of study:_____

TYPE OF ACTIVITY		1. 00	10	20	30	40	50	TOT.	1	2. 00	10	20	30	40	50	TOT.	2	3. 00	10	20	30	40	50	TOT.	3	4. 00	10	20	30	40	40	TOT.	4	5. 00	10	20	30	40	50	TOT.	5	6. 00	10	20	30	40	50	TOT.	6	
Communication with Patient/Family	1.																																																	1
Medications, I.V. (Administering)	2.																																																	2
Nutrition and Elimination	3.																																																3
Patient Hygiene	4.																																																4
Patient Transport/Escort	5.																																																5
Positioning, Exercising	6.																																																6
Assist MD/other with Patient	7.																																																7
Nursing Assessment/Observation	8.																																																8
Specimen Gathering/Testing	9																																																9
Treatments and Procedures	10.																																																10
Vital Signs	11.																																																11
Other	12.																																																12
Charting, Checking chart or Kardex	13.																																																13
Communication about patient	14.																																																14
Preparing medications/IV's	15.																																																15
Transcribing Orders	16.																																																16
Other	17.																																																17
Cleaning / Housekeeping Tasks	18																																																18
Clerical	19																																																19
Communication with others, Unit Related	20.																																																20
Errands off Unit	21																																																21
Shift Report	22.																																																22
Meetings / Inservice	23.																																																23
Supplies, Check, Restock	24.																																																24
Other	25.																																																25
Personal	26.																																																26
	TOTAL																																																

© Catalyst Systems

Appendix 3 - Direct Care Sampling Data Form

DIRECT PATIENT CARE SAMPLING DATA FORM

Hospital: _____

Unit: _____

Type of Unit: _____

Date: ☐☐ (MO) ☐☐ (DAY) ☐☐ (YR)

Observer: _____

TYPE OF ACTIVITY:

1. Communication with patient and/or family
2. Medications, IVs (administering)
3. Nutrition and elimination
4. Patient hygiene
5. Patient Transport/Escort
6. Positioning, exercising
7. Assist MD or other with patient
8. Nursing assessment/symptom observation
9. Specimen gathering and testing
10. Treatments and procedures, Nsg. only
11. Vital signs
12. Other

Shift: D E N

Day of Study: _____

Patient Classification: _____

Patient Number: ☐☐

Patient Name: _____

Room/Bed _____

TIME	:00	:10	:20	:30	:40	:50	:00	:10	:20	:30	:40	:50	:00	:10	:20	:30	:40	:50	:00	:10	:20	:30	:40	:50	TOTAL
1																									
2																									
3																									
4																									
5																									

TIME	:00	:10	:20	:30	:40	:50	:00	:10	:20	:30	:40	:50	:00	:10	:20	:30	:40	:50	:00	:10	:20	:30	:40	:50	TOTAL
1																									
2																									
3																									
4																									
5																									

Appendix 4 - Human Subjects Approval

COMMITTEE ON HUMAN RESEARCH
OFFICE OF RESEARCH AFFAIRS, Box 0962
UNIVERSITY OF CALIFORNIA, SAN FRANCISCO

TO: Susan H. Neidlinger, Ph.D.
Box 0608

Rosalind W. Harper
Box 0608

RE: Care and Cost Effectiveness of Nursing Care Management: An Evaluation Study

The Committee on Human Research, the UCSF Institutional Review Board holding Department of Health and Human Services Multiple Assurance #M-1169, has reviewed and approved this application to involve humans as research subjects.

APPROVAL NUMBER: H5479-06665-01. This number is a UCSF CHR number and should be used on all consent forms, correspondence and patient charts.

APPROVAL DATE: March 21, 1991. Expedited Review

EXPIRATION DATE: March 15, 1992. If the project is to continue, it must be renewed *by the expiration date.* See reverse side for details.

ADVERSE REACTIONS/COMPLICATIONS: All problems having to do with subject safety must be reported to the CHR within ten working days.

MODIFICATIONS: All protocol changes involving subjects must have prior CHR approval.

QUESTIONS: Please contact the office of the Committee on Human Research at (415) 476-1814 or campus mail stop, Box 0962.

Sincerely,

Reese T. Jones, M.D.
Chairman
Committee on Human Research

HEPC Project # 91006665

Appendix 5A

Work Sampling: Pre-Case Management Day Shift Average Time by Activity and Staff Level

