A COST COMPARISON OF PRIMARY VERSUS MODULAR NURSING CARE MODALITIES IN AN ACUTE CARE SETTING

by

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CHAPTER I

INTRODUCTION

The historic change approved by Congress in March, 1983, to eliminate cost reimbursement as a method of hospital payment under Medicare will significantly affect the management of nursing service departments. Under the new prospective payment system, hospitals will be at risk for the length of stay and use of services, but will also benefit financially from improvements in management. Nursing administrators will be forced to defend the use of nursing care modalities such as modular and primary nursing that require a higher ratio of the registered nurse component.

A reflection of the new competitive incentive was experienced in August, 1982, when the administrator of a 450 bed acute care hospital and medical center in the northwest established a 1983 hospital-wide budgetary goal of a 4 percent increase in labor productivity as a cost containment effort. Labor adjustments were also required in view of a 6 percent reduction in 1983 forecasted patient days. As Director of Nursing Services, this researcher was expected to eliminate 46 full time equivalent (FTE) positions to meet the goal of the institution in its effort to control health care costs. This study will describe the methodology used to reduce these positions and a cost analysis of the results.

Review of the Literature

Health Care Costs

The cost of health care since the early 1970s has been a national policy concern. In its annual tabulation of money spent for health care in the United States, the Health Care Financing Administration (HCFA) reported the 1982 estimated total was a record $322 billion, up 12.5 percent from 1981's $287 billion. This was equal to 10.5 percent of the Gross National Product (GNP). In 1965, health care costs totaled only 6 percent of the GNP. These expenditures have more than doubled since 1975 and have increased seven times over the $41.7 billion in 1965 when Congress created Medicare and Medicaid (Hospital Week, 1983).

Hospital Costs

As state and federal legislators search for the means to control the costs of health care, they invariably turn their attention to hospitals. Among other 1981 statistics reported by HCFA was $118 billion spent for hospital care -- 17.5 percent more than in 1980 -- which accounted for 41 percent of total health care expenditures. Hospital costs not only comprise the largest single segment of health care costs, but hospitals are easily regulated by policy makers principally because they are few in number and a substantial portion of their revenue is derived from public sources. Hospitals are and will continue to be the focus of health care cost containment (Wellever, 1982).

The average cost per hospital claim paid by Blue Cross of Oregon increased from $1,763 in 1980 to $1,950 in September, 1981 and $2,095 in February, 1982. The average cost per patient day in Portland hospitals was $427.82 in 1981. The state's two largest private health insurers - Blue Cross and OPS Blue Shield recorded a combined loss of $7.2 million in 1982 (Hill, 1982).

Nursing Service Costs

The nursing service department has been singled out as a major cost in hospital's operating expenditures (Swansburg, 1978; Wellever, 1982). Generally, nursing service salary costs are approximately one-half of all hospital salary expenses and one-third of total hospital costs. Yet, the actual cost of nursing care is unknown because it is embedded in the daily hospital room charge. The cost of nursing care has been synonymous with the room rate and is assumed by many that the rapidly rising costs of hospital care are due to increased nurses salaries (Walker, 1983). Consequently, if one wanted to make an impact on hospital costs, one of the first departments scrutinized would be nursing.

Nursing Care Delivery Modalities

With the present impelling need to be accountable to the consumer for the cost of health care and to control the skyrocketing prices of hospital services, it is important to delineate the significant patterns of nursing care delivery and assess their cost effectiveness. Historically,

the pattern of nursing assignment has evolved from the case method to functional nursing to team nursing to primary nursing.

The Case Method

In the early decades of the twentieth century, prior to the emergence of the hospital system, private duty nursing in patients' homes embodied the concept of individual nursing for total patient care or the case method (Hegyvary, 1977). In this mode, one nurse was responsible for planning and administering care for one patient for as long as she was on duty. In later years, with the emergence of the hospital system and with the reorganization of American medicine following the Flexner report, the locus of patient care and of nurse-patient relations shifted to the acute care facility. The practice of nursing was modified to fit the needs and characteristics of these institutions (Lysaught, 1981).

Functional Nursing Modality

The formation of hospital nursing departments that emphasized task performance and efficiency set the stage for functional nursing. Instead of individual nurses having responsibility for the total care of assigned patients, functional nursing introduced division of labor consistent with principles of scientific management. It was thought that specific nursing duties would somehow sum up into a complete coverage of patient needs. However, hospital nurses increasingly found themselves performing a limited range of tasks, while patients encountered more and more individuals throughout their hospital stay. This trend accelerated after World War II when a shortage of registered

nurses led to the widespread use of licensed practical nurses and nursing assistants. However, the diversity of tasks to be performed and the increasing numbers and types of nursing employees performing them required more and more coordination and management. This development led to another stage in nursing care organization -- team nursing.

The Team Nursing Modality

Team nursing was considered an organizational innovation in the delivery of nursing care until the mid-seventies. It evolved after World War II to accommodate the increase in ancillary nursing staff and to cope with the scarcity of registered nurses. In team nursing, a team of two RNs, an LPN and an aide would provide care to a group of 20 to 25 patients, contributing different skill levels of nursing personnel to nursing care. The concept was designed to maximize the use of nursing staff skills and provide cost-effective nursing care (Douglass and Bevis, 1970; Kron, 1966; Williams, 1964.) The team leader's role is to (1) plan nursing care through participative planning strategies; (2) delegate specific tasks and/or patients to team members; (3) provide part of the direct care; and, (4) supervise, coordinate, and evaluate the care provided by the team members. In the 1950's and 1960's when the prevalent system of nursing care was functional nursing, team nursing was viewed as a better system of providing nursing care.

The literature of the period, cited the advantages of team nursing over functional nursing, including the availability of professional nursing staff skills to a larger number of patients (Peterson, 1973); greater continuity of care (Kron, 1976); and reduction of time spent in performing nonprofessional tasks by professional staff (Brown and Reche, 1966; Henderson, 1964).

But Lysaught (1981) cited studies on nurse utilization that indicated that team leaders spent 80 to 90 percent of their time on administrative and institutional tasks, with the remainder devoted to direct patient care. Nursing care might have been planned by professionals, but it was largely delivered through others, the less qualified members of the team.

Kramer (1971) compared and contrasted a means-end focus of team nursing and discussed the then-current state of the modality. She asked the directors of 37 medical center hospitals, as well as staff nurses, and 22 inservice educators the extent to which team nursing was practiced. The findings indicated that the general impression of team nursing was a methodology for the completion of tasks, and only secondarily a philosophy or assessment of the quality of care. Even as a work technique it was subverted toward functional nursing, with rare exceptions. There was little evidence of job satisfaction, but it was suggested that more and more nurses were saying that the nature of their work was their fundamental motivator, and that responsibility and accountability were increasingly being sought.

Team nursing literature, for the most part, is devoted to discourses about its nature and process with little systematic attempt to evaluate its impact. The lack of investigation into this organizational approach toward care delivery might reflect the increasingly clinical focus of nursing (Jelinek, 1976).

The Primary Nursing Modality

The primary nursing concept emerged from the experiences of the nursing services department of the University of Minnesota Hospitals (Ciske, 1974; Manthey and Kramer, 1970). By the late 1960's, hospital nurses throughout the country were a dissatisfied group. Some of their frustrations are reflected in Kramer's (1969) surveys of graduate nurses working in hospitals. She found a 20% dropout rate from nursing for a group of nurses she followed during their first two years of employment following graduation. And, her findings imply that nurses become more bureaucratic in orientation with continued employment by the hospital. Harrington & Theis (1968) and Reinkemeyer (1968) agreed that baccalaureate nurses particularly found many dissatisfactions as employees of traditional hospitals. Team nursing found these nurses frustrated by unmet nursing goals when they were expected to know and act upon the critical information of 10 to 20 patients in order to plan their care.

In 1968, an experimental project at the University of Minnesota Hospitals was designed to improve the delivery of services to patients on a small medical unit. An organizational philosophy emerged after months of trial and error that allocated 24-hour accountability for a small group of patients' nursing care to a registered nurse who planned, gave, coordinated and evaluated care until discharge from her unit. All RNs were expected to assume the responsibility of primary nursing and were assigned 3 to 4 patients. Emphasis was placed on mastery of the total nursing process:

-Assessment of patients' needs, which required that the primary nurse consider the quality of patients' lives not only during

hospitalization but also prior to admission and following discharge.

-Development of a nursing care plan to meet those needs.

-Implementation of nursing care plans.

-Provision of supportive measures, such as counseling and teaching.

-Arrangement of the patient and his family into the health care network.

-Ongoing evaluation of each step of the total nursing process.

Manthey and Kramer (1970) observed at Minnesota: the individual involvement and commitment of the nursing staff; the problems of evening, night and weekend coverage; the seeming development of care review conferences as learning experiences and provision of opportunity for collegial validation, control and advisement; the ability of primary nursing to visibly differentiate manifest levels of competence; the evidence of continuity and comprehensiveness of patient care through written nursing care plans, written nursing orders and directives, and discharge planning; and an overall satisfaction with the system. Ciske (1974) reported three years later that the system had been adopted on ten other units. Staff turnover was found to be dramatically lower on primary units than team units in all groups but the nursing assistants. Patients were also questioned about their reactions to primary nursing. The responses to one question were statistically significant; the patient's perceptions of freedom to voice complaints to their nurse was increased on the primary units.

Converting the functional or team models of nursing practice to

the primary model in many hospitals throughout the country has required extensive communication and planning. Not all of the response has been positive. Pisani (1977) reported the varied feelings and reactions among nursing staff on a 24 bed psychiatric unit in a large midwestern hospital. Most of the feelings and attitudes this particular staff identified fell into three broad categories: (1) fear-anxiety, (2) resistence, and (3) confusion. Most of the feelings of fear and anxiety were specifically related to the change in the assignment of responsibility and accountability involved in the primary nurse role. Nurses feared they would not be able to "live up to" the expectation of the role. Their feelings of inadequacies were voiced most specifically around the writing of care plans. Even though care plans had been an integral part of the daily activity on the unit, when the primary nurse became singularly responsible for the care plan, the care plan itself became a threat.

Changing from the leadership role to the "care-giver" role precipatated resistance among nurses. Even though teaching, explanation, and definition of the primary nurse role had been accomplished, confusion was experienced by the nurses; they had difficulty understanding the expectations of the role.

Williams and Stewart (1980) reported that team nursing was preferred by some RNs because it appeared to upgrade their status. Some graduate RNs, in particular, did not like the prospect of returning to bedside activities. Others did not want to lose the opportunities for specialization provided by team nursing. Underlying these concerns, again, was the fundamental problem: many of the nurses were unwilling and unable to assume total responsibility for the patient. Resistance to a major change in the concept of nursing practice was being observed.

The new heritage of primary nursing encompasses the concept of autonomy. Brown (1976) describes the autonomous nurse as one who:

-is responsible to the patient and family for individualized, total nursing care.

-is capable of independent clinical decision-making and does not need to get this decision ratified ahead of time either by a physician or nurse.

-has a thorough command of nursing practice. Is capable of thoroughly assessing the patient's needs (history and physical taking; developing a plan of care in collaboration with physicians, the patient and family, and other health disciplines).

-provides direct care to patients and their families, and provides an opportunity for patients and families to participate in their own care whenever desired and possible.

-serves as a consultant to patients and families and assists them in informed decision-making regarding their health status through comprehensive teaching processes.

-has professional parity with physicians and deals with individual physicians as a fully accountable member of a hospital organization in providing quality patient care.

-practices the complete professional model of service, education, consultation and research.

Brown (1976) points out that few nurses begin practice or change to the primary concept exhibiting the full professional characteristics of autonomy. She emphasizes "a transition program clearly defined and specified to provide an orderly environment and milieu in which to develop an autonomous

nurse state." (p.36) Both Brown (1976) and Christman (1976) describe the arena that makes it possible for autonomy in practice; that is, an organizational format in which nurses may practice with personal accountability and shared power and influence.

Young's (1981) study involved an extensive review and critique of the literature on organizational modes for the delivery of nursing care. Of central importance is the literature on primary nursing. On this topic, over 150 articles and reports were critiqued. While the literature revealed virtually nothing in the way of negative criticism of primary nursing, the basis for such optimism was considered unfounded. Fifty-six percent of the literature was classified as purely descriptive and contained no data; twenty-two percent was classified as descriptive-evaluative, containing limited non-comparative data; and twenty-one percent was classified as research. Of the latter group, it was found that generalization of findings was severly restricted due to the absence of experimental designs, the lack of reliability and validity testing of instruments, and the universal absence of operational definitions of primary nursing as an organizational mode.

The findings of the research effort suggest the use of caution in the implementation of primary nursing and the need for more rigorous studies. Although primary nursing may be an ideal way in which to provide nursing care in one setting, it may prove less than effective in another. Operational modifications may be required in order to cope with the variety of factors that affect nurse staffing in specific care settings. More specifically:

1. The literature is not definitive on the benefits of primary nursing or other organizational modes.

2. It is unlikely that there is one nursing-care delivery system that is best under all circumstances.
3. All nursing care delivery systems may be more appropriately viewed as a continuum rather than discrete entities.
4. Organizational configuration should be based on an assessment of the needs of the patients as well as an assessment of the nursing resources to meet those needs.

The Loeb Center System of Total Patient Care

Hall (1963) described the organizational mode of nursing still practiced at the Loeb Center for Nursing and Rehabilitation, Montefiore Hospital, New York. The 80-bed center for recuperating hospital patients offers an organization and program of professional nursing in an institutional setting which constitutes care halfway between home and hospital. Professional nurses, supported only by messenger-attendants and ward secretaries, provide nursing care. Bower-Ferres (1975) elaborated on the nursing organization at Loeb, explaining that each nurse carries a caseload of eight patients and is rotated every six weeks to a block of rooms which represents her district. The day nurse discusses with the evening nurse the patient's progress and decisions about care, and each nurse is considered to be responsible and accountable for her own practice.

Ciske (1979) in an article on accountability in primary nursing, characterized the organizational mode at Loeb as total patient care. She distinguished the Loeb mode, in which nurses are assigned responsibility for their patients for an eight-hour period, from primary nursing care, in which the primary nurse is given 24-hour responsibility from admission

through discharge, for a small group of patients.

Carlson, Kaufman and Schwaid (1969) described the organizational mode of nursing implemented at Long Island Jewish Medical Center, New York, where the philosophy of nursing care at the Loeb Center was adopted. The result was claimed to be a flexible, democratic, patient-centered organization in which each professional nurse was made responsible whenever possible, for the total care of her patients throughout their entire stay.

Modular Nursing

The modular nursing structure was instituted in the late 1970's as a unit organizational design to facilitate the transition from team to primary nursing (Elpern, 1977). The modular structure consists of physically dividing a 48-bed nursing unit into four 12-bed sub-units called modules. Each module would be staffed by one registered nurse and one licensed practical nurse, and both persons would plan the patient care activities. The modular structure is a "mini-team" (one RN and one LPN or one RN and one aide) taking care of from 10 to 12 patients in one geographic area (Shukla, 1982).

Elpern (1977) describes the implementation of modular nursing on a 47-bed general medical unit at Rush-Presbyterian-St. Luke's Medical Center in which nursing personnel were permanently assigned to a module of 10 to 12 patients. When rotating shifts, nurses remained on the same module. On a given unit, then, the care of each individual patient was provided by a small group of nursing staff with minimal change from day to day. The benefits reported were continuity in assignments, opportunities to develop working relationships and skill in communication and nursing care management. Relationships among

staff developed more on a mutually supportive basis. Limitations of the design included disruption of continuity of care with intra-unit patient transfers, diminution of a unit level focus and criticism that the design compromised primary nursing evolvement by retaining the team nursing structure (Elpern, 1977).

The successful transition to primary nursing by using modular nursing as a structural base is also reported by Corpuz (1977) and Ferrin (1981). Both described their modules as smaller teams or a small group of nursing personnel caring for a small group of patients with continued use of licensed practical nurses and nursing assistants to form collaborative units. The LPN or NA was not assigned to a patient, but to an RN who provided direction and guidance as well as supervision and instruction.

