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Analysis of Nursing Care Hours in Selected Diagnostic Related Groups Using Patient Classification System Methodology

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By

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ABSTRACT

ANALYSIS OF NURSING CARE HOURS FOR SELECTED DIAGNOSTIC RELATED GROUPS USING PATIENT CLASSIFICATION SYSTEM METHODOLOGY

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The purpose of this study was to explore if Patient Classification System (PCS) methodology provides reliable information which can be used to identify differences in resource use within specific DRGs. This descriptive study utilized t-tests, standard deviations and product-moment correlations to examine the variability of mean Nursing Care Hours (NCH) and Length of Stay (LOS) and to determine if any relationship existed between these two variables for 227 subjects in four DRGs at two study sites. A significant difference in mean Nursing Care Hours between sites was noted for DRG #14 (CVA), which also displayed the greatest amount of variability in NCH. Acute MI, DRG #122 was the only DRG which had a significant correlation between LOS and NCH. This study adds to the literature which suggests that the use of PCS methodology is a valid and reliable framework for identification of nursing resource use within DRGs.

This work is dedicated to my husband, Rick, who consistently gives of himself unselfishly to support me in my endeavors.

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CHAPTER 1

INTRODUCTION

A revolution is under way in the health care industry. The escalating cost of health care has become the object of increasing national concern and attention, and much of that attention has been focused on the hospital as a major provider of healthcare services. Nursing care is the primary reason for hospital admission. Almost all other hospital services (lab, radiology, therapy) can be obtained on an outpatient basis (Bailie, 1986; Curtin, 1983). Therefore, controlling the cost for the service provided by hospitals is to a great degree, control of nursing costs. The current reimbursement system does not provide for differentiation in the intensity of the illness, nor does it account for variation in nursing resource use. It must be linked with a system that will identify nursing resource use to enable accurate cost containment strategies as well as accurate treatment cost estimates. This study will explore the use of one such system, the Patient Classification System, to identify nursing resource use by individual patient within selected DRGs.

Health care costs have consistently increased as a percentage of the Gross National Product (GNP), especially in the last decade (Stanfill, 1985; US Bureau of Census, 1981). The

United States government is the largest consumer of healthcare services, paying for over 50% of the nations healthcare bill through Medicare and Medicaid (Davis, 1985). Efforts to curb the seemingly endless increases in cost generated from the fee or service orientation of the past have led to major reforms in federal payment for health care in the last six years.

Diagnostic Related Groups (DRGs) were introduced in 1983 as the method to decrease healthcare costs by shifting from a fee-for-service retrospective reimbursement scheme to a prospective payment system (PPS). In a PPS the amount of payment is preset, and fixed reimbursement is received after discharge regardless of cost incurred. Therefore, if a healthcare provider, such as a hospital, incurs costs which exceed the amount of reimbursement the provider experiences financial loss. If the cost is less than the reimbursement the provider will realize financial gain.

DRGs, developed by Yale University researchers classify diseases (as listed in the International Classification of Diseases - Adapted 9th Edition, otherwise known as ICD9-CM) into twenty three major disease categories organized by body systems, with further classification into one of 467 distinct DRGs. Each DRG contains over twenty diagnoses. The DRG system is based upon an assumption that all patients in the same DRG will, on the average, require the same amount of care or resource utilization. Patients are assigned to a specific DRG at

discharge based on the principal diagnosis, other illnesses or conditions (secondary diagnoses),principal surgical procedures, and age.

DRGs currently serve as the basis for payment for services rendered to Medicare patients only, but are expected to be adopted by all third party payers within the decade (Curtin and Zurlage, 1984). At present, each DRG has a fixed payment amount, and payments to hospitals are considered to be payment in full regardless of the cost incurred with each hospitalization. The intent of the DRG system, as with any PPS, is to provide economic incentive to hospitals to deliver care in the most cost-effective manner possible, since the hospital will experience losses unless costs can be maintained at or below the fixed reimbursement rate.

DRGs have consistently been criticized for failing to incorporate intensity of illness, which has been shown to cause variances in the cost of care (Bailie, 1986; Bargagliotti & Smith, 1985; Fosbinder, 1986; Halloran, 1985; Horn, 1983; Horn, 1987; Lagona & Stritzel, 1984; Lucke & Lucke, 1986; McCormick, 1986; McKibben, Brimmer, Clinton, Galliher & Hartley, 1985; Mitchell, Miller, Welches & Walker, 1984; Mowry & Korpman, 1985; Prescott, 1986; Reschak, Biordi, Holm & Santucci, 1985; Sovie, Tarcinale, VanPuttee, & Studen, 1985; Trofino, 1986). To provide accurate predictions of treatment costs without causing a reduction in the quality of health care, the DRG system must

be correlated with a system which will identify the intensity of illness or amount of nursing resources required. Patient Classification System (PCS) information, a nursing classification system, can provide the missing factor of nursing resource use that is needed to link the DRG medical classification system with total patient care costs.