UNIT: 3rd FLOOR

SHIFT: Day

TYPE OF UNIT: MEDICAL SURGICAL

AREA OF ACTIVITY	CHG RN		RN		LVN		NA		FLOAT		WC		TOTAL	
	Minutes	%	Minutes	%	Minutes	%	Minutes	%	Minutes	%	Minutes	%	Minutes	%
1. Communication with Patient/Family	15	2.9	45	2.9	38	5.2	20	4.2	0	0.0	0	0.0	118	3.5
2. Medication, I. V. (Administering)	0	0.0	80	5.1	53	7.3	5	1.1	3	3.4	0	0.0	141	4.2
3. Nutrition and Elimination	3	0.5	123	7.8	48	6.6	50	10.5	20	20.7	0	0.0	243	7.2
4. Patient Hygiene	0	0.0	265	16.9	103	14.2	150	31.6	20	20.7	0	0.0	538	15.9
5. Patient Transport/Escort	5	1.0	38	2.4	18	2.4	25	5.3	27	27.6	0	0.0	112	3.3
6. Positioning, Exercising	0	0.0	25	1.6	5	0.7	5	1.1	0	0.0	0	0.0	35	1.0
7. Assist MD, Others with Patient	0	0.0	3	0.2	5	0.7	0	0.0	0	0.0	0	0.0	8	0.2
8. Nursing Assessment/Observation	18	3.3	63	4.0	13	1.7	5	1.1	0	0.0	0	0.0	98	2.9
9. Specimen Gathering/Testing	3	0.5	10	0.6	15	2.1	5	1.1	0	0.0	0	0.0	33	1.0
10. Treatment/Procedure	5	1.0	25	1.6	10	1.4	10	2.1	0	0.0	0	0.0	50	1.5
11. Vital Signs	0	0.0	68	4.3	38	5.2	35	7.4	0	0.0	0	0.0	140	4.1
12. Other Direct Care	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL DIRECT CARE	48	9.0	743	47.4	343	47.4	310	65.3	70	72.4	0	0.0	1513	44.7
13. Charting	60	11.4	243	15.5	123	17.0	60	12.6	0	0.0	0	0.0	485	14.3
14. Communication About Patient	100	19.0	98	6.2	68	9.3	15	3.2	0	0.0	0	0.0	280	8.3
15. Preparing Medication	13	2.4	80	5.1	25	3.5	0	0.0	0	0.0	0	0.0	118	3.5
16. Transcribing Orders	60	11.4	13	0.8	10	1.4	5	1.1	0	0.0	0	0.0	88	2.6
17. Other Indirect Care	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL INDIRECT CARE	233	44.3	433	27.6	225	31.1	80	16.8	0	0.0	0	0.0	970	28.6
18. Housekeeping	5	1.0	8	0.5	5	0.7	0	0.0	3	3.4	0	0.0	21	0.6
19. Clerical	5	1.0	10	0.6	5	0.7	0	0.0	10	10.3	0	0.0	30	0.9
20. Communication with Others	60	11.4	35	2.2	20	2.8	0	0.0	7	6.9	0	0.0	122	3.6
21. Errands	23	4.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	23	0.7
22. Shift Report	90	17.1	140	8.9	53	7.3	25	5.3	0	0.0	0	0.0	308	9.1
23. Meetings	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
24. Supplies	15	2.9	35	2.2	10	1.4	0	0.0	7	6.9	0	0.0	67	2.0
25. Other Unit-Related	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL UNIT-RELATED	198	37.6	228	14.5	93	12.8	25	5.3	27	27.6	0	0.0	569	16.8
26. Total Personal	48	9.0	165	10.5	63	8.7	60	12.6	0	0.0	0	0.0	335	9.9
TOTAL ALL ACTIVITIES	525	100.0	1568	100.0	723	100.0	475	100.0	97	100.0	0	0.0	3387	100.0

Appendix 5B

Work Sampling: Post-Case Management Day Shift Average Time by Activity and Staff Level