The complexity of converting to primary nursing is reiterated throughout the literature. Understanding and implementing a well planned process of change is repeatedly emphasized. Ferrin (1981) cites experiences with nurses uncertain about their ability to develop new skills and their unwillingness to give up comfortable patterns and perceived power structures. Elpern (1977) reports that primary nurses at Rush experienced apprehension over extending their responsibilities and accepting accountability beyond what has traditionally been expected of them. The modular nursing system established as a structural base in at least three institutions seems to have facilitated a gradual transition to the primary model.

Current Trends in Modalities of Hospital Nursing Care

Hospitals throughout the United States have been altering their

systems of nursing care delivery since the mid 1960's. A 1981 survey of 118 hospitals known to practice primary nursing found 20 percent using a combination of primary and team nursing and 19 percent using primary nursing exclusively. Overall, the survey identified eleven different combinations among 81 percent of the sample (van Servellen, 1981). This is a small sample of the 5,000 United States hospitals, but it does indicate a movement toward the primary nursing concept.

Some hospital administrators report satisfactory results with primary nursing. For example, the Bayfront Medical Center administrator in St. Petersburg, Florida, reported a dramatic increase in occupancy, a decline in turnover and a vast improvement in staffing since the implementation of primary nursing. In 1975, prior to implementation, the RN FTEs in the facility were 20 percent of the total nursing staff; by 1976 they were 68 percent and morale was high and absenteesim non-existent. Patient satisfaction made the Bayfront Medical Center a favorite hospital for admissions (Isler, 1976).

Rush-Presbyterian St. Luke's Medical Center, Chicago, Illinois, in its development as a center of excellence in nursing included the implementation of primary nursing initially within the modular organizational structure. This involved a change in the ratio of RNs to ancillary personnel. Between 1973 and 1977, the registered nurse to ancillary staff ratio at Rush increased from 40 to 70 percent (Millman, 1978).

Evanston (IL) Hospital also implemented primary nursing within the modular nursing structure in the 1970's on an undisclosed number of nursing units. Using the Hospital Administrative Services (HAS) reports of the American Hospital Association, Evanston Hospital's nursing department was

compared with other institutions having 400 beds and over and with teaching institutions nationally and in the Midwest. Data collected over a three-year period showed that Evanston Hospital pays slightly less for nursing hours per patient day on all its nursing units than do other institutions. Through the first 6 months of fiscal year 1974-75, Evanston Hospital paid 6.24 nursing hours per patient day for all nursing units as compared with 7.17 nursing hours nationally. For medical-surgical units, the data showed that Evanston Hospital paid 4.89 nursing hours per patient day during the same period as compared with 5.92 nursing hours nationally (Corpus, 1977).

Systems of nursing care in Portland, Oregon, hospitals utilized the traditional team modality until two new acute care facilities opened in the mid 1970's. These facilities instituted the 8-hour accountability primary model. Since that time, most major institutions in the metropolitan area have developed one or more primary units or have increased the ratio of their professional staff. One hospital that practices primary nursing reported 4.0 nursing care hours per patient day in contrast to other hospitals in the area that reported 4.9 to 6.5 hours (Dahlen, 1978).

Labor Costs Associated with Modalities of Nursing Care

Within most hospital settings, each nursing unit is financially structured as a separate cost center. These cost centers include an annual budget for labor which must take into account the variable and fixed costs for each class of nursing personnel based on patient acuity levels and projected occupancy rates.

The concept of variable labor costs is based upon a unit of service; such as, the patient day, which measures the level of activity for each cost center. As the level of activity rises and falls, there will be a parallel increase or decrease in the amount of certain resources consumed, while other resource needs will not change. Those resource needs which fluctuate with the level of activity are variable, while those that do not are fixed.

A patient day is the basic unit of service or statistic for a nursing unit. The level of activity on the unit will go up and down as more patients enter or leave the unit. As the patient days increase, the number of nursing staff assigned to that unit will increase, and as the patient days decrease, the number of assigned nursing staff decreases. The positions of Unit Supervisor (Head Nurse) and Unit Secretary are required regardless of the census and are, therefore, fixed costs. Salaries paid for all other staff of Registered Nurses, Licensed Practical Nurses and Nursing Assistants are variable costs.

Nursing care hours are defined as productive and non-productive. In this study, productive hours are those actual hours of direct care administered to a patient within a 24-hour period of time as well as indirect care that includes patient care planning, charting, consultations, other communication activities such as unit or departmental meetings and in-hospital staff development or inservice education programs. Non-productive hours include holidays, vacation, illness and out of hospital staff development or inservice education. Total paid hours are defined as a total of the productive and non-productive hours of all employees for each cost center.

Comparative Costs for Different Modalities of Nursing Care

Concerted efforts to reduce hospital costs are being made throughout the nation to achieve the ultimate goal of providing optimum health care to the populace at a lower cost. The nursing service department has been singled out as a major cost in hospital's operating expenditures (Swansburg, 1978; Porter-O'Grady, 1979).

Nursing administrators have long recognized the importance of identifying costs of nursing care programs as distinct from other related costs such as those associated with equipment, housekeeping and patient transportation services. These costs inflate the direct costs of nursing programs (Prescott and Sorensen, 1978). Despite the acknowledgement and concern over these practices, very few evaluations of nursing care programs have included any attempt to: (1) systematically identify costs related to a specific program of nursing care, or (2) systematically relate reliable and accurate program costs to program outcome.

The Marram et al. (1976) study of cost effectiveness of primary and team nursing has been widely quoted as documentation that primary nursing is cost-effective relative to team nursing (Osinski and Powals, 1980; Schmied, 1980; Williams and Stewart, 1980; Shukla, 1982). This is unfortunate, as the study does not complete the accounting, statistical or research tasks which constitute an adequate cost-effective analysis. The costs identified as salaries, were totaled and divided by the number of beds on each unit to yield a cost-per-bed figure. Financial data in the form of a unit of service (e.g., day of nursing care or hour of direct care) were not identified or combined with operating statistics (e.g., number of hours of nursing care consumed by a patient) to yield a cost

per unit of nursing care. The cost per bed is an inappropriate figure to express the relationship between nursing program costs and client outcomes. In addition, the observed differences in salaries were acknowledged as differences in staff longevity and staff vacancies. The equivalency of patients on the two units was questionable as neither random assignment nor other equivalency techniques such as use of covariates or matching of subjects was used. (Prescott and Sorenson, 1978). This beginning effort to identify the cost data of two nursing modalities experienced major design and control problems.

Another more recent comparison of staffing costs between an all-RN staffed primary nursing surgical unit at the Atlantic City Medical Center, Mainline Division, and 35 surgical units in New Jersey area hospital surgical units that utilized other nursing modalities also based their cost savings on the cost per bed rather than providing financial data in the form of a unit of service (Osinski and Powals, 1980).

Nursing cost estimates for an all-RN staff at a 99-bed acute care hospital in Tualatin, Oregon, were compared with staffing patterns used at two other Portland hospitals (Dahlen, 1978). One hospital in the study used RNs, LPNs, aides and ward clerks. The other hospital used RNs, LPNs and ward clerks, but no aides. Dahlen (1978) reported 4.0 nursing care hours for the all-RN staffing pattern and 5.6 nursing care hours for the other hospitals which had the mixed staffing pattern. Monthly cost estimates were approximated for operation of the nursing department for 34 beds without identifying the cost definition. Many nursing administrators are wary of implementing primary nursing, with or without an all-RN staff because of the presumed resultant higher labor costs. Studies such as Dahlen's contribute to the prevailing skepticism

in that the data were collected in a relatively small hospital where the costs identified were only estimates and the acuity of the patients was not controlled.

Hinshaw, Scofield and Atwood (1981) describe the gradual institution of an all-RN staffing pattern on one inpatient medical unit serving cardiac and oncology patients. Their cost benefit analysis was concentrated exclusively on decreased turnover, use of sick leave and unpaid absences. Their conclusion that this demonstrated a trend in reduction of these three parameters was based strictly on informally documented statistics. And yet they contended that their study's results supported Swansburg's (1978) suggestions that costs can be controlled with an all-RN staff.

Shukla (1982) reports on a study of three nursing care structures - team, modular and primary - with productivity scores used as the dependent measures. Productivity was defined in this study as the proportion of nurses' time spent in direct care, professional care and various communication activities. Three nursing units of similar size, similar mix of medical/surgical patients, similar patient communication, material and medication distribution systems were selected. The nurses within each of the three structures chose their structure and stated they were working in their preferred structure. Equitable staffing was established with the team unit budgeted for 50 percent RNs, 25 percent LPNs, and 25 percent aides; modular, 50 percent RNs and LPNs; and primary, 100 percent RNs. The number of the patient mix were equalized by patient classification and by monitoring admissions to the units. Homogeneity of nurse competency was established by providing six months of continuing education programs. The average competency scores of the RNs working on the team, modular and the primary nursing care units were 3.22, 3.51 and 3.20

respectively. These mean scores on the five-point Slater Scale were tested for statistical differences using t-tests. The differences in mean scores were not statistically significant. This design separated the effects caused by the structures from the selective qualitative aspects of the nurses providing care.

A work sampling study was designed consisting of making direct observations of the nurses' professional care activities, direct care activities and communication with patients, hospital employees and physicians at random times on the day and evening shifts. The findings revealed that the nurses on the modular unit had a higher percentage of time in professional and direct care tasks than the other nurses. The modular unit's nurses needed to coordinate less than the team nurses and did not perform as many non-professional and indirect care tasks as the primary nurses. The difference in productivity of the most and the least productive nursing system was only about 5 percent, which this researcher considers only slightly significant in a practical sense. A side comment to this study related that the primary nursing unit was found to be most expensive with the cost of nursing care about $2.00 per patient day more than the cost on the team unit. The derivation of this figure was not reported.

Shukla's (1982) well designed and controlled study finding low marginal differences in productivity between the units suggests that there may be other more critical variables than nursing structures that have greater impact on the productivity levels of nursing personnel.

Studies at Rush-Presbyterian-St. Luke's Medical Center, however, have demonstrated the low productivity of ancillary nursing personnel. Nursing assistants were found to have nearly 27 percent unoccupied time per diem as compared to 8 percent unoccupied time per diem for registered nurses.

In other words, every fourth aide might be considered unproductive, resulting in high operational costs for aides. Increased costs for turnover, inservice training and supervision also decreased the cost efficiency of using aides in their nurse staffing structure (Millman, 1978).

In a recent study, Halloran (1983) presents findings in which one ward with predominantly (72 percent) RNs operated with fewer staff and more patients than a similar ward with a staff comprised of 40 percent RNs, 40 percent aides and 20 percent LPNs. Direct nursing care time was measured using an established engineering technique, and as a check for accuracy, the Medicus patient classification scheme was used to place patients on a time continuum. The .93 correlation between the two values, Medicus scores and direct care time, indicated very high correspondence between methods. However, the patient classification data were not used in the cost analysis. It was reported that the salary cost of delivering direct nursing care on the ward with 72 percent RNs averaged over $25.00 per day less than on the ward with 40 percent RNs. This conclusion was surprisingly based on the collection of only 14 consecutive days of data from the two nursing units. The methodology for computing the costs was not reported, and RN hours were calculated only for the day shift. As a result, this study offers a minimal contribution to the nursing literature on cost effectiveness.

In addition to cost decreases directly attributable to reductions in labor costs, Jones (1975) cited another cost reduction in the care of renal transplant patients at the University of Michigan Medical Center. Patients were placed in a primary or traditional nursing unit by random assignment. The study sample was small (9), but significant findings

were reported. Patients in the primary nursing unit recovered from a major surgical procedure with fewer complications, lowering their length of stay - 21 days less than that of the patients receiving traditional nursing care. A total savings of 189 days at a cost of $323 per day, $6,500 per patient, or a total of $61,084 was reported.

Cost effectiveness is a recent and newly emerging approach in nursing evaluation studies. To date, the results found in the literature regarding the cost analysis of nursing care modalities are inconclusive. Because of the imminent cuts in the hospital reimbursement system, accurate studies comparing the cost of various strategies such as changing nursing care modalities in the acute care setting will be crucial. Already some medical care companies are acting quickly to cut expenses; for example, the executive vice president of National Medical Enterprises has dispatched corporate teams to the firm's 90 hospitals to find ways of reducing costs. The teams have recommended changing the mix of staffing in nursing departments by employing more licensed practical nurses and aides in lieu of registered nurses (American Medical News, 1983). Another administrative approach cites that "hospitals may need to get along with a leaner staff of professional nurses than they may have been accustomed to in order to remain competitive" (Hospitals, 1983).

On the other hand, Carolyne Davis, Ph.D., Administrator, Health Care Financing Administration (HCFA), cites the need for a rich mix of registered nurses at the bedside to ensure that costly complications don't arise (Hospital Week, 1983).

Nursing administrators must have accurate cost data to make future decisions in the choice of programs that are both effective in meeting their objectives and efficient in their utilization resources.

Conceptual Framework for Study

The cost of nursing and health care is a strong inducement to study further the cost effectiveness of two major alternative professional nursing modalities -- modular and primary. In the literature search, it was discovered that the labor costs associated wtih different models of nursing care was one of the major variables. It was also discovered that labor costs for direct care include the wages and fringe benefits for all classes of employees as well as those costs associated with turnover, supervision and inservice education. This study will compare the impact of modular and primary nursing on the hours and cost per acuity adjusted patient day for nursing services.

The conceptual model used to study the relationship between the organization of nursing care and costs has been derived from a model developed by Jelinek and Dennis (1976). In their model, an attempt is made to broadly characterize the concept of nursing productivity defined in terms of the nursing organization. They emphasized the critical need to assess both the adequacy and cost of nursing care, utilizing a methodology that evaluated the productivity of nursing personnel. Jelinek and Dennis (1976) describe an open system framework, identifying four key components: input, technology, output and environment.

The model used for this study will be confined to the specific concepts within each of the four components that are associated with nursing care costs in an acute care setting that may be affected by different modalities of nurisng practice (See Figure 1).

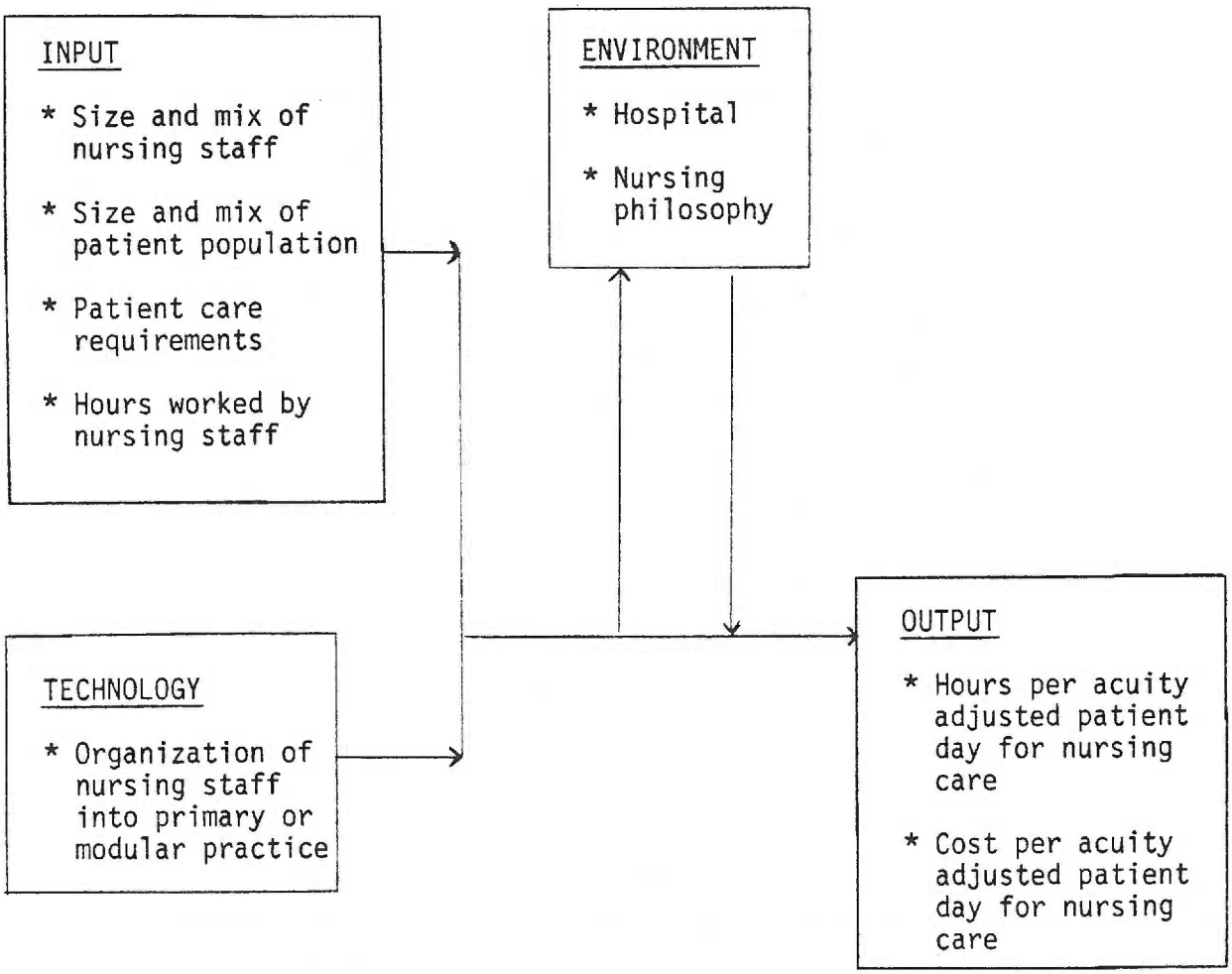

Figure 1. Nursing Productivity Framework

Concepts Associated with Input

Jelinek and Dennis (1976) describe inputs to the nurse productivity framework as: personnel numbers, qualifications and time; building space and available equipment; and supplies and inventories used in providing patient services. For the purposes of this study, the input will include the size and mix of the nursing staff, the size and mix of the patient population, the patient care requirements as shown by patient acuity and the hours worked by all RNs, LPNs and Nursing Assistants on ten medical-surgical nursing units in an acute care setting.