At present, reimbursement for nursing service is not directly affected by DRGs. The costs for nursing care are included in the DRG payment as are the costs for all the hospital services. Competition for the scarce dollars has increased since hospitals have been forced to reduce expenses. All services within the organization (for example nursing, dietary, etc.) have come under close fiscal scrutiny, and are forced to justify their expenses. Because nursing service represents 30-50% of the typical hospital labor budget (Bailie, 1986; Coleman & Smith, 1984; McCormick, 1986; Riley & Schaefers, 1983), it too is having to confront cost-cutting measures. Nursing must be able to identify and control its costs to obtain the share of shrinking hospital budget dollars necessary to provide quality care. Costs of delivering care cannot be controlled, however, until each cost is individually identified.

Furthermore, if the actual costs for nursing care services can be identified, hospital accounting practices can be altered to establish nursing as a revenue center. That portion of the reimbursement which represents nursing's cost would be allocated

to the nursing service budgets, thereby maintaining nursing control over nursing resources. The traditional financial view of nursing as a cost center has contributed to the lack of autonomy and the absence of fiscal accountability within nursing. Establishing nursing as a revenue center would promote the image of nursing as a valuable service, and would strengthen and enhance professional practice by validating that the nursing division makes a contribution to the financial stability of the institution.

Problem Statement

The DRG reimbursement system has been implemented as an initial means of cost-containment for healthcare costs. At present the DRG system only applies to Medicare patients, but is expected to be utilized by most insurance companies in the near future. Because the DRG system does not adequately address amount of nursing resource use per patient, which has been shown to affect the cost of a hospital admission, the DRG system must be coupled with a system which measures nursing resource use. Patient Classification Systems (PCS) provide a specific measure of nursing resource use, and are a workable adjunct to the DRG system. The combination of DRGs and PCS is necessary to provide an accurate cost framework for healthcare.

Purpose

The purpose of this study is to explore if Patient Classification System methodology, which is already in common

use, does provide reliable information which can be used to identify differences in resource use within specified DRGs.

CHAPTER 2

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

Review of Literature

Implementation of the PPS using DRGs is based on the assumption that DRGs identify groups of patients with similar (homogeneous) resource use, including nursing care. However, the majority of literature firmly establishes that the resource utilization patterns within DRGs are actually heterogeneous (Bargagliotti & Smith, 1985; Fosbinder, 1986; Lagona & Stritzel, 1984; McCormick, 1986; Mitchell et al., 1984; Mowry & Korpman, 1985; Reschak et al., 1985; Sovie et al., 1985; Trofino, 1986, 1989a, 1989b). This established heterogeneity within DRGs which may be caused by severity of illness raises doubts as to the accuracy of reimbursement levels within DRGs.

McKibben et al. (1985) and Trofino (1989a) performed the latest studies which suggest that the variations in resource utilization may not be a great as originally thought. These two studies conclude that there are at least some DRGs which are inaccurate from the standpoint of resource utilization and so require revision. One of these authors, Trofino (1989b), stated that this trend toward homogeneity within DRGs may be surfacing as nurses and hospitals comply with established DRG

standards for length of stay and urged further refinement of the DRG system to improve accuracy in payment.

A second dissenting opinion is presented by Cromwell and Price (1988), who simulated the effects of variance reported by one nursing study (Sovie & Smith, 1986) in NCH/DRG on the actual DRG cost weights and found little effect (only 2% increase or decrease at most in reimbursement levels). Cromwell and Price also identify the need for further refinement of the DRG system and concur that DRG pricing is currently inaccurate.

The conflicting reports in the literature serve as impetus for further study to determine if the DRG system is indeed inadequate from the perspective of variation in resource use, and therefore costs, of patient care.

Severity of Illness Measures

In response to the repeatedly identified shortcomings of the DRG system a number of tools to measure illness severity. These severity of illness measures have been presented in the literature as methods to provide DRG adjustments, and are discussed below.

Relative Intensity Measures (RIMs).

The RIMs method was developed through the cooperative effort of the New Jersey Department of Health and the Health

Care Financial Administration in 1977. Each RIM is actually one minute of nursing resource use. The cost per RIM is based on the relationship between total nursing cost within the hospital and total minutes of nursing resource use. Patients are categorized into one of thirteen Nursing Resource Clusters (NRCs). Each NRC has associated RIMs or minutes of care which is then used to allocate nursing costs to the patient (Caterinnicchio, 1984).

The RIMs method was intended for use by the state of New Jersey for modification of DRGs, but has been abandoned at present because of multiple protests that it is inadequate. The RIMs method has been faulted for having methodological failures in design (Reschak, Biordi, Holm, & Santucci, 1985; Thompson, 1984) and is also complicated as it requires working with many algorithms, equations and decision trees to arrive at the appropriate NRC for each patient (Joel 1984). Furthermore, Thompson (1984) noted that RIMs is based on linear equations (which assumes the same incremental value of nursing resource use each day) and is derived from the Multiple Diagnostic Categories (MDCs) which contain even more variability than DRGs. Consequently, the RIMs method is no longer considered a viable alternative for identification of variability.