UNIT: 3rd FLOOR

SHIFT: Day

TYPE OF UNIT: MEDICAL

AREA OF ACTIVITY	CCC		RN		LVN		FLOAT		PCA		Other		TOTAL	
	Minutes	%	Minutes	%	Minutes	%	Minutes	%	Minutes	%	Minutes	%	Minutes	%
1. Communication with Patient/Family	75	7.1	65	4.2	73	14.2	5	3.4	38	3.7	0	0.0	256	6.0
2. Medication, I. V. (Administering)	73	6.8	135	8.7	33	6.5	0	0.0	3	0.2	0	0.0	243	5.7
3. Nutrition and Elimination	25	2.4	65	4.2	7	1.3	5	3.4	25	2.5	0	0.0	127	3.0
4. Patient Hygiene	73	6.8	245	15.9	73	14.2	3	1.7	135	13.4	0	0.0	528	12.4
5. Patient Transport/Escort	15	1.4	18	1.1	10	1.9	98	67.2	10	1.0	0	0.0	150	3.5
6. Positioning, Exercising	10	0.9	40	2.6	3	0.6	15	10.3	20	2.0	0	0.0	88	2.1
7. Assist MD, Others with Patient	3	0.2	3	0.2	3	0.6	0	0.0	10	1.0	0	0.0	18	0.4
8. Nursing Assessment/Observation	25	2.4	43	2.8	17	3.2	0	0.0	0	0.0	0	0.0	84	2.0
9. Specimen Gathering/Testing	5	0.5	15	1.0	0	0.0	0	0.0	3	0.2	0	0.0	23	0.5
10. Treatment/Procedure	15	1.4	23	1.5	3	0.6	0	0.0	0	0.0	0	0.0	41	1.0
11. Vital Signs	18	1.7	28	1.8	13	2.6	5	3.4	60	6.0	0	0.0	123	2.9
12. Other Direct Care	0	0.0	3	0.2	0	0.0	8	5.2	0	0.0	0	0.0	10	0.2
TOTAL DIRECT CARE	335	31.6	680	44.0	237	45.8	138	94.8	303	30.0	0	0.0	1692	39.6
13. Charting	130	12.3	278	18.0	103	20.0	0	0.0	63	6.2	0	0.0	573	13.4
14. Communication About Patient	110	10.4	58	3.7	20	3.9	3	1.7	45	4.5	0	0.0	235	5.5
15. Preparing Medication	18	1.7	63	4.0	10	1.9	0	0.0	0	0.0	0	0.0	90	2.1
16. Transcribing Orders	18	1.7	15	1.0	0	0.0	0	0.0	160	15.9	0	0.0	193	4.5
17. Other Indirect Care	0	0.0	0	0.0	0	0.0	0	0.0	3	0.2	0	0.0	3	0.1
TOTAL INDIRECT CARE	275	25.9	413	26.7	133	25.8	3	1.7	270	26.8	0	0.0	1093	25.6
18. Housekeeping	13	1.2	13	0.8	0	0.0	0	0.0	15	1.5	0	0.0	40	0.9
19. Clerical	5	0.5	8	0.5	3	0.6	0	0.0	95	9.4	0	0.0	111	2.6
20. Communication with Others	118	11.1	58	3.7	30	5.8	3	1.7	130	12.9	0	0.0	338	7.9
21. Errands	13	1.2	3	0.2	0	0.0	0	0.0	30	3.0	0	0.0	45	1.1
22. Shift Report	160	15.1	170	11.0	43	8.4	0	0.0	30	3.0	0	0.0	403	9.4
23. Meetings	13	1.2	3	0.2	0	0.0	0	0.0	5	0.5	0	0.0	20	0.5
24. Supplies	13	1.2	13	0.8	0	0.0	0	0.0	30	3.0	0	0.0	55	1.3
25. Other Unit-Related	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL UNIT-RELATED	333	31.4	265	17.2	77	14.8	3	1.7	335	33.3	0	0.0	1012	23.7
26. Total Personal	118	11.1	188	12.1	70	13.5	3	1.7	100	9.9	0	0.0	478	11.2
TOTAL ALL ACTIVITIES	1060	100.0	1545	100.0	517	100.0	145	100.0	1008	100.0	0	0.0	4274	100.0

Appendix 5C

Work Sampling: Pre-Case Management Evening Shift Average Time by Activity and Staff Level