Concepts Associated with Technology

Technology, as it applies to nursing productivity, is described by Jelinek and Dennis (1976) as all methodologies employed in converting inputs to outputs; for example, nursing leadership and supervision, unit management, team-modular-primary nursing, workload methodologies, staffing, patient classification systems and scheduling. Any modification of the techniques of providing nursing care would be a technology change, resulting in change in output and, potentially, in productivity. This study will involve four medical-surgical units that are practicing modular nursing, two medical-surgical units that are practicing primary nursing and four medical-surgical units that have recently converted from modular to primary nursing.

Concepts Associated with Environment

Environment as described by Jelinek and Dennis (1976) comprises the influencing surrounding which defines the setting and establishes the conditions for the system under evaluation. They contend that

although input, output and technology are the major factors in the evaluation of nursing productivity, environmental considerations affect the boundaries for these three major factors.

A significant environmental factor involved in this study is the nursing philosophy that exists within the acute care setting. This metropolitan, not-for-profit study hospital is a fast paced, highly bureaucratic structure wherein the physician, as entrepreneur, admits acutely ill patients for medical or surgical treatment and care. The philosophy of nursing operating within the study hospital includes the provision of high quality patient centered and compassionate nursing care services. The concept of collaborative nursing practice that encourages independence, accountability, creativity and participation in decision making is fostered. For the purpose of this study, it is assumed that these environmental factors are consistent across all units.

Concepts Associated with Output

The output of nursing services provided can be defined in terms of nursing processes, health status of patients, quality of nursing care, patient response to care and the cost of providing nursing care. This study will address the nursing cost per patient day as affected by the mix of nursing personnel, controlling for patient acuity, unit occupancy rates and unit capacity.

This conceptual framework indicates that the output measurements of nursing services, i.e., hours and costs are affected by the two modalities of nursing practice - modular and primary. These modalities represent different mixes of nursing personnel as well as different systems of nursing practice within the acute care setting. Nursing

administrators who are charged with the responsibility to staff hospitals with an adequate number of qualified personnel to meet patient care needs must address the issue of cost. Health care in the future will emphasize prevention and outpatient intervention; hospitalization will be discouraged. Those patients who will be admitted to hospitals, as a result, will have a higher acuity. Nurses administering direct care in this setting can impact health care costs. Efficient, well organized nursing interventions can result in increased productivity, lower costs and shorter lengths of stay for the patient.

Study Questions

The purpose of this investigation is to compare the cost effectiveness of primary vs. modular nursing care modalities in an acute care setting. More specifically, this study addresses the following questions:

1. Is there a significant decrease in the mean productive hours and costs expended per acuity adjusted patient day on nursing units practicing primary nursing versus those practicing modular nursing?
2. Is there a significant decrease in the mean productive hours and costs expended per acuity adjusted patient day on those units converted to primary nursing during the study versus the mean productive hours and costs per acuity adjusted patient day on those units converted to primary nursing prior to the study?
3. Is there a significant decrease in the mean productive hours and costs expended per acuity adjusted patient day in the last seven months of the study as compared to the first five months of the study on those nursing units converted from modular to primary nursing?
4. Is there a significant decrease in the mean productive hours and costs expended per acuity adjusted patient day in the last seven months of the study as compared to the first five months of the study on those units which did not change their modality of practice?

Hypotheses

In examining the study questions, the following hypotheses will be tested:

Hypothesis 1: Mean productive hours and costs expended per acuity adjusted patient day on units practicing primary nursing will be less than mean productive hours and costs expended per acuity adjusted patient day on units practicing modular nursing.

Hypothesis 2: Nursing units converted to primary nursing prior to the study will demonstrate lower mean productive hours and costs per acuity adjusted patient day than those units converted to primary nursing during the study.

Hypothesis 3: Nursing units converted from modular to primary nursing during the study will demonstrate a decrease in mean productive hours and costs per acuity adjusted patient day during the seven month period after their conversion as compared to their mean productive hours and costs expended per acuity adjusted patient day during the five month period prior to their conversion.

Hypthesis 4: Nursing units which did not change their modality of practice during the study will not demonstrate a decrease in mean productive hours and costs expended per acuity adjusted patient day during the last seven months of the study as compared to their mean productive hours and costs expended per acuity adjusted patient day during the first five months of study.

CHAPTER II

METHODOLOGY

This retrospective study was conducted to analyze and compare the productive labor hours and costs per acuity adjusted patient day for direct patient care nursing services on primary nursing units and on modular nursing units in an acute care hospital. In the following sections, the setting and sample will be described; the design, the measurement of the variables, the data collection procedure and statistical analyses will be discussed and explained.

Setting

The setting for the study was a 450 bed, not-for-profit, acute care, metropolitan hospital, located in the Pacific Northwest United States. This institution provides a range of acute care services including cardiology, neurology-neurosurgery, orthopedics, oncology and general medical-surgical services. This research was timely and convenient for the hospital and the investigator. As Director of Nursing Services for this hospital, this researcher implemented a labor cost containment program in March, 1983 by converting four medical-surgical units from the modular system of nursing practice to the primary system. The purpose was to demonstrate the cost effectiveness of the primary modality over modular. In this setting, primary nurses were responsible for the total care of their assigned patients, implementing the nursing

process with 8-hour accountability. An approximate patient/RN ratio of 5:1 on the day shift, 6:1 on the evening shift and 10:1 on the night shift was adjusted to patient acuity; whereas in the modular system, nurses supervised small teams of non-professional staff when administering patient care. The patient/RN ratio was 8:1 on the day shift, 10:1 on the evening shift and 12-15:1 on the night shift, adjusted to patient acuity.

A component of the cost containment program included the installation of a computerized Nursing Management system. An individualized patient acuity-based staffing system was implemented to achieve objectivity in daily staffing assignments. The 24-hour staffing requirements for the ten medical-surgical units were based on the coding of 33 weighted classification criteria by each day shift nurse for each assigned patient. The data were processed on a microcomputer with the individual unit's labor budget keyed to the nursing modality practiced. A 24-hour, three shift, predictive staffing guide was produced (See Figure 2 for an illustration). See Appendix A for a more complete description.

Permission to conduct this study on the comparative costs of two methods of nursing practice over a period of one year was obtained from the Assistant Administrator for Patient Care Services and the Associate Administrator for Hospital Operations.

Sample

The sample consists of ten medical-surgical nursing units selected to represent the universe, each with a bed capacity ranging

PRELIMINARY STAFF REQUIREMENTS REPORT RUN MON. FEB. 20, 1984 AT 11:00

FOR EVENING, NITE AND FOLLOWING DAY'S DAY SHIFT

** FRI. SEP. 02, 1983 **

	PATIENTS/CLASS							BY ACUITY FORMULA			SUMMARY			
UNIT	1	2	3	4	EA	DA	TOT	EVENING RN/LP/NA	NIGHT RN/LP/NA	DAY RN/LP/NA	SCHED HOURS	BUDGT HOURS	DIFF	% DIFF
4-E	2	6	5	1	0	0	14	2/ 0/ 1	2/ 0/ 0	3/ 0/ 1	72	62	10	16.4%
4-W	5	10	6	3	0	0	24	5/ 0/ 1	3/ 0/ 1	6/ 0/ 1	136	114	22	19.6%
5-E	2	7	4	2	0	0	15	2/ 0/ 1	2/ 0/ 0	3/ 0/ 1	72	74	-2	-2.6%
6-E	5	17	5	2	0	0	29	5/ 0/ 1	3/ 0/ 0	6/ 0/ 2	136	140	-4	-2.9%
6-W	3	14	3	0	0	0	20	3/ 0/ 2	2/ 0/ 0	2/ 1/ 2	96	107	-11	-10.6%
7-E	0	10	9	2	0	0	21	4/ 0/ 2	3/ 0/ 0	4/ 1/ 2	128	104	24	23.4%
7-W	1	8	12	1	0	0	22	4/ 0/ 1	3/ 0/ 1	5/ 0/ 1	120	107	13	12.0%
8-E	0	28	4	1	0	0	33	6/ 0/ 0	4/ 0/ 0	8/ 0/ 0	144	164	-20	-12.4%
8-W	2	21	7	0	0	0	30	4/ 1/ 1	3/ 0/ 1	4/ 1/ 4	152	152	0	-0.3%
9-E	5	9	5	6	0	0	25	5/ 0/ 1	3/ 0/ 1	6/ 0/ 1	136	137	-1	-0.5%
TOT(E)	3-E) 25	130	60	18	0	0	233	40/ 1/11	28/ 0/ 4	47/ 3/15	1,192	1,161	31	2.7%

Figure 2: Predictive Staffing Guide Example

from 29 to 37. One cardiovascular unit converted to primary in February, 1979; one orthopedic unit converted in August, 1982. The remaining eight units functioned under the modular system until March, 1983 when four were converted to the primary system. Prior to the conversion, data from the eight remaining units were examined. The four units demonstrating the highest total productive hours and the highest productive hours per patient day during this baseline period were selected for conversion (See Table 1).

Table 1

Description of Units Included in Study by Staffing Modality During the Base Period
October 1982 through February 1983

Staffing Modality	Unit	Bed Capacity	Service	Implementation of Primary Model	Patient Days	Total Productive Hours	Productive Hours/ Patient Day
Primary	A	30	Cardiology	February, 79	4,093	19,195	4.69
Primary	B	35	Orthopedics	August, 82	4,831	23,274	4.82
Modular	C	33	Cardiology	NC*	4,575	25,437	5.56
Modular	D	30	Urology/Gyn	NC*	3,701	21,069	5.69
Modular	E	36	Surgical	NC*	4,599	24,259	5.27
Modular	F	35	Diabetes/ENT	NC*	3,843	18,856	4.91
Modular	G	29	Oncology	March, 83	4,471	28,229	6.31
Modular	H	32	Medical	March, 83	4,568	25,432	5.57
Modular	I	33	Surgical	March, 83	4,300	26,818	6.24
Modular	J	37	Neurology	March, 83	4,556	26,862	5.90

* NC = not converted to primary model

Design

The design in this study was a twelve month retrospective non-equivalent control group design. Three treatment groups were established to study the effect on the expended mean productive hours and productive hour costs per acuity adjusted patient day with the introduction of the primary nursing modality on four of ten medical-surgical nursing units. The units selected for the introduction of primary nursing were not randomly assigned. The design is depicted symbolically as follows:

$$\begin{array}{ccc} O_1 & & O_2 \\ O_1 & & O_2 \\ O_1 & X & O_2 \end{array}$$

The top row represents observations made on a control group of two medical-surgical units where primary nursing had been introduced prior to the collection of the baseline data. Their practice of the primary nursing modality remained the same throughout the study. The middle row represents observations made on a control group of four medical-surgical units where modular nursing had been introduced prior to the collection of the baseline data. Their practice of the modular nursing modality remained the same throughout the study. The bottom row represents observations made on the experimental group of four medical-surgical units practicing modular nursing prior to the introduction of primary nursing, i.e., the experimental treatment (X).

Baseline data were collected on the ten units for five consecutive months immediately prior to the introduction of primary nursing on the four experimental units. Post-treatment data were collected on all units for seven consecutive months immediately following the introduction of primary nursing on the four experimental units. The variation in patient acuity on all units was controlled by adjusting the workload unit, the patient day for acuity. The design of the study is shown in Figure 3.

Random assignment to treatment groups was impossible due to the specific hospital's cost containment program. All nursing units were expected to decrease their productive hours per patient day, but those units demonstrating the highest productive hours and the highest productive hours per patient day were selected since their need for improvement was the greatest. Because of the inability to randomize, the study is quasi-experimental. The design is, nevertheless, a very strong one because the collection of pre-treatment data establishes the similarity of the groups in terms of their expended productive hours, productive hour costs per patient day and patient acuity.

Treatment Group	Unit	Base Period Nursing Modality October, 1982-February, 1983 $\bar{x}$ Productive Hours Per Acuity Adjusted Patient Day	Base Period Nursing Modality October, 1982-February, 1983 $\bar{x}$ Productive Hour Cost Per Acuity Adjusted Patient Day	Post-Treatment Period Nursing Modality March, 1983-October, 1983 $\bar{x}$ Productive Hours Per Acuity Adjusted Patient Day	Post-Treatment Period Nursing Modality March, 1983-October, 1983 $\bar{x}$ Productive Hour Cost Per Acuity Adjusted Patient Day
		PRIMARY		PRIMARY	
I	A				
	B				
		MODULAR		MODULAR	
II	C				
	D				
	E				
	F				
		MODULAR		PRIMARY	
III	G				
	H				
	I				
	J				

Figure 3: Non-equivalent Control Group Design During the Study

Instruments

The productive and overtime hours for each unit were derived from the monthly printouts supplied by the Accounting Department entitled "Budget Variance Summary-Hours." These data were based on the actual hours paid as recorded by the nursing staff on their individual time cards.

The acuity points and patient days were derived from the Nursing Department's monthly "Classification Summary Report" for each month of the study period (See Figure 4). The mean acuity was calculated by the following formula:

$$\text{Mean acuity} = \frac{\text{Total Acuity Points}}{\text{Total Patient Days}}$$

The acuity points were obtained by multiplying the number of patient days at each category by the numeric value of each category. The acuity points for each category (I-IV) were then summed to obtain the total acuity points.

The average salary rate for the registered nurses, licensed practical nurses and nursing assistants were supplied by the Personnel Department. These figures were derived by determining the actual number of personnel at each salary grade for the three skill levels on the ten medical-surgical units included in the study. The RN salary rate was also adjusted for the charge nurse premium based on the actual number of charge nurses at each salary grade. The hourly rates derived by this method and used in this study are: RN = $10.82; LPN = $8.30; and NA = $7.17.

CLASSIFICATION SUMMARY REPORT RUN 04/16/84 AT 13:30

FOR 12/83 REPORT COVERS 31 DAYS.