UNIT: 3rd FLOOR

SHIFT: Evening TYPE OF UNIT: MEDICAL SURGICAL

AREA OF ACTIVITY	CHG RN		RN		LVN		NA		FLOAT		WC		TOTAL	
	Minutes	%	Minutes	%	Minutes	%	Minutes	%	Minutes	%	Minutes	%	Minutes	%
1. Communication with Patient/Family	33	6.5	50	5.9	50	6.0	0	0.0	25	6.9	0	0.0	158	6.2
2. Medication, I. V. (Administering)	50	9.7	163	19.1	120	14.5	0	0.0	35	9.7	0	0.0	368	14.4
3. Nutrition and Elimination	13	2.6	80	9.4	103	12.5	0	0.0	50	13.9	0	0.0	247	9.7
4. Patient Hygiene	3	0.6	10	1.2	17	2.0	0	0.0	10	2.8	0	0.0	40	1.6
5. Patient Transport/Escort	3	0.6	13	1.6	10	1.2	0	0.0	10	2.8	0	0.0	37	1.4
6. Positioning, Exercising	7	1.3	63	7.4	37	4.4	0	0.0	20	5.6	0	0.0	127	5.0
7. Assist MD, Others with Patient	13	2.6	3	0.4	0	0.0	0	0.0	0	0.0	0	0.0	17	0.7
8. Nursing Assessment/Observation	10	1.9	20	2.3	10	1.2	0	0.0	0	0.0	0	0.0	40	1.6
9. Specimen Gathering/Testing	3	0.6	0	0.0	10	1.2	0	0.0	0	0.0	0	0.0	13	0.5
10. Treatment/Procedure	10	1.9	13	1.6	10	1.2	0	0.0	5	1.4	0	0.0	38	1.5
11. Vital Signs	10	1.9	63	7.4	70	8.5	0	0.0	35	9.7	0	0.0	178	7.0
12. Other Direct Care	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL DIRECT CARE	157	30.5	480	56.3	437	52.8	0	0.0	190	52.8	0	0.0	1263	49.5
13. Charting	80	15.6	120	14.1	113	13.7	0	0.0	35	9.7	0	0.0	348	13.6
14. Communication About Patient	13	2.6	10	1.2	17	2.0	0	0.0	5	1.4	0	0.0	45	1.8
15. Preparing Medication	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
16. Transcribing Orders	103	20.1	3	0.4	10	1.2	0	0.0	5	1.4	0	0.0	122	4.8
17. Other Indirect Care	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL INDIRECT CARE	197	38.3	133	15.6	140	16.9	0	0.0	45	12.5	0	0.0	515	20.2
18. Housekeeping	0	0.0	3	0.4	0	0.0	0	0.0	5	1.4	0	0.0	8	0.3
19. Clerical	3	0.6	3	0.4	7	0.8	0	0.0	15	4.2	0	0.0	28	1.1
20. Communication with Others	13	2.6	7	0.8	10	1.2	0	0.0	0	0.0	0	0.0	30	1.2
21. Errands	0	0.0	3	0.4	13	1.6	0	0.0	10	2.8	0	0.0	27	1.0
22. Shift Report	60	11.7	80	9.4	70	8.5	0	0.0	45	12.5	0	0.0	255	10.0
23. Meetings	10	1.9	7	0.8	0	0.0	0	0.0	0	0.0	0	0.0	17	0.7
24. Supplies	20	3.9	23	2.7	20	2.4	0	0.0	50	13.9	0	0.0	113	4.4
25. Other Unit-Related	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL UNIT-RELATED	107	20.8	127	14.8	120	14.5	0	0.0	125	34.7	0	0.0	478	18.7
26. Total Personal	53	10.4	113	13.3	130	15.7	0	0.0	0	0.0	0	0.0	297	11.6
TOTAL ALL ACTIVITIES	513	100.0	853	100.0	827	100.0	0	0.0	360	100.0	0	0.0	2553	100.0

Appendix 5D

Work Sampling: Post-Case Management Evening Shift Average Time by Activity and Staff Level

UNIT: 3rd FLOOR

SHIFT: Evening

TYPE OF UNIT: MEDICAL

AREA OF ACTIVITY	CCC		RN		LVN		FLOAT		PCA		Other		TOTAL	
	Minutes	%	Minutes	%	Minutes	%	Minutes	%	Minutes	%	Minutes	%	Minutes	%
1. Communication with Patient/Family	37	7.1	87	7.3	20	2.3	3	2.2	60	6.5	0	0.0	207	5.7
2. Medication, I. V. (Administering)	37	7.1	140	11.7	97	11.3	13	8.7	3	0.4	0	0.0	290	8.0
3. Nutrition and Elimination	7	1.3	70	5.9	43	5.1	13	8.7	47	5.0	0	0.0	180	4.9
4. Patient Hygiene	10	1.9	23	2.0	23	2.7	0	0.0	20	2.2	0	0.0	77	2.1
5. Patient Transport/Escort	0	0.0	10	0.8	13	1.6	10	6.5	17	1.8	0	0.0	50	1.4
6. Positioning, Exercising	20	3.9	40	3.4	27	3.1	10	6.5	33	3.6	0	0.0	130	3.6
7. Assist MD, Others with Patient	0	0.0	10	0.8	0	0.0	0	0.0	7	0.7	0	0.0	17	0.5
8. Nursing Assessment/Observation	10	1.9	30	2.5	13	1.6	3	2.2	3	0.4	0	0.0	60	1.6
9. Specimen Gathering/Testing	7	1.3	17	1.4	13	1.6	0	0.0	7	0.7	0	0.0	43	1.2
10. Treatment/Procedure	13	2.6	33	2.8	3	0.4	13	8.7	20	2.2	0	0.0	83	2.3
11. Vital Signs	3	0.6	37	3.1	30	3.5	3	2.2	60	6.5	0	0.0	133	3.7
12. Other Direct Care	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL DIRECT CARE	143	27.9	497	41.6	283	33.2	70	45.7	277	29.9	0	0.0	1270	34.9
13. Charting	110	21.4	273	22.9	197	23.0	20	13.0	127	13.7	0	0.0	727	20.0
14. Communication About Patient	50	9.7	23	2.0	7	0.8	0	0.0	10	1.1	0	0.0	90	2.5
15. Preparing Medication	37	7.1	73	6.1	77	9.0	3	2.2	0	0.0	0	0.0	190	5.2
16. Transcribing Orders	23	4.5	3	0.3	3	0.4	13	8.7	213	23.0	0	0.0	257	7.1
17. Other Indirect Care	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL INDIRECT CARE	220	42.9	373	31.3	283	33.2	37	23.9	350	37.8	0	0.0	1263	34.7
18. Housekeeping	7	1.3	23	2.0	37	4.3	0	0.0	30	3.2	0	0.0	97	2.7
19. Clerical	3	0.6	7	0.6	7	0.8	0	0.0	63	6.8	0	0.0	80	2.2
20. Communication with Others	17	3.2	3	0.3	7	0.8	3	2.2	20	2.2	0	0.0	50	1.4
21. Errands	0	0.0	0	0.0	0	0.0	0	0.0	17	1.8	0	0.0	17	0.5
22. Shift Report	57	11.0	127	10.6	73	8.6	3	2.2	3	0.4	0	0.0	263	7.2
23. Meetings	3	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	0.1
24. Supplies	3	0.6	23	2.0	20	2.3	17	10.9	57	6.1	0	0.0	120	3.3
25. Other Unit-Related	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL UNIT-RELATED	90	17.5	183	15.4	143	16.8	23	15.2	190	20.5	0	0.0	630	17.3
26. Total Personal	60	11.7	140	11.7	143	16.8	23	15.2	110	11.9	0	0.0	477	13.1
TOTAL ALL ACTIVITIES	513	100.0	1193	100.0	853	100.0	153	100.0	927	100.0	0	0.0	3640	100.0