	PATIENTS					PERCENTAGE			
UNIT	1	2	3	4	TOTAL	1	2	3	4
4-E	213	413	129	19	774	27.5%	53.3%	16.6%	2.4%
4-W	124	500	250	68	942	13.1%	53.0%	26.5%	7.2%
5-E	70	197	158	73	498	14.0%	39.5%	31.7%	14.6%
6-E	172	501	202	61	936	18.3%	53.5%	21.5%	6.5%
6-W	83	260	81	15	439	18.9%	59.2%	18.4%	3.4%
7-E	35	320	220	25	600	5.8%	53.3%	36.6%	4.1%
7-W	48	340	254	57	699	6.8%	48.6%	36.3%	8.1%
8-E	80	462	89	16	647	12.3%	71.4%	13.7%	2.4%
8-W	122	480	181	59	842	14.4%	57.0%	21.4%	7.0%
9-E	101	361	263	217	942	10.7%	38.3%	27.9%	23.0%
TOT	1,048	3,834	1,827	610	7,319	14.3%	52.3%	24.9%	8.3%

Figure 4: Classification Summary Report Sample

To determine the additional costs incurred by overtime, the total RN, LPN and NA overtime hours for each unit were multiplied by one half the designated skill level rate. The result was added to the productive hour cost previously obtained. These rates were in effect at the conclusion of the study and were used to calculate costs throughout the study to remove the distortion which would have been caused by using a lower rate earlier in the study, thereby reducing a threat to internal validity.

Data Collection Procedure

Data collection was conducted by manually extracting productive and overtime hours for each staff level from the hospital printout "Budget Variance Summary-Hours." These reports are forwarded each month by the Accounting Department to the Nursing Director's office, where they are maintained on file for several years. The number of patient days at each category were extracted from the "Staffing Requirements" printouts produced on the Nursing Department's microcomputer. These printouts are maintained on file in the Staffing Office of the Department of Nursing.

Code letters were assigned to each of the ten medical-surgical units to insure anonymity and confidentiality of data as follows:

Treatment Group I (Converted to primary nursing prior to the study)

Unit A

Unit B

Treatment Group II (Modular nursing throughout the study)

Unit C

Unit D

Unit E

Unit F

Treatment Group III (Converted from modular to primary nursing during the study)

Unit G

Unit H

Unit I

Unit J

Data were collected for all units for five months prior to the implementation of primary nursing on the four units in Treatment Group III and continued to be collected for all units for seven months after that date.

The total productive hours for each unit, which included both regular and overtime hours, were determined by accumulating the total productive hours for each skill level (i.e., RN, LPN and NA) for each month. These figures were then summed for the base period (October, 1982 through February, 1983) and the post-treatment period (March, 1983 through September, 1983) by treatment group (See Table 2).

The mean productive hours per patient day (including both regular and overtime hours) for each unit for each month was obtained

Table 2

Productive Hours by Skill Level:

Pre-Treatment and Post-Treatment Periods

	Pre-Treatment Period Productive Hours			Post-Treatment Period Productive Hours		
Group	RN	LPN	NA	RN	LPN	NA
I	33,699	1,165	7,605	42,900	2,107	10,500
II	45,807	8,250	35,575	63,280	11,022	40,322
III	52,478	12,331	40,532	85,632	6,764	25,124
Total	133,984	21,746	83,712	191,782	19,893	75,946

by aggregating the productive hours for each unit for each month and dividing by the appropriate total patient days for each unit for each month. For purposes of statistical analysis, this constitutes an observation or cell. The mean productive hours per patient day for each unit for the base period was obtained by summing the productive hours per patient day for months one through five and dividing by five. The post-treatment figure was obtained by adding the productive hours per patient day for months six through twelve and dividing by seven. The mean productive hours per patient day by treatment group was derived by a similar process, i.e., by adding the mean productive hours per patient day for each month for each unit in the particular treatment group and then dividing by the appropriate number of observations. The same process as above was followed to obtain overtime hours per patient day.

The total productive hour cost for each unit for each month was derived by multiplying the total productive hours for each skill level by the weighted average hourly salary rates: RN = $10.82; LPN = $8.30 and NA = $7.17. These figures were adjusted for overtime by multiplying the overtime hours for each unit by one-half the appropriate skill level rate and adding these results to the productive hour cost previously obtained. The total productive hour cost per patient day for each unit for each month was obtained by aggragating the total productive hour costs for each unit for each month and dividing by the total patient days for each unit for each month. The mean productive hour cost per patient day by individual unit and by treatment group was obtained by adding the productive hour cost per patient day for each month for each unit for the period desired

(months one through five for the base period and months six through twelve for the post-treatment period) and dividing by the total number of observations.

The mean productive hours and mean productive hour cost per patient day were summarized for each unit and group for both the base period and the post-treatment period (See Table 3). These same data are shown graphically in Figures 5 and 6.

To determine the mean acuity per patient day, the total acuity points by unit for each month were divided by the appropriate patient day totals. The mean acuity by treatment group for both the base and post-treatment periods was obtained by totaling the mean acuity per patient day for each unit in the particular group for each month (months one to five in the base period and months six to twelve in the post-treatment period) and dividing by the number of observations.

The total reduction in productive hours per patient day and overtime hours per patient day between the base period and the post-treatment period was determined by subtracting the post-treatment hours per patient day from the base period hours per patient day. The percent reduction of total productive hours per patient day due to the reduction in overtime hours per patient day was derived by dividing the total reduction in overtime hours per patient day by the total reduction in productive hours per patient day and multiplying the result by 100 (See Table 4).

To determine the productive hours per patient day by skill level, the total productive hours for each skill level for each

Table 3

Mean Productive Hours and Cost Per

Patient Day (Not Acuity Adjusted)

Group	Unit	Base Period Hours	Base Period Cost	Post-Treatment Hours	Post-Treatment Cost
I	A	4.70	49.38	4.64	48.02
	B	4.83	49.30	4.76	48.12
	$\bar{x}$ Group I	4.77	49.34	4.70	48.07
II	C	5.59	52.10	5.41	50.46
	D	5.78	53.39	5.04	47.70
	E	5.31	49.43	4.78	45.84
	F	4.99	46.15	4.69	43.76
	$\bar{x}$ Group II	5.42	50.27	4.98	46.96
III	G	6.35	59.59	5.03	51.10
	H	5.58	51.29	4.71	46.62
	I	6.25	58.04	5.08	51.30
	J	5.92	56.17	5.51	55.74
	$\bar{x}$ Group III	6.03	56.27	5.08	51.19

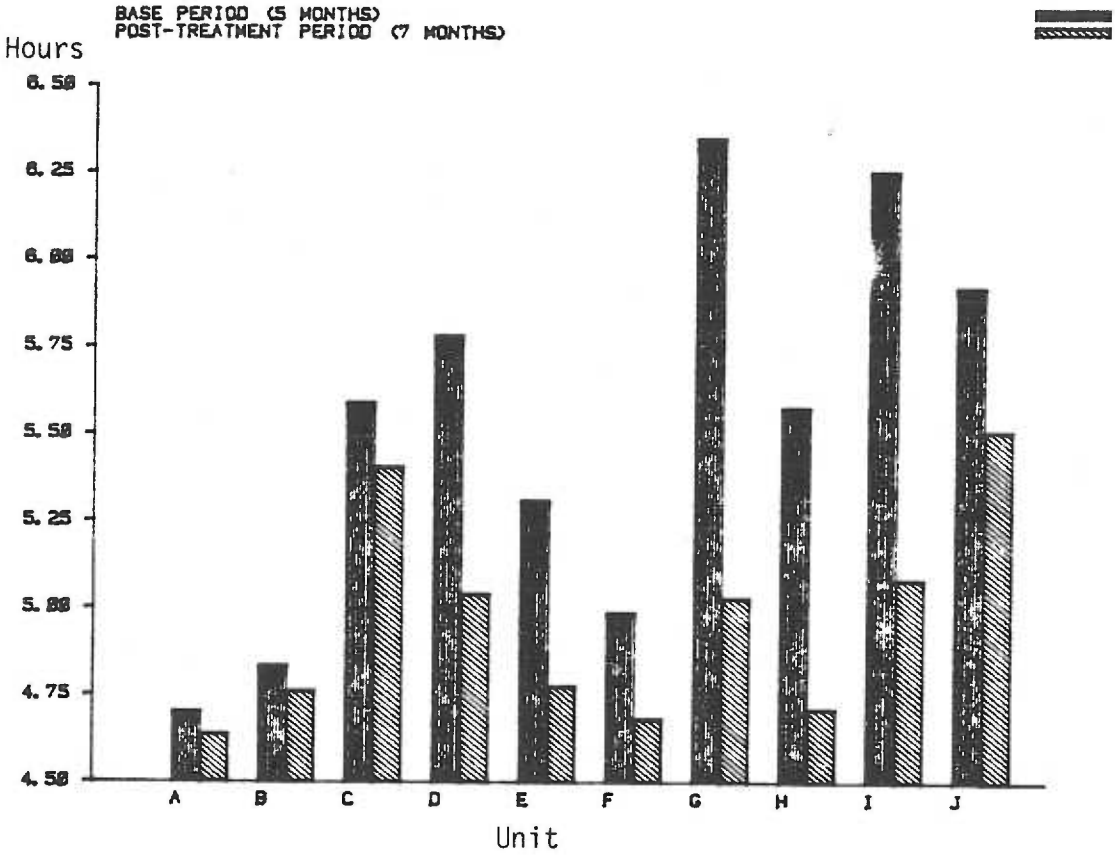

Figure 5: Mean Productive Hours Per Patient Day by Unit (Not Acuity Adjusted)

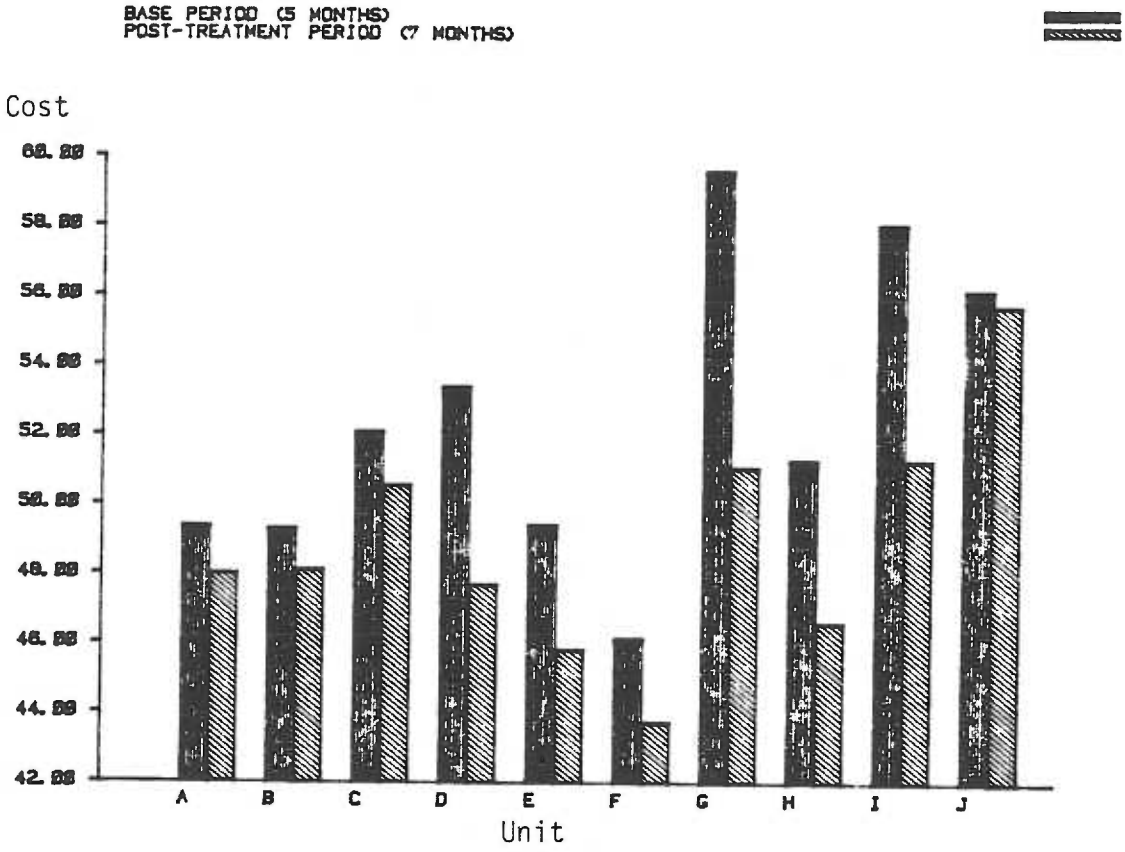

Figure 6: Mean Productive Hours Cost Per Patient Day by Unit (Not Acuity Adjusted)

Table 4

Reduction in Productive Hours Per Patient Day

Due to Overtime Hours Reduction (Not Acuity Adjusted)

		OVERTIME HOURS PER PATIENT DAY				
Group	Unit	Base Period	Post-Treatment Period	Reduction in Overtime Hours	Reduction in Productive Hours /Patient Day	Percent of Reduction in Productive Hours Due to Overtime Hours Reduction
I	A	0.2546	0.1550	0.0996	0.0649	> 100
	B	0.1968	0.1746	0.0222	0.0711	32.6
	Group $\bar{x}$	0.2257	0.1648	0.0609	0.0680	89.6
II	C	0.2255	0.1658	0.0597	0.1823	32.7
	D	0.1305	0.1219	0.0086	0.7406	1.2
	E	0.1316	0.1353	0.0037 (inc.)	0.5292	0.0
	F	0.1757	0.1361	0.0396	0.3023	13.1
	Group $\bar{x}$	0.1658	0.1398	0.0260	0.4387	5.9
III	G	0.2634	0.1702	0.0932	1.3166	7.1
	H	0.1560	0.1234	0.0326	0.8631	3.8
	I	0.2684	0.1811	0.0873	1.1711	7.5
	J	0.2403	0.224	0.0179	0.4111	4.4
	Group $\bar{x}$	0.2320	0.1743	0.0577	0.9405	6.1
Grand $\bar{x}$		0.2078	0.1596	0.0482	0.5653	8.5

unit and treatment group were added for the base period and the post-treatment period and divided by the appropriate patient day total. The formula used for both the base and post-treatment periods for registered nurses by unit is shown below:

$$\text{Unit (z) RN } \bar{x} \text{ Productive Hours/Patient Day} = \frac{\text{[Total Productive RN Hours] Unit (z)}}{\text{[Total Patient Day] Unit (z)}}$$

This same procedure was repeated for both the LPN and NA hours. The sum of the productive hours for all three skill levels was divided by the appropriate base and post-treatment patient day totals to derive the mean productive hours per patient day by unit for both periods.

The percent of productive hours by each staff level was obtained at both the unit and treatment group level by means of the following formula:

$$\text{\%RN Productive Hours/Patient Day} = \frac{\text{RN Productive Hours/Patient Day}}{\text{Productive Hours: RN + LPN + NA}} \times 100$$

This formula was repeated with first LPN and then the NA productive hours per patient day in the numerator to obtain the percent LPN and NA productive hours per patient day (See Table 5).

Due to the inability to control for the normal seasonal and unit variations in patient acuity, an adjustment was made in the workload unit, the patient day, to reflect an acuity standard on all units in both base and post-treatment periods. For the purpose of this study, a unit of workload is defined as a patient day of a patient at acuity classification level 2. This measurement was arbitrarily established as a standard to demonstrate the variation of all units and treatment groups in relation to it. To adjust the monthly figures for each unit for acuity, the following calculations were completed:

Table 5

Mean Productive Hours Per Patient Day and Percent of

Total Staff by Skill Level for Base and

Post-Treatment Periods (Not Acuity Adjusted)

		Base Period: October, 1982 to February, 1983							Post Treatment Period: March, 1983 to October, 1983						
Group	Unit	RN $\bar{x}$ Productive Hour /Patient Day	%	LPN $\bar{x}$ Productive Hour /Patient Day	%	NA $\bar{x}$ Productive Hour /Patient Day	%	$\bar{x}$ Productive Hour /Patient Day	RN $\bar{x}$ Productive Hour /Patient Day	%	LPN $\bar{x}$ Productive Hour /Patient Day	%	NA $\bar{x}$ Productive Hour /Patient Day	%	Grand $\bar{x}$
		PRIMARY							PRIMARY						
I	A	3.88	82.6	0.18	3.8	0.64	13.6	4.70	3.79	81.8	0.12	2.5	0.73	15.7	4.64
	B	3.70	76.6	0.09	1.9	1.04	21.5	4.83	3.52	73.7	0.23	4.8	1.02	21.5	4.76
	Group $\bar{x}$	3.79	79.3	0.13	2.7	0.85	17.9	4.77	3.63	77.3	0.18	3.8	0.89	18.9	4.70
		MODULAR							MODULAR						
II	C	2.88	51.6	0.41	7.4	2.29	41.0	5.59	2.89	53.3	0.41	7.5	2.12	39.2	5.41
	D	2.92	50.5	0.60	10.4	2.26	39.1	5.78	2.82	56.0	0.59	11.7	1.63	32.3	5.04
	E	2.80	52.8	0.42	7.9	2.09	39.3	5.31	2.88	60.2	0.34	7.0	1.57	32.8	4.78
	F	2.44	48.8	0.60	11.9	1.96	39.2	4.99	2.42	51.5	0.62	13.1	1.66	35.4	4.69
	Group $\bar{x}$	2.76	51.1	0.51	9.2	2.15	39.7	5.42	2.75	55.1	0.48	9.6	1.76	35.2	4.98
		MODULAR							PRIMARY						
III	G	3.32	52.2	0.53	8.3	2.51	39.5	6.35	3.82	75.9	0.20	3.9	1.01	20.2	5.03
	H	2.68	48.0	0.71	12.7	2.18	39.2	5.58	3.26	69.2	0.25	5.3	1.20	25.4	4.71
	I	2.93	46.8	1.11	17.7	2.21	35.5	6.25	3.79	74.5	0.26	5.3	1.03	20.2	5.08
	J	3.30	55.8	0.44	7.4	2.18	36.8	5.92	4.01	72.8	0.42	7.6	1.08	19.6	5.51
	Group $\bar{x}$	3.06	50.8	0.69	11.5	2.27	37.8	6.03	3.70	72.9	0.29	5.8	1.10	21.4	5.08
	Grand $\bar{x}$	3.09	56.0	0.50	9.1	1.94	35.0	5.53	3.34	66.7	0.34	6.9	1.32	26.4	5.01

1. $\frac{\text{Unit } \bar{x} \text{ Acuity}}{2}$ = Acuity Factor

2. Acuity Factor x Unit Census = Acuity Adjusted Patient Days

3. $\frac{\text{Total Productive Hours}}{\text{Acuity Adjusted Patient Days}}$ = Productive Hours Per Acuity Adjusted Patient Day

4. $\frac{\text{Total Productive Hour Cost}}{\text{Acuity Adjusted Patient Days}}$ = Productive Hour Cost Per Acuity Adjusted Patient Day

The mean acuity factor, acuity and acuity adjusted days for each unit and treatment group for the base and post-treatment periods are depicted in Table 6.

The mean productive hours and productive hour costs per acuity adjusted patient day were then determined for each unit and each treatment group for both the base and post-treatment periods (See Table 7). These same data are shown graphically in Figures 7 and 8. The mean productive hours and cost per patient day and per acuity adjusted patient day were summarized by treatment group and the differences between the base and post-treatment periods calculated (See Table 8).

Table 6

Mean Acuity Factor, Acuity

and Acuity Adjusted Days

Group	Unit	Base Period			Post-Treatment		
		Factor	Acuity	Days	Factor	Acuity	Days
I	A	1.01	2.01	826	0.91	1.82	693
	B	1.17	2.34	1129	1.04	2.09	966
	$\bar{x}$ Group I	1.09	2.18	977	0.98	1.95	853
II	C	1.03	2.05	937	0.97	1.95	883
	D	1.14	2.27	837	1.06	2.11	782
	E	1.15	2.31	1066	1.09	2.18	913
	F	1.07	2.14	819	1.06	2.12	836
	$\bar{x}$ Group II	1.10	2.19	915	1.05	2.09	853
III	G	1.29	2.57	1144	1.20	2.39	831
	H	1.20	2.40	1096	1.05	2.11	979
	I	1.19	2.37	1022	1.16	2.32	815
	J	1.19	2.39	1088	1.22	2.43	1187
	$\bar{x}$ Group III	1.22	2.43	1087	1.16	2.31	953

Table 7

Mean Productive Hours and Cost Per

Acuity Adjusted Patient Day

Group	Unit	Base Period Hours	Base Period Cost	Post-Treatment Hours	Post-Treatment Cost
I	A	4.69	49.25	5.10	52.78
	B	4.13	42.14	4.57	46.13
	$\bar{x}$ Group I	4.41	45.70	4.83	49.45
II	C	5.46	50.94	5.56	52.03
	D	5.11	47.18	4.78	45.24
	E	4.66	43.33	4.41	42.26
	F	4.68	43.28	4.41	41.18
	$\bar{x}$ Group II	4.98	46.18	4.79	45.18
III	G	4.94	46.36	4.21	42.78
	H	4.67	42.90	4.49	44.35
	I	5.31	49.26	4.37	44.14
	J	4.99	47.26	4.53	45.85
	$\bar{x}$ Group III	4.97	46.45	4.40	44.28

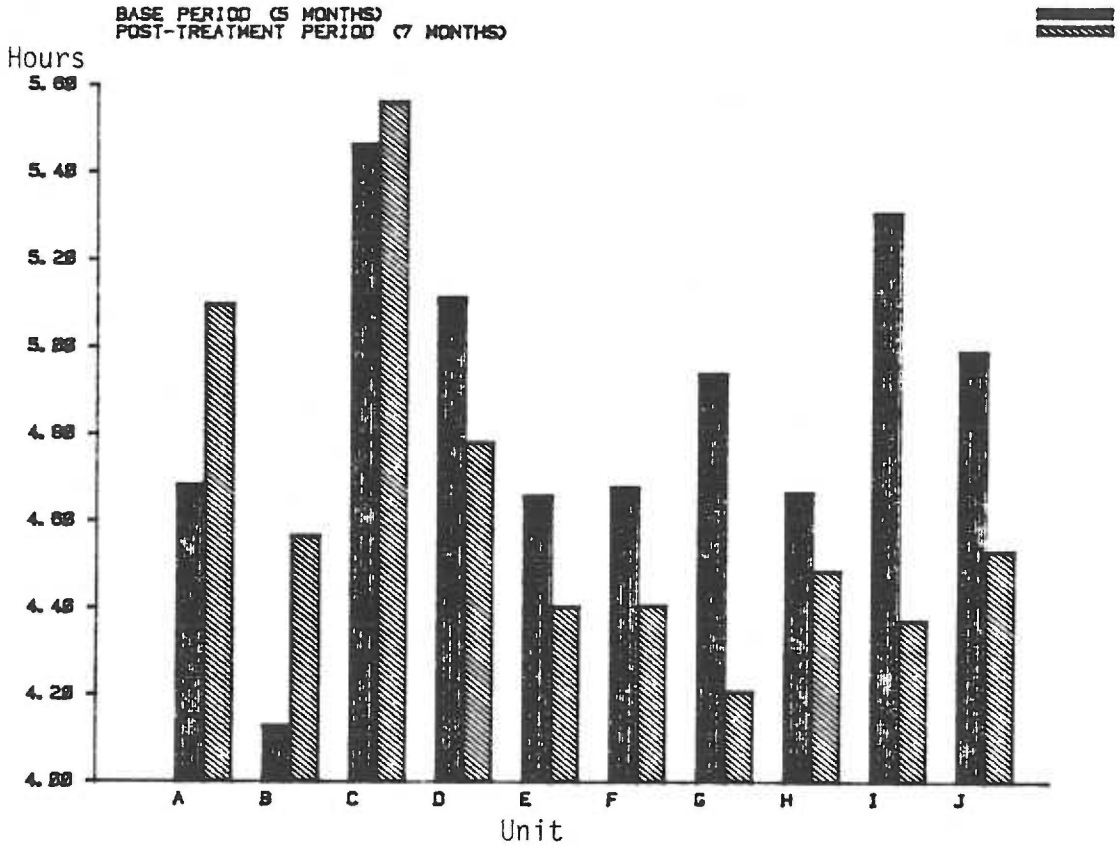

Figure 7: Mean Productive Hours Per Acuity Adjusted Patient Day by Unit

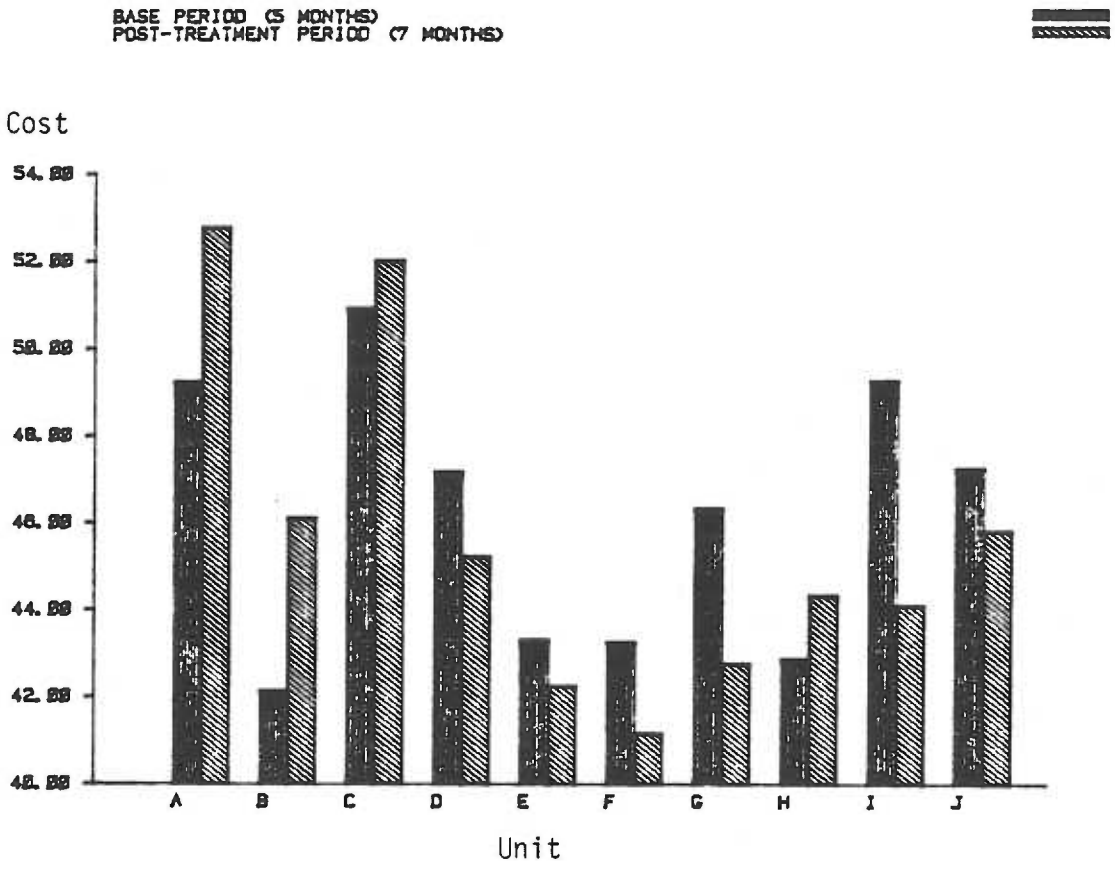

Figure 8: Mean Productive Hour Cost Per Acuity Adjusted Patient Day by Unit

Table 8

Means by Treatment Group

for Base and Post-Treatment Periods

Treatment Group		Base Period				Post-Treatment Period				Differences Base to Post-Treatment Period			
		$\bar{x}$ Pt. Days	$\bar{x}$ Acuity	$\bar{x}$ Prod. Hour/ Pt.Day	$\bar{x}$ Prod. Hour Cost/ Pt.Day	$\bar{x}$ Pt. Days	$\bar{x}$ Acuity	$\bar{x}$ Prod. Hour/ Pt.Day	$\bar{x}$ Prod. Hour Cost/ Pt.Day	$\bar{x}$ Pt. Days	$\bar{x}$ Acuity	$\bar{x}$ Prod. Hour/ Pt.Day	$\bar{x}$ Prod Hour Cost/ Pt.Day
I	Actual	892	2.18	4.77	$49.34	843	1.96	4.70	$48.07	-49	-0.22	-0.07	-$1.27
	Acuity Adj.	976		4.41	$45.70	830		4.83	$49.45	-146		0.42	$3.75
II	Actual	835	2.19	5.42	$50.27	819	2.09	4.98	$46.96	-16	-0.10	-0.44	-$3.31
	Acuity Adj.	915		4.98	$46.18	853		4.79	$45.18	-62		-0.19	-$1.00
III	Actual	894	2.43	6.03	$56.27	827	2.31	5.08	$51.19	-67	-0.12	-0.95	-$5.08
	Acuity Adj.	1087		4.97	$46.45	954		4.40	$44.28	-133		-0.57	-2.17

Analysis of Data

To test the effects of the primary nursing modality on nursing productivity, the differences between the base and post-treatment group means of productive hours per acuity adjusted patient day and productive hour costs per acuity adjusted patient day were calculated for statistical significance by computing the *t*-test with the level of significance set at $p \leq .05$.

For hypothesis one, a one-tailed *t*-test was used to test the differences between the previously established primary units and the modular units in both the base and the post-treatment periods. A one-tailed *t*-test was also used to test the differences between the primary units and the study units prior to their conversion to primary nursing. Finally, a one-tailed *t*-test was used to test the differences between the converted primary units and the modular units in the post-treatment period.

For hypothesis two, a two-tailed *t*-test was used to test the differences between the primary units and the converted units in the post-treatment period.

For hypothesis three, a one-tailed *t*-test was used to test the differences between the base and the post-treatment period on the converted units.

For hypothesis four, a two-tailed *t*-test was used to test the differences between the base and the post-treatment period on both the primary and modular units.

For each t-test, the number of observations used per unit was five for the base period and seven for the post-treatment period. These multiple observations per unit are treated in the t-test as though they are independent observations when, in fact, they are repeated measures on the same unit. Consequently, the reported significance levels for the t-test may be underestimates of the actual Type I error. Therefore, the statistical results are interpreted carefully, with special attention given to the practical importance of the findings.

Assumptions and Limitations

Assumptions

In this research investigation, the following assumptions are made:

1) it is assumed that the Nursing Department's budget goals and acuity classification system provide consistent and effective means for improving productivity on all units;
2) inevitable fluctuations in productivity due to turnover, fluctuations in the patient census and the indirect impact on productivity of such factors as holidays, absenteeism and vacations are to a large extent minimized over a full year.

Limitations

The three limitations of this study are:

1) productivity was measured only for five months prior to initiation of primary nursing on the test units,
2) the sample was drawn from only ten acute care medical-surgical units in one hospital; and
3) no attempt was made to measure the impact of the individual unit supervisor's performance on productivity.

Because of these limitations, generalizations to other unit types or acute care hospitals with different management systems must be made with caution.

CHAPTER III

RESULTS

Over twelve consecutive months of the study, two different nursing modalities were in effect. Two acute care nursing units practiced primary nursing throughout the twelve month period (Primary Group). Four nursing units practiced modular nursing throughout the year (Modular Group). Four other units practiced modular nursing for the first five months of the study and primary nursing for the final seven months of the study (Study Group). The productive hours worked by each skill level and the patient census were collected throughout the year on all ten units. Patient acuity was determined by means of a patient classification system used on all units throughout the study period.

The mean productive hours and cost per acuity adjusted patient day, the standard deviation for each and the differences between the hour and cost figures were derived for each treatment group for both the base and post-treatment periods (See Table 9).

Effects of the Primary Nursing Modality

It was hypothesized that the mean productive hours and cost expended per acuity adjusted patient day would be less on units practicing primary nursing than the mean productive hours and cost per acuity adjusted patient day on units practicing modular nursing. A one-tailed *t*-test was used to test the differences at $p \leq .05$ (See Table 10).