Appendix 6

Work Sampling Chi Square Tables

Day Shift; Charge Nurse; Direct Care/Total Minutes

		Pre 1	Post 2	
Direct Care Min	1	48 9.14	335 31.60	383 24.16
Non-Direct Care Min	2	477 90.86	725 68.40	1202 75.84
Total Min		525 33.12	1060 66.88	1585

Chi -square = 95.4381 (P < 0.0000)

Day Shift; Charge Nurse; Indirect Care/Total Minutes

		Pre 1	Post 2	
Indirect Care Min	1	233 44.38	275 25.94	508 32.05
Non-Indirect Care Min	2	292 55.62	785 74.06	1077 67.95
Total Min		525 33.12	1060 66.88	1585

Chi-square = 53.9619 (P < 0.0000)

Day Shift; Charge Nurse; Unit-Related/Total Minutes

		Pre 1	Post 2	
Unit-Related Min	1	198 37.71	333 31.42	531 33.50
Non Unit-Related Min	2	327 62.29	727 68.58	1054 66.50
Total Min		525 33.12	1060 66.88	1585

Chi-square = 5.9740 (P < 0.0145)

Day Shift; Charge Nurse; Personal/Total minutes

		Pre 1	Post 2	
Personal Min	1	48 9.14	118 11.13	166 10.47
Non-Personal Min	2	477 90.86	942 88.87	1419 89.53
Total Min		525 33.12	1060 66.88	1585

Chi-square = 1.2772 (P < 0.2584)

PM Shift; Charge Nurse; Direct Care/Total Minutes

		Pre 1	Post 2	
Direct Care Min	1	157 30.60	143 27.88	300 29.24
Non-Direct Care Min	2	356 69.40	370 72.12	726 70.76
Total Min		513 50.00	513 50.00	1026

Chi - Square = 0.7961 (P < 0.3722)

PM Shift; Charge Nurse; Indirect Care/Total Minutes

		Pre 1	Post 2	
Indirect Care Min	1	197 38.40	220 42.88	417 40.64
Non-Indirect Care Min	2	316 61.60	293 57.12	609 59.36
Total Min		513 50.00	513 50.00	1026

Chi - Square = 1.9554 (P < 0.1620)

PM Shift; Charge Nurse; Unit-Related/Total Minutes

		Pre 1	Post 2	
Unit-Related	1	107 20.86	90 17.54	197 19.20
Non Unit Related	2	406 79.14	423 82.46	829 80.80
Total Minutes		513 50.00	513 50.00	1026

Chi-Square = 1.6083 (P < 0.2047)

PM Shift; Charge Nurse; Personal/Total Minutes

		Pre 1	Post 2	
Personal Min	1	53 10.33	60 11.70	113 11.01
Non-Personal Min	2	460 89.67	453 88.30	913 88.99
Total Minutes		513 50.00	513 50.00	1026

Chi-Square = 0.3580 (P < 0.5496)

Days and PMs; Charge Nurse; Direct CareTotal Minutes

		Pre 1	Post 2	
Direct Care Min	1	205 19.75	478 30.39	683 26.16
Non-Direct Care Min	2	833 80.25	1095 69.61	1928 73.84
Total Min		1038 39.75	1573 60.25	2611

Chi-square = 36.0907 (P < 0.0000)

Days and PMs; Charge Nurse; Indirect Care/Total Minutes

		Pre 1	Post 2	
Indirect Care Min	1	430 41.43	495 31.47	925 35.43
Non-Indirect Care Min	2	608 58.57	1078 68.53	1686 64.57
Total Min		1038 39.75	1573 60.25	2611

Chi-square = 26.6694 (P < 0.0000)