Table 9

Means and Standard Deviations for

Productive Hours and Cost Per Acuity Adjusted Patient Day by

Treatment Group for Base and Post-Treatment Periods

Treatment Group	Base Period				Post-Treatment Period				Differences	
	$\bar{x}$ Prod. Hour/ Acuity Adj. Patient Day	SD	$\bar{x}$ Prod. Hour Cost/ Acuity Adj. Patient Day	SD	$\bar{x}$ Prod. Hour/ Acuity Adj. Patient Day	SD	$\bar{x}$ Prod. Hour Cost/ Acuity Adj. Patient Day	SD	$\bar{x}$ Prod. Hour/ Acuity Adj. Patient Day	$\bar{x}$ Prod. Hour Cost/ Acuity Adj. Patient Day
I Primary	Primary				Primary					
	4.41	0.426	$45.70	5.226	4.83	0.405	$49.45	4.482	0.42	$3.75
II Modular	Modular				Modular					
	4.98	0.794	$46.18	7.027	4.79	0.617	$45.18	5.513	-0.19	-$1.00
III Study	Modular				Primary					
	4.98	0.552	$46.45	4.855	4.40	0.346	$44.28	3.439	-0.58	-$2.17

Table 10

Results of t-tests:

Comparison of Primary Nursing

to Modular Nursing

Treatment Groups Compared	Period	$\bar{x}$ Prod. Hrs./Acuity Adjusted Patient Day		$\bar{x}$ Prod.Hr.Cost/Acuity Adjusted Patient Day	
		df	t	df	t
I (Primary) II (Modular)	Base	28	-2.047*	28	-0.187
I (Primary) II (Modular)	Post-Treatment	40	0.225	40	2.452*[a]
I (Primary) III (Study)	Base	28	-2.755*	28	-0.378
III (Study) II (Modular)	Post-Treatment	54	-2.843**	54	-0.718

[a] This t-test is significant in the direction opposite of that hypothesized; a two-tailed significance level is reported

* $p \leq .05$

** $p \leq .01$

The difference between the mean productive hours and cost per acuity adjusted patient day on the Group I units previously converted to primary nursing were compared to the Group II units practicing modular nursing throughout this study. In the base period, it was found that the primary care units were expending fewer productive hours and less cost than the modular units; however, only the difference in hours

was statistically significant. In the post-treatment period, the opposite result was found: the primary care units were expending more productive hours and higher costs than the modular units. The cost for the primary units was higher than the cost for the modular units, contrary to the hypothesis.

The next t-test involved a comparison in the base period of the Group I units practicing primary nursing throughout the year to the Group III study units prior to their conversion to primary nursing. It was found that the primary units expended fewer productive hours and less costs than the study units practicing modular nursing. The difference in the hours, but not the cost was statistically significant.

The final t-test of this hypothesis involved a comparison in the post-treatment period of the Group III study units practicing primary nursing to the Group II units which were practicing modular nursing throughout the study. It was found that the productive hours and costs expended by the study units practicing primary nursing were less than the modular units; the difference in hours was statistically significant.

Effects of Primary Nursing Over the Study Year

It was hypothesized that the mean productive hours and cost per acuity adjusted patient day would be lower on those units converted to primary nursing prior to the study as compared to the expenditures on those units converted to primary nursing during the study. A one-

tailed t-test was originally selected to test the difference at $p \leq .05$ (See Table 11). However, because differences were in the direction opposite that hypothesized, a two-tailed test was employed.

Table 11

Results of t-test: Comparison of Previously Converted Primary Care Units (Group I) to Newly Converted Primary Units (Group III)

Treatment Groups Compared	Period	$\bar{x}$ Prod. Hours/Acuity Adjusted Patient Day		$\bar{x}$ Prod. Hour Cost/Acuity Adjusted Patient Day	
		df	t	df	t
I (Primary) III (Study)	Post-Treatment	40	3.488*	40	4.035**

* $p \leq .01$

** $p \leq .001$

It was found that the units practicing primary nursing throughout the study were expending more productive hours and costs during the final seven months of the study than those units converted to primary nursing during the study. Both the differences in hours and the cost were significantly higher, contrary to the hypothesis.

Effects of Converting from Modular to Primary Nursing

It was hypothesized that nursing units that convert from modular to primary nursing during the study would demonstrate a decrease in the mean productive hours and costs per acuity adjusted patient day during the seven month period after their conversion as compared to the five month period prior to their conversion. A one-tailed *t*-test was used to test the significance at $p \leq .05$ (See Table 12).

Table 12

Results of *t*-test: Examination of Change in the Study Group from the Base Period (Modular Nursing) to the Post-Treatment Period (Primary Nursing)

Treatment Group Examined	Periods Compared	$\bar{x}$ Prod. Hours/Acuity Adjusted Patient Day		$\bar{x}$ Prod. Hour Cost/Acuity Adjusted Patient Day	
		df	t	df	t
III (Study)	Base Post-Treatment	46	4.311**	46	1.773*

* $p \leq .05$

** $p \leq .001$

It was found on the study units that after the conversion to primary nursing, both the productive hours and cost were less than those expended prior to conversion; the reductions in both hours and cost were statistically significant.

Effects with No Change in Nursing Modality

It was hypothesized that nursing units which did not change their modality of practice during the study would not experience a decrease in the mean productive hours and cost expended per acuity adjusted patient day during the last seven months of the study compared to the expenditures in the first five months of the study. A two-tailed *t*-test was used to test the differences at $p \leq .05$ (See Table 13).

Table 13

Results of *t*-tests: No Change in Nursing Modality

Treatment Group Examined	Periods Compared	$\bar{x}$ Prod. Hours/Acuity Adjusted Patient Day		$\bar{x}$ Prod. Hour Cost/Acuity Adjusted Patient Day	
		df	t	df	t
I (Primary)	Base Post-Treatment	46	-2.369*	22	-1.806
II (Modular)	Base Post-Treatment	46	0.898	46	0.541

* $p \leq .01$

It was found that the units which were practicing primary nursing throughout the study were expending more productive hours and higher

costs during the last seven months of the study as compared to the first five months; the change in hours was statistically significant, contrary to the hypothesis.

Finally, although it was found that the units which were practicing modular nursing throughout the study were expending fewer productive hours and lower costs in the last seven months compared to the first five months, these changes were not statisically significant.

CHAPTER IV

DISCUSSION

Before full discussion of the findings of this study, several factors must be considered. First, this type of research lacks the advantages of randomization. It was possible to control the two discrete nursing modalities, the number of nursing units, the nursing unit size and the patient acuity. In addition, the effects of salary variations were controlled on all units by using a standard rate for productive hours throughout the study. One major threat to the study's validity was the change in staff composition on all units during the study year due to turnover in clinical and management personnel. In addition, the inability to control for substitution of one staff level for another at a lower or higher level due to the unavailability of personnel indicated by the computerized staffing system existed. This threat was minimized as the condition was prevalent on all units.

It should be noted that the patient classification system utilized to compute predictive staffing patterns on all units was phased in over a period of four months during the study year. Significance of the impact is unknown, but time constraints of the researcher did not permit delay of the study until implementation was complete. Auditing of patient category by the Unit Supervisor was completed on all units from the start of the study to establish interrater reliability of the patient classification instrument, but cross-auditing did not begin until January, 1983 and was phased in as units converted to the computerized acuity-based staffing system. Interrater reliability

for all units ranged from 79.2 percent agreement in February, 1983 to 85.7 percent in September, 1983. Increased reliability of the instrument may have been possible by increasing the length or postponing the start of the study. In addition, the validity of the patient classification instrument was not established. The comprehension and acceptance level of the patient classification system by the clinical staff was uneven within each unit and from unit to unit. The commitment of the Unit Supervisor to the acuity-based staffing system, as well as the effect of their individual management skills and expertise resulted in varied pressure from unit to unit even though all units were under tremendous cost containment pressures. Lack of familiarization with the new system could have contributed to some of the variability in management performance.

It should also be noted that due to budgetary constraints the four units that converted to primary nursing were selected by nursing administration without staff participation in the decision.

Finally, two environmental factors should be mentioned. Three nursing units (D in Group II and G and J in Group III) were physically relocated in January, 1983, and during the course of the study five units were closed intermittantly for a total of 70 days due to low census.

Comparison of Primary to Modular Nursing

In that no comparative reports of the productive hours and cost per acuity adjustment patient day for modular or primary modalities

could be found in the literature, the results of this study could only be compared with the less rigorous data reported by Marram et al (1976), Dahlen (1978), Osinski and Powals (1980), Shukla (1982) and Halloran (1983).

Both Marram et al (1976) and Osinski and Powals (1980) reported that primary nursing was more cost effective than team nursing based on salary cost savings per bed. This study included four distinct comparisons of primary to modular nursing. In three of these comparisons, the productive hours and cost per acuity adjusted patient day were less on those units practicing primary nursing as compared to those practicing modular nursing. In the five month base period, the Primary Group expended significantly fewer hours per acuity adjusted patient day than either the Modular Group or the Study Group. In the seven post-treatment period, the Study Group expended significantly fewer hours per acuity adjusted patient day than the Modular Group. In the fourth comparison, however, the Primary Group in the post-treatment period expended significantly higher productive hour cost per acuity adjusted patient day than the Modular Group.

As cited above, when these same two groups were compared in the base period, the results were the opposite. This shift in results between the base and post-treatment periods was due to the sharp increase in productive hours and cost per acuity adjusted patient day which occurred in the Primary Group in the post-treatment period. The increase in hours was statistically significant. The mean productive hours and cost per acuity adjusted day for the three groups are shown in Figures 9 and 10 respectively. The Primary Group is comprised of two units, one a cardiovascular unit that had been

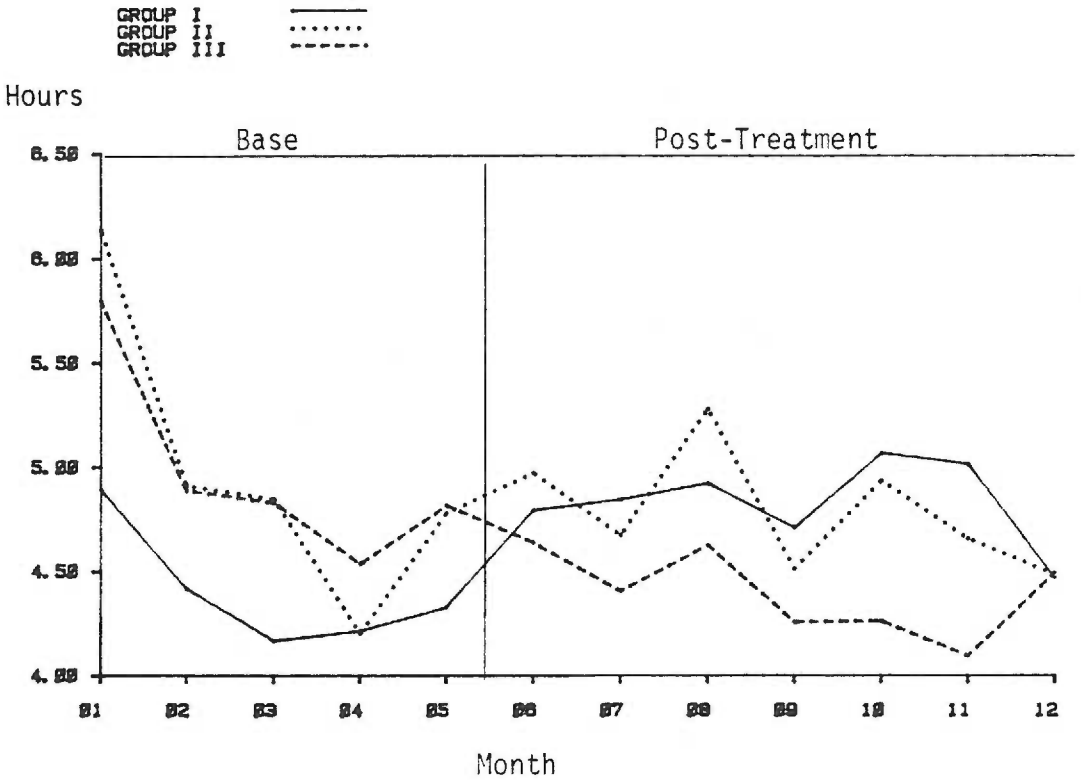

Figure 9: Mean Productive Hours Per Acuity Adjusted Patient Day by Treatment Group and Month

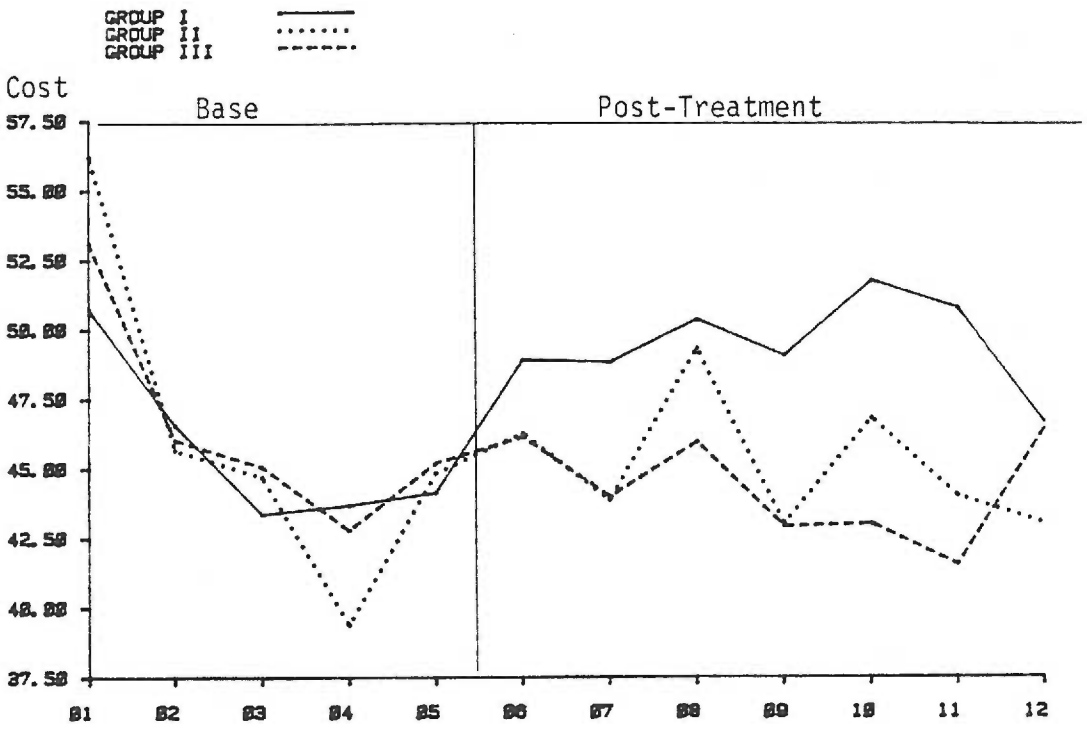

Figure 10: Mean Productive Hour Cost Per Acuity Adjusted Patient Day by Treatment Group and Month

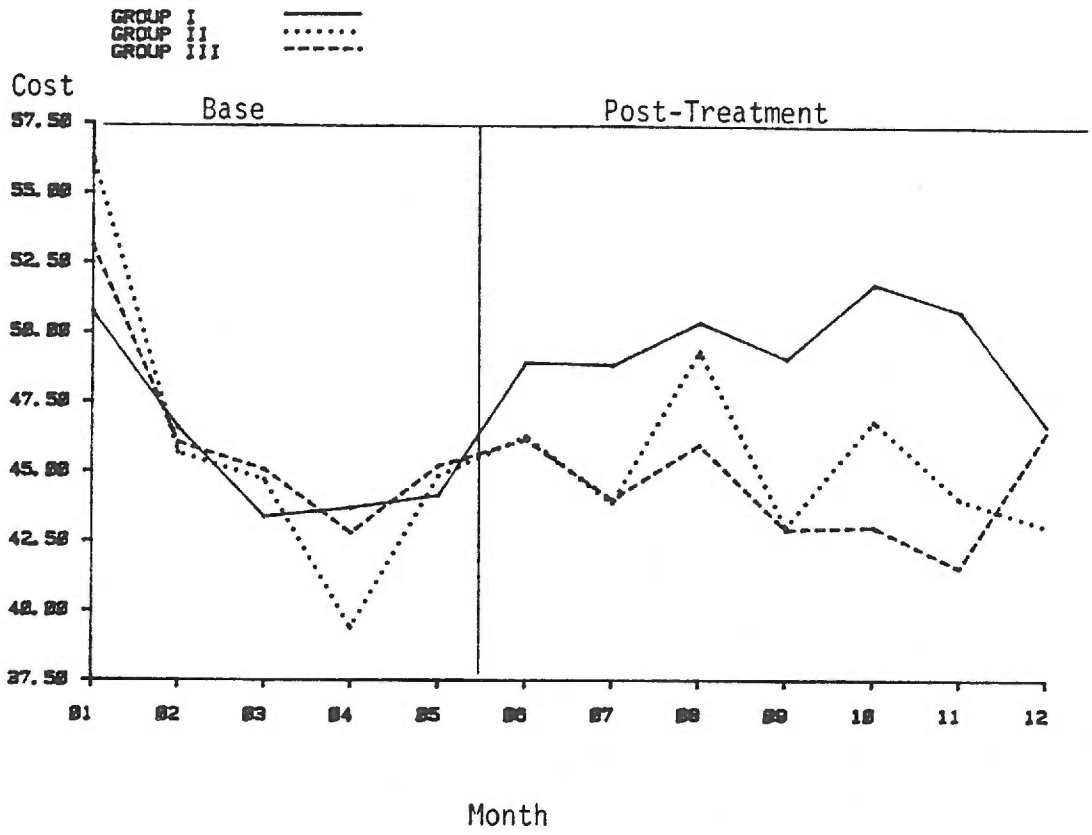

Figure 10: Mean Productive Hour Cost Per Acuity Adjusted Patient Day by Treatment Group and Month

converted to primary nursing in 1979. It is possible that lower expectations or minimized pressure for cost containment were factors inferred by nursing administration. It could have been assumed that this unit was already practicing at a high level of productivity, having not only adjusted to the conversion to primary nursing, but having had over four years experience to develop an efficient structure. Another factor to consider is the possible reluctance on the part of the clinical staff on this unit to accept the acuity-based staffing system. Less rigorous patient classification was demonstrated on this unit by lower cross-audit scores. This may have accounted for the lower acuity scores, which, in turn, increased the productive hours and cost per acuity adjusted patient day.

The second nursing unit in the Primary Group is an orthopedic unit that traditionally practices at a high level of productivity. It was the first unit in the department to convert from team to modular nursing in 1981 at the request of the nursing staff. The unit subsequently made the conversion to primary nursing in August, 1982 and was expected to be as successful as the modular conversion. In September, 1982, one month prior to the start of this study, a new Unit Supervisor was appointed to this unit who exerted rigorous demands and expectations in terms of patient classification accuracy and high cross-auditing scores for interrater reliability. It should also be noted that the acuity scores for these orthopedic patients demonstrated the highest homogeneity during the study. These extraneous factors may have indeed resulted in lower acuity scores, and therefore, increased the productive hours and cost per acuity adjusted patient day. Rather than assume that primary

nursing is more expensive over time, it is suggested that further research of these variables be conducted to confirm impact of these factors.

Dahlen (1978) reported 4.0 nursing care hours for an all-RN staffing pattern compared to 5.6 nursing care hours for hospitals with mixed staffing patterns. Costs identified were based on estimates and the acuity of the patients was not controlled. In this study, during the base period, the units practicing primary nursing averaged 4.8 productive hours per patient day compared to 5.4 productive hours per patient day for the Modular Group and 6.0 productive hours per patient day for the Study Group. These results are in general agreement with Dahlen's (1978) findings and are the basis for this researcher's decision as Director of Nursing Services to convert four units practicing the modular modality and expending a mean 6.0 productive hours and a mean $56.27 per patient day to the primary modality in that those two units were demonstrating a mean 4.8 productive hours and a mean $49.34 per patient day, not acuity adjusted.

During the post-treatment period, however, the Primary Group had 4.7 productive hours per patient day compared to 5.0 productive hours per patient day for the Modular Group and 5.1 hours per patient day for the Study Group which, during that period was practicing primary nursing. The latter results seem to contradict Dahlen's (1978) findings in that the Study Group which converted to primary nursing had higher hours than the Modular Group. These findings point out the importance of controlling for acuity. When computing

productive hours per acuity adjusted patient day, the Study Group expended significantly less productive hours in the post-treatment period when practicing primary nursing than the Modular Group used in the same period. There was not a significant difference in the productive hours per acuity adjusted patient day expended by the Primary Group as compared to the Modular Group in the post-treatment period.

With the conversion to primary nursing of the four nursing units comprising the Study Group, several factors must be taken into consideration. The patient acuity-based staffing system was implemented over a four-month period during the study. Unit Supervisors of the ten study units and other members of nursing administration, including this researcher, met on a daily basis for six months to analyze staffing problems from the previous 24-hours on those units using the patient classification as a base for their staffing. The four units in the Study Group essentially converted to primary nursing and began acuity-based staffing simultaneously, four months after the Modular and Primary Groups went on line. The Supervisors of these latter groups had the advantage of four months of direct feedback regarding staffing problems with an opportunity for immediate adjustments on their individual units.

There seemed to be less acceptance of the acuity-based staffing system by the Study Group Unit Supervisors, possibly because their clinical staff were burdened with the conversion to primary nursing, a change made without their prior input. In addition, the clinical staff of the Study Group units seemed very skeptical that the acuity-

based staffing system would provide sufficient staff for their highly acute patients. It is possible that "over-categorization" existed, resulting in higher mean acuity scores and lower productive hours and cost per patient day when adjusted for acuity. Again, further research would be required to confirm this factor.

Finally, consistency of management expertise was notably deficient on two of the units of the Study Group. Two Unit Supervisors resigned during the study year, one due to complete rejection of the nursing management role. This is reflected in that particular units' minimal improvement in productivity during the post-treatment period.

Shukla (1982) reported that the cost of nursing care was about $2.00 per day more on the primary nursing unit studied than the cost expended on the team unit. Since he did not report the derivation of this figure, it is difficult to compare it with the data reported in this study. It can be noted, however, with the exception of the Primary to Modular Group comparison in the post-treatment period, all other comparisons demonstrated primary nursing to have a lower productive hour cost per acuity adjusted patient day.

Effects of Primary Nursing Over the Study Year

There were no reports in the literature which compared the productive hours and costs while controlling for patient acuity on units recently converted to primary nursing to those units previously converted and adjusted to the change. The results of this study contradicted the hypothesis in that the two units practicing primary

nursing for the longer period expended significantly higher productive hours and costs per acuity adjusted patient day than the average of the four units which had just converted to primary nursing. Once again, these results are attributed to the sharp increase which occurred in the Primary Group's productive hours and cost per acuity adjusted patient day during the last seven months of the study as compared to the first five months. It is interesting to note that the Study Group achieved a level of productive hours and cost expended per acuity adjusted patient day in the post-treatment period which were not significantly different from the Primary Group's productive hours and cost expended per acuity adjusted patient day in the base period.

Primary Group - Base Period:

4.41 hours and $45.70/acuity adjusted patient day

Study Group - Post-Treatment Period:

4.40 hours and $44.28/acuity adjusted patient day

These figures lend weight to the supposition that extraneous factors pushed the Primary Group beyond the productive hours and cost they had previously achieved. If confirmed by further research, it points to the need for careful monitoring of extraneous factors to maintain high levels of efficiency.

In addition, both groups experienced a decline in mean acuity between the base and post-treatment periods, although the Primary Group experienced a greater decline: from 2.18 to 1.95 for the Primary Group and from 2.43 to 2.31 for the Study Group. Because of the relative difference in acuity between the two groups, when productive hour costs were adjusted for acuity in

the post-treatment period the Primary Group experienced $1.38 increase per patient day over the non-adjusted figure and became the most costly group; whereas, the Study Group reflected a $6.91 decrease in the acuity adjusted productive hour cost and became the least costly group. These shifts clearly illustrate the impact of acuity adjustment and the importance of the reliability of the acuity-based staffing system. Futher research is strongly suggested for confirmation of the reliability of the system. In addition, although no specific guidelines exist in the literature to validate a patient classification system, this would be an interesting area for further research.

It is likely that the increases experienced in the Primary Group were due to the same extraneous factors previously cited rather than an inherent increase in the cost of primary nursing due to either lower acuity or the passage of time.

Effects of Modular Nursing Over the Study Year

Shukla (1982) reported that nurses on a modular unit were most productive, providing direct and professional care tasks at a higher percentage of the time than the nurses on a team unit and a primary unit. It was pointed out that the primary nursing unit was the most expensive in that the cost of nursing care was about $2.00 per patient day more than the cost on the team unit. No mention was made of the cost on the modular unit. In this study, both the productive hours and costs per acuity

adjusted patient day were less in the post-treatment period for the Modular Group as compared to the base period, but the reductions made were not significant nor as extensive as the reductions made in the Study Group. The post-treatment results of the Modular Group, however, were lower than those reported for the Primary Group with the costs significantly lower for reasons cited previously. The mean acuity for the Modular Group decreased the least among the three groups from 2.19 to 2.09 from the base to the post-treatment period. These acuity scores are higher than those reported for the Primary Group, but lower than those reported for the Study Group. After adjustment for acuity, the Modular Group shifted from the lowest cost expended per patient day to a level higher than those costs expended by the Study Group.

The four units comprising the Modular Group made no changes in their modality of practice throughout the study and were able to focus their cost containment efforts directly toward the implementation of the acuity based staffing system and the reduction of overtime. The four units in this Modular Group had consistent cross-auditing scores for interrater reliability and seemed to offer the least resistance to the implementation of the system. It would seem that extraneous factors had less of an impact on this group than either the Primary or Study Groups.

Effects of Converting from Modular to Primary Nursing

There were no reports in the literature which cited the productive hours and cost expended per acuity adjusted patient day on a unit both before and after conversion from modular to primary nursing. The results of this study support the hypothesis that the Study Group would expend significantly lower productive hours and cost per acuity adjusted patient day after conversion from modular to primary nursing.

It should be noted that the Study Group had the highest mean acuity in both the base and post-treatment periods (2.43 and 2.31 respectively), and the Modular Group (2.19 and 2.09 respectively). Thus, after acuity adjustment, the Study Group shifted from the highest productive hours and cost per patient day to the lowest in the post-treatment period.

The four units comprising the Study Group were selected for conversion to primary nursing because of their relatively low productivity and the perceived high acuity of their patients. The pressures impacting the Study Group units were higher than the other two groups in that they not only converted to the acuity-based staffing system, but they changed their modality of nursing practice after a six-week orientation program on each unit and underwent a major change in staff mix. As mentioned previously, three out of the four study units converted to the acuity-based staffing system at the end of the four month implementation period, giving the Supervisors of the Primary and Modular

Groups the advantage of four additional months of direct feedback. However, the Study Group Supervisors were able to avoid some of the problems encountered in the implementation of the acuity-based staffing system which had been solved by the other groups. But, when these units were converted, the clinical staff were more concerned that the system would not provide an adequate staffing complement, in that the total number of personnel administering direct care would be decidedly less. Given the high acuity of patients in the Study Group, this assertive position on the part of the clinical staff reflected a healthy skepticism but may have lead to "over-classification" on their part. Once again, the importance of the accuracy of the acuity scores is emphasized, but only further study could confirm both the reliability and validity of the acuity instrument.

Other extraneous factors that may have affected the results of the Study Group include the physical relocation of two of the units and the resignation of the Unit Supervisors from the same two units soon after the conversion to primary nursing.

Finally, it should be noted that although the productive hours and cost per acuity adjusted patient day were significantly lower for the Study Group after conversion to primary nursing, there were three other comparisons of modular to primary nursing in this study in which the productive hours were significantly lower but not the costs (i.e., base period: Primary Group to Modular Group; base period: Primary Group to Study Group and post-treatment period: Study Group to Modular Group). Given the fact that the Study Group

had the highest acuity, one must ask the question whether primary nursing units will only have significantly lower productive costs per acuity adjusted patient day when the acuity reaches a certain level, or whether the results seen here are due to extraneous factors. It would seem especially interesting to repeat the measurement of the productive hours and costs of the Study Group at a later period, when the staff has had sufficient time to adjust to the practice of primary nursing and when the extraneous factors are better controlled. One can speculate that, under these conditions, they would become even more productive than seen in this study.

Relationship of Productive Hours and Cost Per Acuity Adjusted Day

The shifts in mean productive hours and cost per acuity adjusted patient day which have been previously discussed can also be depicted by plotting the hours versus cost on a scattergram (See Figure 11). When comparing the base period to the post-treatment period, this figure clearly shows: 1) the shift upward which occurred in both Primary Units A and B; 2) the moderate downward shift wich occurred in three of the four Modular Units D, E and F; and 3) the larger downward shift which occurred in three of the Study Units G, I and J.

It was beyond the scope of this study to identify the various factors which caused Modular Unit C and Study Unit H to experience an increase in their cost per acuity adjusted patient day. Two factors, however, can be noted: 1) Unit C, which is a Cardiology unit, has a similar acuity and cost to Primary Unit A, which is also

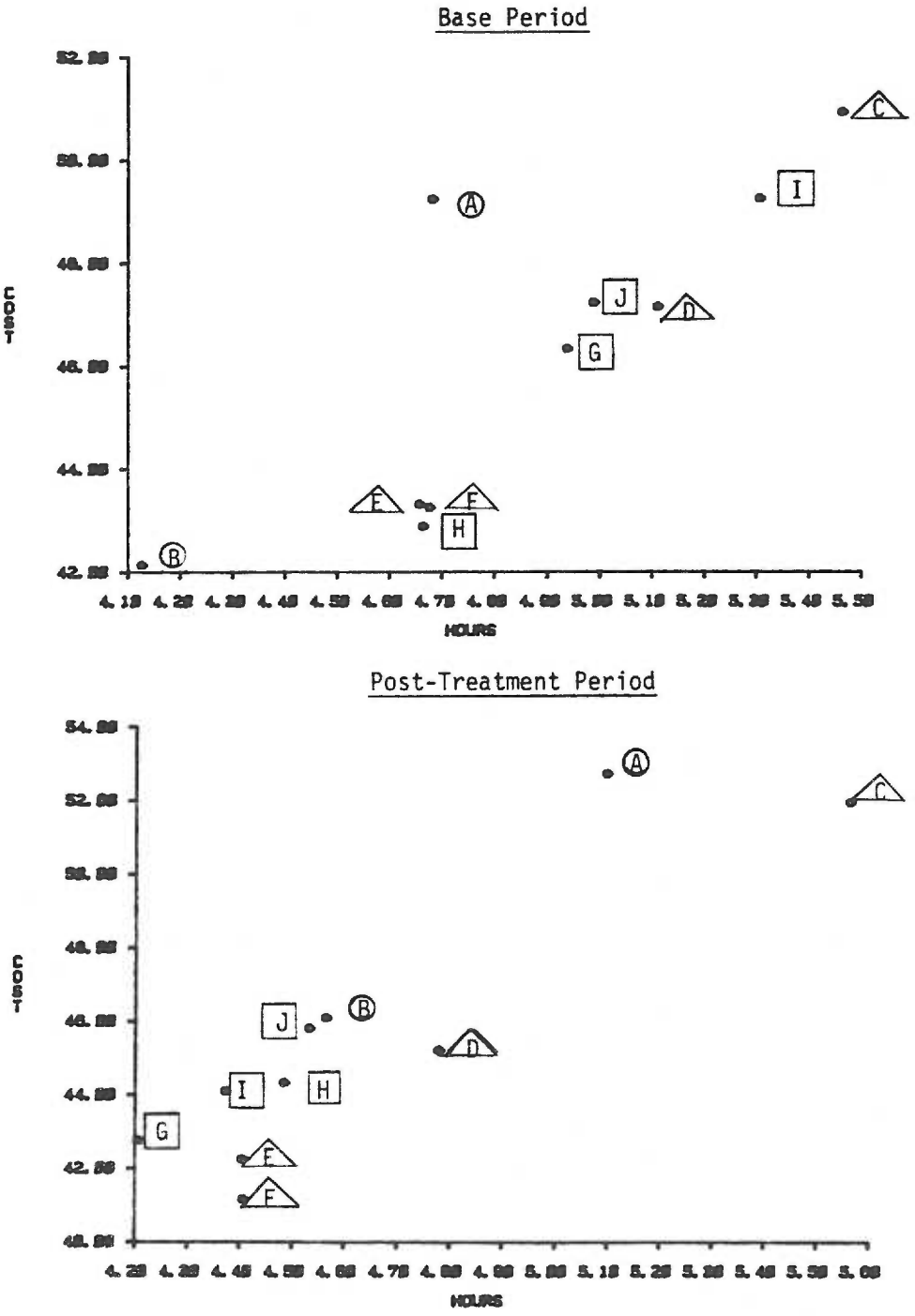

Figure 11: Mean Productive Hours Per Acuity Adjusted Patient Day Versus Mean Productive Hour Cost Per Acuity Adjusted Patient Day by Unit

a Cardiology unit; 2) Unit H had the largest decline in acuity among the Study Units. The first factor raises the issue of whether the clinical specialty on a unit plays a predominant role in determining the cost of providing care. The second factor reinforces the issue previously raised; that is, the importance of further research into the reliability and validity of the acuity instrument.