Days and PMs; Charge Nurse; Unit-Related/Total Minutes

		Pre 1	Post 2	
Unit-Related Min	1	305 29.38	423 26.89	728 27.88
Non Unit-Related Min	2	733 70.62	1150 73.11	1883 72.12
Total Min		1038 39.75	1573 60.25	2611

Chi-square = 1.8096 (P < 0.1786)

Days and PMs; Charge Nurse; Personal/Total Minutes

		Pre 1	Post 2	
Personal Min	1	101 9.73	178 11.32	279 10.69
Non-Personal Min	2	937 90.27	1395 88.68	2332 89.31
Total Min		1038 39.75	1573 60.25	2611

Chi-square = 1.4856 (P < 0.2229)

Day Shift; Charge Nurse; Communication with Patient/Direct Care Minutes

		Pre 1	Post 2	
Communication Min	1	15 31.25	75 22.39	90 23.50
Non-Communication Min	2	33 68.75	260 77.61	293 76.50
Total Direct Care Min		48 12.53	335 87.47	383

Chi-square = 1.3743 (P < 0.2411)

Day Shift; Charge Nurse; Communication about patient/Indirect Care Minutes

		Pre 1	Post 2	
Communication	1	100 42.92	110 40.00	210 41.34
Non-Communication	2	133 57.08	165 60.00	298 58.66
Indirect Care Min		233 45.87	275 54.13	508

Chi-square = 0.3308 (P < 0.5652)

Day Shift; Charge Nurse; Shift Report/Unit-Related Minutes

		Pre 1	Post 2	
Shift Report	1	90 45.45	160 48.05	250 47.08
Non-Shift Report	2	108 54.55	173 51.95	281 52.92
Unit-Related Min		198 37.29	333 62.71	531

Chi-square = 0.2392 (P < 0.6248)

PM Shift; Charge Nurse; Communication with Patient/Direct Care Minutes

		Pre 1	Post 2	
Communication	1	33 21.02	37 25.87	70 23.33
Non-Communication	2	124 78.98	106 74.13	230 76.67
Direct Care Min		157 52.33	143 47.67	300

Chi-square = 0.7334 (P < 0.3918)

PM Shift; Charge Nurse; Communication About Patient/Indirect Care Minutes

		Pre 1	Post 2	
Communication	1	13 6.60	50 22.73	63 15.11
Non-Communication	2	184 93.40	170 77.27	354 84.89
Indirect Care Min		197 47.24	220 52.76	417

Chi-square = 19.8406 (P < 0.0000)

PM Shift; Charge Nurse; Shift Report/Unit-Related Minutes

		Pre 1	Post 2	
Shift Report	1	60 56.07	57 63.33	117 59.39
Non-Shift Report	2	47 43.93	33 36.67	80 40.61
Unit-Related Min		107 54.31	90 45.69	197

Chi-square = 0.7881 (P < 0.3747)

Days and PMs; Charge Nurse; Communication about Patient/Indirect Care Minutes

		Pre 1	Post 2	
Communication	1	113 26.28	160 32.32	273 29.51
Non-Communication	2	317 73.72	335 67.68	652 70.49
Indirect Care Min		430 46.49	495 53.51	925

Chi-square = 3.7556 (P < 0.0526)

Appendix 7A

Direct Care Sampling: Pre-Case Management Day Shift Average Time by Activity and Staff Level

SHIFT: Day

UNIT: 3rd FLOOR

TYPE OF UNIT: MEDICAL SURGICAL

Area of Activity	RN		LVN		NA		FLOAT		WC		Total	
	Minutes	Percent	Minutes	Percent	Minutes	Percent	Minutes	Percent	Minutes	Percent	Minutes	Percent
1. Communication with Patient and/or Family	82	12.4%	32	9.6%	30	13.0%	5	11.9%	0	0.0%	149	11.7%
2. Medication, I.V. (Administering)	95	14.3	60	18.0	5	2.2	0	0.0	0	0.0	160	12.6
3. Nutrition and Elimination	95	14.3	35	10.5	25	10.9	5	11.9	0	0.0	160	12.6
4. Patient Hygiene	210	31.7	127	38.0	95	41.3	0	0.0	0	0.0	432	34.0
5. Patient Movement	10	1.5	2	0.6	10	4.3	30	71.4	0	0.0	52	4.1
6. Positioning, Exercising	42	6.3	20	6.0	20	8.7	2	4.8	0	0.0	84	6.6
7. Rounds, Assist M.D. or other with Patient	15	2.3	0	0.0	0	0.0	0	0.0	0	0.0	15	1.2
8. Nursing Rounds, Checks, Symptom Observation	35	5.3	12	3.6	5	2.2	0	0.0	0	0.0	52	4.1
9. Specimen Gathering and Testing	7	1.1	7	2.1	5	2.2	0	0.0	0	0.0	19	1.5
10. Treatment and Procedures	22	3.3	22	6.6	5	2.2	0	0.0	0	0.0	49	3.9
11. Vital Signs	50	7.5	17	5.1	30	13.0	0	0.0	0	0.0	97	7.6
12. Other	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total, All Activities	663	100.0%	334	100.0%	230	100.0%	42	100.0%	0	0.0%	1269	100.0%
% of Total Time Available		31.7%		46.2%		48.4%		57.9%				40.6%

Appendix 7B

Direct Care Sampling: Post-Case Management Day Shift Average Time by Activity and Staff Level

UNIT: 3rd FLOOR

SHIFT: Day TYPE OF UNIT: MEDICAL

Area of Activity	RN		LVN		FLOAT		PCA		Other		Total	
	Minutes	Percent	Minutes	Percent	Minutes	Percent	Minutes	Percent	Minutes	Percent	Minutes	Percent
1. Communication with Patient and/or Family	102	12.3%	53	41.4%	2	5.6%	27	12.6%	0	0.0%	184	15.2%
2. Medication, I.V. (Administering)	127	15.3	3	2.3	0	0.0	2	0.9	0	0.0	132	10.9
3. Nutrition and Elimination	75	9.1	3	2.3	0	0.0	15	7.0	0	0.0	93	7.7
4. Patient Hygiene	292	35.3	53	41.4	10	27.8	115	53.5	0	0.0	470	38.9
5. Patient Movement	42	5.1	0	0.0	20	55.6	2	0.9	0	0.0	64	5.3
6. Positioning, Exercising	35	4.2	0	0.0	0	0.0	22	10.2	0	0.0	57	4.7
7. Rounds, Assist M.D. or other with Patient	7	0.8	0	0.0	2	5.6	0	0.0	0	0.0	9	0.7
8. Nursing Rounds, Checks, Symptom Observation	37	4.5	0	0.0	0	0.0	0	0.0	0	0.0	37	3.1
9. Specimen Gathering and Testing	22	2.7	3	2.3	0	0.0	2	0.9	0	0.0	27	2.2
10. Treatment and Procedures	35	4.2	3	2.3	0	0.0	0	0.0	0	0.0	38	3.1
11. Vital Signs	52	6.3	10	7.8	2	5.6	30	14.0	0	0.0	94	7.8
12. Other	2	0.2	0	0.0	0	0.0	0	0.0	0	0.0	2	0.2
Total, All Activities	828	100.0%	128	100.0%	36	100.0%	215	100.0%	0	0.0%	1207	100.0%
% of Total Time Available		31.8%		24.8%		24.8%		21.3%				29.1%

Appendix 7C

Direct Care Sampling: Pre-Case Management Evening Shift Average Time by Activity and Staff Level

UNIT: 3rd FLOOR

SHIFT: Evening

TYPE OF UNIT: MEDICAL SURGICAL

Area of Activity	RN		LVN		NA		FLOAT		WC		Total	
	Minutes	Percent	Minutes	Percent	Minutes	Percent	Minutes	Percent	Minutes	Percent	Minutes	Percent
1. Communication with Patient and/or Family	23	5.2%	26	10.7%	0	0.0%	0	0.0%	0	0.0%	49	6.3%
2. Medication, I.V. (Administering)	103	23.4	53	21.8	0	0.0	0	0.0	0	0.0	156	20.1
3. Nutrition and Elimination	80	18.2	23	9.5	0	0.0	30	35.3	0	0.0	133	17.1
4. Patient Hygiene	56	12.7	23	9.5	0	0.0	20	23.5	0	0.0	99	12.7
5. Patient Movement	20	4.5	6	2.5	0	0.0	10	11.8	0	0.0	36	4.6
6. Positioning, Exercising	43	9.8	33	13.6	10	100.0	0	0.0	0	0.0	86	11.1
7. Rounds, Assist M.D. or other with Patient	13	3.0	0	0.0	0	0.0	0	0.0	0	0.0	13	1.7
8. Nursing Rounds, Checks, Symptom Observation	43	9.8	10	4.1	0	0.0	0	0.0	0	0.0	53	6.8
9. Specimen Gathering and Testing	6	1.4	26	10.7	0	0.0	10	11.8	0	0.0	42	5.4
10. Treatment and Procedures	10	2.3	10	4.1	0	0.0	0	0.0	0	0.0	20	2.6
11. Vital Signs	43	9.8	33	13.6	0	0.0	15	17.6	0	0.0	91	11.7
12. Other	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total, All Activities	440	100.0%	243	100.0%	10	100.0%	85	100.0%	0	0.0%	778	100.0%
% of Total Time Available		32.2%		29.4%				23.6%				32.0%

Appendix 7D

Direct Care Sampling: Post-Case Management Evening Shift Average Time by Activity and Staff Level