Actual Cost Reductions

In this study four of the five comparisons between modular and primary nursing showed a decrease in productive hour cost per acuity adjusted patient day. The only statistically significant decrease occurred in the Study Group from the base to the post-treatment period. Although the difference in cost per acuity adjusted patient day was not significant in all comparisons (perhaps due to the small number of units and the relatively short period of time studied), the total difference in dollars on an annual basis, as depicted in Table 14 suggests an important savings in actual cost per patient day.

These savings during the post-treatment period were achieved through reductions in productive hours, of which only 8.5 percent was attributed to a reduction in overtime hours. During the same time these savings occurred, it is important to note that the overall RN productive hours per patient day increased from 3.09 to 3.34 and the overall percentage of RNs increased from 56.0 to 66.7.

Table 14

Savings in Productive Hour Costs

Group	Post Treatment Pt. Days	Reduction in Cost/ Pt. Day	Savings in Post-Treatment Period	Savings on an Annualized Basis	Percent Contribution
I	11,807	$1.27	$14,995	$25,706	7.2
II	22,937	$3.31	$75,922	$130,151	36.4
III	23,142	$5.08	$117,561	$201,533	56.4
Total	57,886		$208,478	$357,330	

Applicability of Methodology to Other Settings

Because of the many environmental and operational factors that affect nurse staffing in acute care settings, as well as the specific factors which affected this study, generalization of these results to other settings must be made with caution. The methodology used in this study, however, can be applied by other researchers to compare the cost effectiveness of different nursing modalities in other acute care settings. Studies of this type will require that certain conditions be met: 1) a reliable acuity-based staffing system must be used on the units being compared; 2) the operational definitions for key variables must be documented; 3) an overall average salary rate for each job family, adjusted for the proportion of personnel at each salary grade, must be established; 4) required data (productive hours, overtime hours, acuity points and patient days) must be collected for each unit for a sufficient period of time to reliably measure the differences between nursing modalities; and 5) extraneous factors on each unit which may affect the results must be carefully noted.

Systematic studies of this type will contribute to a better understanding of the intervening variables and their control, to develop more credible data with which to make administrative decisions and, hopefully, provide sufficient data to establish which model of nursing practice is most effective under various conditions and settings.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This study was an effort to present a methodology for evaluating the productivity of nursing personnel in an acute care setting. The primary purpose was to compare the cost effectiveness of primary versus modular nursing care modalities in a moderate size hospital. A review of the literature revealed very few studies regarding the cost analysis of various nursing care modalities and these studies presented inconclusive results due either to an absence of operational definitions or deficiencies in experimental design. Given the new competitive incentives to control health care costs, it is hoped that this study will encourage further research in this important area and lead to the development of valid cost data which will assist nursing administrators in the choice of nursing care modalities that both meet their objectives and can be demonstrated as cost effective.

This study was done over a twelve month period on ten acute care nursing units: two units which converted to primary nursing prior to the study; four units which practiced modular nursing throughout the study; and four units which practiced modular nursing for the first five months of the study, then converted to primary nursing for the last seven months. The number of patient days, patient acuity and nursing productive hours were collected for each unit throughout the study year. An average salary rate,

adjusted for the actual number of personnel at each salary grade, was computed for each job family and used throughout the study to compute productive hour costs. In addition, an acuity factor, the productive hours and productive hour cost per patient day and per acuity adjusted patient day were computed for each unit and treatment group for both the base and post-treatment periods. The data were analyzed to compare the productive hours and productive hour cost per acuity adjusted patient day by computing the t-test on the differences of the various group means.

There were five comparisons of primary to modular nursing. In four of the five comparisons, the groups practicing primary nursing expended fewer productive hours and cost per acuity adjusted patient day than the groups practicing modular nursing. In three of these comparisons, the differences in hours were statistically significant: Primary versus Modular Group in the base period; Primary versus Study Group in the base period; Study versus Modular Group in the post-treatment period. In the fourth comparison, both the differences in hours and cost of the Study Group were significantly lower in the post-treatment period under primary nursing compared to the base period under modular nursing. In the fifth comparison, contrary to the hypothesis, the Primary Group in the post-treatment period had higher productive hours and cost per acuity adjusted patient day than the Modular Group; only the costs were significantly higher.

Two other intra-Group comparisons were done in this study: the Modular Group had lower productive hours and costs per acuity adjusted patient day in the post-treatment period than in the base

period, neither of which was significantly less; the Primary Group had higher hours and costs in the post-treatment period than the base period with the hours significantly higher.

Conclusions

A summary of the findings of this study will be discussed in relation to each of the hypotheses. These results will be related to other studies, but due to the lack of rigorous studies in the literature, very few can be cited. Finally, it should be noted that because of the limitations explained in Chapter IV, the conclusions presented here are provisional and require further research.

The first hypothesis that mean productive hours and costs per acuity adjusted patient day on units practicing primary nursing will be less than on units practicing modular nursing involved four comparisons. The hypothesis was supported in three of four comparisons, thus adding to less rigorous findings by Marram, et al. (1976) and Osinski and Powals (1980). The opposite finding in the fourth comparison in which the Primary Group expended higher productive hours and cost per acuity adjusted patient day in the post-treatment period than the Modular Group may support Shukla (1982) who reported that primary nursing was more expensive than team nursing. Given the Primary Group functioned at a more efficient level for five months during the base period, a more likely explanation is that extraneous factors caused the increase seen in the post-treatment period.

The second hypothesis that units converted to primary nursing prior to the study will demonstrate lower mean productive hours and cost per acuity adjusted patient day than those converted to primary nursing during the study was not supported. This result is likewise attributed to the significant increase in hours and cost which occurred in the Primary Group during the post-treatment period. This explanation is supported by the fact that the Study Group achieved a level of productive hours and cost per acuity adjusted patient day in the post-treatment period very similar to those of the Primary Group in the base period.

The third hypothesis that the Study Group will demonstrate a decrease in mean productive hours and costs per acuity adjusted patient day after their conversion from modular to primary nursing was supported. It was noted that this Group had the highest mean acuity in both the base and post-treatment period compared to both the Primary and Modular Groups. Also, because of the many changes which the Study units underwent during the study year, it is thought that their hours and costs will be lower over time.

The fourth hypothesis that the nursing units which did not change their modality of practice during the study will not demonstrate a decrease in productive hours and cost per acuity adjusted patient day during the last seven months of the study was not supported. The Modular Group's hours and costs were lower, although not significantly lower. The Primary Group's hours and cost per acuity adjusted patient day were higher, with the hours significantly higher. Prior to the acuity adjustment, both Groups

had lower productive hours and cost per patient day in the post-treatment period. These results illustrate the importance of the acuity adjustment for an accurate assessment of the cost effectiveness of different nursing care modalities.

Recommendations

It is recommended that further research be undertaken as a result of this study. Very few systematic investigations of the cost effectiveness of different nursing modalities have been conducted; none have tried to control or adjust for patient acuity. There has been a failure to establish standard definitions, to consider multiple factors in a conceptual framework or to demonstrate the reliability and validity of the patient classification system as a means of establishing patient care requirements. Thus, comparisons between and among settings continue to be difficult. Establishing these parameters needs to be a priority in future studies. Until such standards are determined, productivity measurements remain valid only in specific organizations, units or groups monitored over time. These intra-organizational longitudinal assessments could be used to determine which nursing modality is most cost effective in specific settings or conditions.

A follow-up investigation should be done on the units examined in this study which are practicing primary nursing. By measuring the productivity of the Study units after they have had time to adjust to the many changes which occurred during the study year, it

may be possible to determine if the improvement in productivity will continue to the extent that not only productive hours, but costs will be significantly lower than the units practicing modular nursing. By measuring the productivity of the Primary units, it may be possible to determine if extraneous factors did in fact cause the loss of productivity in the post-treatment period, or whether primary care units are inherently less efficient at a lower acuity.

Further research is needed to identify and better control the various extraneous factors which impact a unit's productivity. Two areas of special interest are the scope and acceptance of the management role by the unit supervisor and the impact of the unit's clinical speciality in explaining some of the variation in productivity among units.

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APPENDIX A

PATIENT ACUITY CLASSIFICATION SYSTEM

Phase I of the patient acuity classification system, developed by the hospital's nursing department in cooperation with the Medco Corporation and a private consultant, was initiated on the ten medical-surgical units in this study in March, 1982. The system is based on a nationally developed and federally supported (HRA 74-25) methodology modified specifically for this institution.

Four patient-acuity categories were established by application of 33 weighted patient-specific criteria. The criteria applicable to each patient are determined daily by the professional nurse staff and are marked accordingly on the Patient Classification Form. Each categorized patient is designated as a patient day in this system. The patient classification mark-sense forms are read through a Scantron (R) which interfaces with the nursing department's micro-computer to sum the weights of each criterion for each patient to determine the appropriate category:

		Acuity Point Totals
Category I	=	1 - 24
Category II	=	25 - 69
Category III	=	70 - 119
Category IV	=	> 119

Once the nursing staff on the ten units were oriented to patient classification, initial interrater reliability of the classification instrument was established through weekly auditing of randomly selected days and patients by Unit Supervisors on their own unit. An initial acceptable level of 90 percent was targeted and achieved by all units in December, 1982. The system

was now ready to be used as the basis for daily staffing.

Implementation of Phase II of the system in which a 24-hour predictive staffing guide based on patient acuity was computed daily for each unit for actual staffing on each shift took place over a five month period:

Unit	Date
A	12/6/82
B	2/1/83
C	12/6/82
D	4/4/83
E	12/6/82
F	2/1/83
G	2/1/83
H	3/1/83
I	4/4/83
J	4/4/83

The Predictive Staffing Guide is computed following the categorization of each patient. The total number of each patients in each category is summed for each unit. This sum is multiplied by the unit-specific, weighted productive hour for each staff level for each shift. These hours are based on the individual unit's labor budget and an industrial engineering workload study conducted by Medco Corporation on the ten medical-surgical units in this study in March and April, 1982. An example calculation for one unit is as follows:

Unit J: Acuity Weighted Productive Hours

C	EVENING R.N.	EVENING LPN	EVENING AIDE	NIGHT R.N.	NIGHT LPN	NIGHT AIDE	DAY R.N.	DAY LPN	DAY AIDE	TOTAL
1	0.97	0.00	0.00	0.69	0.00	0.00	1.24	0.00	0.00	2.90
2	1.25	0.00	0.00	0.89	0.00	0.00	1.60	0.00	0.00	3.74
3	2.03	0.00	0.00	1.45	0.00	0.00	2.60	0.00	0.00	6.08
4	3.10	0.00	0.00	2.21	0.00	0.00	3.99	0.00	0.00	9.30
5 *	1.18	0.00	0.00	0.84	0.00	0.00	1.52	0.00	0.00	3.54

*Admissions

Unit J: 1983 Productive Labor Budget

UNIT J BUDGETED CENSUS = 34.0 TARGET NURSING HRS. PER DAY = 4.94

SHIFT	R.N. VAR	R.N. FIX	R.N. TOT	LPN VAR	LPN FIX	LPN TOT	AIDE VAR	AIDE FIX	AIDE TOT
DAY	8	0	(8)	0	0	(0)	0	1	(1)
EVE	6	0	(6)	0	0	(0)	0	1	(1)
NITE	4	0	(4)	0	0	(0)	0	1	(1)

Computation of the above statistics by the microcomputer provides a 24-hour, three shift predictive staffing guideline for each study unit.

Example staffing calculation for 35 patients on Unit J for the day shift:

Category	Patients		7 am - 3 pm RN Productive Hour		
1	7	x	1.24	=	8.68
2	13	x	1.60	=	20.8
3	7	x	2.60	=	18.2
4	7	x	3.99	=	27.93
5	0	x	1.52	=	0.0
	n = 34			=	75.61 hours

75.61 - 1 fixed NA (8 hours) = 67.61 Hours ÷ 8 = 8.45 hours

7 am - 3 pm Unit J Staffing Guide

RN	LPN	NA
8	0	1

Interrater reliability of the classification instrument continues with weekly cross-unit auditing of randomly selected days and patients by Unit Supervisors. The department total for agreement on patient category from January through September, 1983 is 85.7% based on the cross audit of 9,644 patients.

APPENDIX B

OFFICAL CORRESPONDENCE

ST. VINCENT HOSPITAL & MEDICAL CENTER
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SISTERS OF PROVIDENCE
SERVING IN THE WEST SINCE 1856

April 16, 1983

Ms. Jane Smith, R.N.
Director of Nursing Services
St. Vincent Hospital and Medical Center

Dear Jane:

This letter will verify my support and encouragement of your work in completing your Master's Thesis: A Cost Comparison of Primary vs Modular Nursing Care Modalities in an Acute Care Setting". I understand and accept that the cost analysis of primary vs modular nursing practices will be accomplished in association with your duties and responsibilities as Director of Nursing Services.

I also want to confirm our understanding of the approach you will take in collecting the data for your thesis. Average salary rates may be obtained from the Personnel Department. The data on productive hours will be obtained from cost center summary records and no individual employee records will be used at any time. This will assure confidentiality and anonymity for St. Vincent Hospital and Medical Center employees while providing you the data you need.

Best wishes for an excellent thesis.

Cordially,

[redacted]

Stanley T. Urban
Associate Administrator

STU:clw

ABSTRACT

AN ABSTRACT OF THE THESIS OF

JANE A. GERLAUGH SMITH

For the MASTER OF NURSING

Date of Receiving this Degree: June 8, 1984

Title: A COST COMPARISON OF PRIMARY VERSUS MODULAR NURSING CARE MODALITIES IN AN ACUTE CARE SETTING: A RETROSPECTIVE STUDY

Approved: _____
Linda Kaeser, Ph.D., Thesis Advisor

The purpose of this study was four-fold: 1) to determine if less mean productive hours and costs were expended per acuity adjusted patient day on units practicing primary nursing when compared to the mean productive hours and costs per acuity adjusted patient day expended on units practicing modular nursing; 2) to determine if lower mean productive hours and costs per acuity adjusted patient day were expended by nursing units converted to primary nursing prior to the study when compared to the expenditures of those units converted to primary nursing during the study; 3) to determine if less mean productive hours and costs per acuity adjusted patient day were expended on nursing units converted from modular to primary nursing during the seven month period after their conversion when compared to their expenditures during the five month period prior to their conversion; 4) to determine if the mean productive hours and costs per acuity adjusted patient day expended on nursing units which did

not change their modality of practice during the study were not lower during the last seven months of the study as compared to their expenditures during the first five months of the study.

A twelve month non-equivalent control group design was employed and data were collected from ten medical-surgical nursing units located in one community hospital. Two units had converted to primary nursing prior to the study, four units practiced modular nursing throughout the study, and four units were converted from modular to primary nursing during the study. Productive hours for all Registered nurses, Licensed practical nurses and Nurse aides were extracted from the records for a five-month base period and a seven-month post-treatment period. Productive hours costs were calculated using an average salary rate for each job family. The mean productive hours and costs for each unit were adjusted for patient acuity for the twelve month period. The data were then analyzed by computing the t-test.

It was found that in three comparisons, groups practicing primary nursing expended fewer productive hours and cost per acuity adjusted patient day than the groups practicing modular nursing. Only the hours were significantly lower. Contrary to the hypothesis, the group which had previously converted to primary nursing had significantly higher hours and costs than the Study Group in the post-treatment period.

The Study Group expended significantly less hours and costs after conversion to primary nursing. Finally, the Primary Group expended significantly higher productive hours per acuity adjusted

patient day in the post-treatment period, contrary to the hypothesis.

Generalization of these findings to other acute care settings must be made with caution since the sample was drawn from only ten units in one hospital, productivity was measured for only five months prior to initiation of primary nursing on the units and no attempt was made to measure the impact of the individual unit supervisor's performance on productivity.