SHIFT: Evening

UNIT: 3rd FLOOR
TYPE OF UNIT: MEDICAL

Area of Activity	RN		LVN		FLOAT		PCA		Other		Total	
	Minutes	Percent	Minutes	Percent	Minutes	Percent	Minutes	Percent	Minutes	Percent	Minutes	Percent
1. Communication with Patient and/or Family	93	14.0%	26	8.8%	0	0.0%	13	9.0%	0	0.0%	132	11.4%
2. Medication, I.V. (Administering)	156	23.5	80	27.0	25	45.5	0	0.0	0	0.0	261	22.5
3. Nutrition and Elimination	80	12.1	33	11.1	0	0.0	30	20.7	0	0.0	143	12.3
4. Patient Hygiene	33	5.0	23	7.8	5	9.1	10	6.9	0	0.0	71	6.1
5. Patient Movement	6	0.9	0	0.0	5	9.1	6	4.1	0	0.0	17	1.5
6. Positioning, Exercising	83	12.5	36	12.2	20	36.4	40	27.6	0	0.0	179	15.4
7. Rounds, Assist M.D. or other with Patient	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
8. Nursing Rounds, Checks, Symptom Observation	16	2.4	3	1.0	0	0.0	0	0.0	0	0.0	19	1.6
9. Specimen Gathering and Testing	13	2.0	16	5.4	0	0.0	3	2.1	0	0.0	32	2.8
10. Treatment and Procedures	43	6.5	13	4.4	0	0.0	0	0.0	0	0.0	56	4.8
11. Vital Signs	140	21.1	66	22.3	0	0.0	43	29.7	0	0.0	249	21.5
12. Other	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total, All Activities	663	100.0%	296	100.0%	55	100.0%	145	100.0%	0	0.0%	1159	100.0%
% of Total Time Available		38.8%		34.7%		23.9%		15.6%				31.8%

Appendix 8

Direct Patient Care Sampling Chi Square Tables

Day Shift; RNs; Direct Care/Total Min All Caregivers

		Pre 1	Post 2	
Direct Care Min	1	663 52.25	828 68.60	1491 60.22
Non-Direct Care Min	2	606 47.75	379 31.40	985 39.78
Total Min		1269 51.25	1207 48.75	2476

Chi-Square = 68.3831 (P < 0.0000)

Day shift; RNs; Communication with Patient/Direct Care Min

		Pre 1	Post 2	
Communication Min	1	82 12.37	102 12.32	184 12.34
Non-Communication Min	2	581 87.63	726 87.68	1307 87.66
Dirct Care Min		663 44.47	828 55.53	1491

Chi-Square = 0.0026 (P < 0.9597)

Dayshift; RNs; Observation/Direct Care Minutes

		Pre 1	Post 2	
Observation Min	1	35 5.28	37 4.47	72 4.83
Non-Observation Min	2	628 94.72	791 95.53	1419 95.17
Direct Care Min		663 44.47	828 55.53	1491

Chi-Square = 0.3646 (P < 0.5460)

PM Shift; RNs; Direct Care/Total Minutes All Caregivers

		Pre 1	Post 2	
Direct Care Min	1	440 56.56	663 57.20	1103 56.94
Non-Direct Care Min	2	338 43.44	496 42.80	834 43.06
Total Minutes		778 40.17	1159 59.83	1937

Chi-Square = 0.0557 (P < 0.8134)

PM Shift; RNs; Communication with Patient/Direct Care Min

		Pre 1	Post 2	
Communication Min	1	23 5.23	93 14.03	116 10.52
Non-Communication Min	2	417 94.77	570 85.97	987 89.48
Direct Care Min		440 39.89	663 60.11	1103

Chi-Square = 20.8380 (P < 0.0000)

PM Shift; RNs; Observation/Direct Care Minutes

		Pre 1	Post 2	
Observation Min	1	43 9.77	16 2.41	59 5.35
Non-Observation Min	2	397 90.23	647 97.59	1044 94.65
Direct Care Min		440 39.89	663 60.11	1103

Chi-Square = 26.8582 (P < 0.0000)

Days and PMs; RNs; Direct Care/Total Minutes All Caregivers

		Pre 1	Post 2	
Direct Care Min	1	1103 53.88	1491 63.02	2594 58.78
Non-Direct Care Min	2	944 46.12	875 36.98	1819 41.22
Total Min		2047 46.39	2366 53.61	4413

Chi-Square = 37.4149 (P < 0.0000)

Days and PMs; RNs; Communication with Patient/Direct Care Min

		Pre 1	Post 2	
Communication Min	1	105 9.52	195 13.08	300 11.57
Non-Communication Min	2	998 90.48	1296 86.92	2294 88.43
Direct Care Min		1103 42.52	1491 57.48	2594

Chi-Square = 7.5075 (P < 0.0061)

Days and PMs; RNs; Observation/Direct Care Minutes

		Pre 1	Post 2	
Observation Min	1	78 7.07	53 3.55	131 5.05
Non-Observation Min	2	1025 92.93	1438 96.45	2463 94.95
Direct Care Min		1103 42.52	1491 57.48	2594

Chi-Square = 15.6287 (P < 0.0001)