Severity of Illness Index (SOII).

The Severity of Illness Index was initially developed by Horn and associates (Roveti, Horn & Kreitzer, 1980) as the AS-Score method of analysis of severity of illness. This multi-attribute clinical index incorporated five variables; age, involved body systems, stage of illness, complications, and response to therapy, into a casemix to account for severity of illness. Later the variables were revised to seven: stage of principle diagnosis, interactions (comorbidities), response to therapy, residual (remission), complications, dependency and procedures. The tool was then renamed to its current title, Severity of Illness Index (SOII). Each variable is coded with a score of one to four, with four being catastrophic.

Concerns regarding the SOII include subjectivity of the raters who perform the chart review after discharge and the cost required to have the coding performed (Horn, 1987). These concerns have currently been addressed by the development of a computerized version of the SOII, called CSI which uses a sixth digit (after the five digit ICD-M code) to code the severity of illness. Coding is performed by computer program which decreases personnel time.

Additional concerns (Curtin, 1983; Reitz, 1985b) revolve around the variables identified by the SOII, which are medical. Psychological and social variables, which Horn admitted have impact on illness and recovery (Horn, 1987) are

not addressed. This is a major fault in the SOII system since Reitz (1985b) has substantiated that emotional response has the greatest explanatory power for variation in illness. In addition, there is no adjustment for nursing intensity with the exception for the dependency rating, which is equally rated with the other six variables. Curtin (1983) suggested that nursing intensity should be included as a weighted factor which reflects nursing costs. It is anticipated that Horn's SOII may be adopted by the federal government as the method for adapting DRGs for severity, but even if this method is incorporated a major piece of the severity of illness scheme, psychological and social factors, will be missing.

Nursing Intensity Index (NII).

The NII, developed by Reitz (1985a) at Johns Hopkins Hospital, is a retrospective PCS based on the Nursing Process which focuses on the patient not discrete tasks (on which PCSs frequently focus). Eleven functional health parameters are rated on a four point ordinal scale (1-low, 4-high) based on the amount of nursing resources required. The audit is performed after discharge and requires specially trained raters, whose inter-rater reliability must be documented.

Using the NII, Reitz (1985b) studied the variability of NCH within DRGs and found that DRGs were not homogeneous with respect to nursing intensity. The author gives detailed

descriptions of the reliability and validity of the NII, as well as excellent reviews of the statistical measures used to obtain the results. Of the eleven indicators, emotional response demonstrated the greatest explanatory power for variability of nursing intensity (Regression analysis, r =.419 if all predictors are considered separately). The best combination of predictors were emotional response, elimination and circulatory function (r =.646 for the three combined). NII had a positive correlation with SOII (r=.61) and a moderately positive correlation (r=.47) with LOS. Small sample size in many DRGs studied (only one case in some) and collection of data at only one institution limits generalization of these findings (Reitz, 1985b). Bailie (1986) reported similar results when replicating this research by studying the variation in nursing intensity of three DRGs using the NII.

The NII, a retrospective classification scheme performed after discharge, requires additional manpower to perform audits. NII is, in fact, another PCS tool. PCSs are already utilized in the majority of hospitals. Rather than introducing another single use classification system it seems more reasonable to utilize readily available PCS data which has multiple uses (e.g. staffing) and which does not require additional staff to collect.

Nursing Diagnosis.

Halloran (1985) was able to show that Nursing Diagnosis explained more of the variability in nursing care than selected DRGs. However, there has been little other work to substantiate the role of nursing diagnosis in identifying severity or intensity within DRGs since this original study. This is probably because Nursing Diagnosis requires more development and consistent usage across the nation, (although JCAHO has mandated the use of Nursing Diagnosis in care plans since 1982) before it can be used as a valid indicator of nursing intensity (Thompson, 1984). Thompson suggested that estimates of intensity for single Nursing Diagnoses and combined Nursing Diagnoses must be developed in the form of algorithms before use of Nursing Diagnosis to identify intensity will be possible. Eventually PCSs which classify patients by Nursing Diagnosis may also be developed which will enable classification by Nursing Diagnosis with assigned intensity (Trofino, 1989b).

Patient Classification Systems (PCS).

A growing body of literature indicates that the use of PCS methodology is an acceptable method for determining variations in severity within DRGs. The underlying premise of PCS methodology is that variations in intensity of care can be defined, measured and converted into time standards which, in turn, can be easily used to determine the cost of direct care.

Although many of the initial studies have been criticized for lack of consistent comparable data and small sample size (Cromwell & Price, 1988; McClosky, 1989) these studies have served as impetus for further study. Several studies quantified the amount of nursing care per DRG to determine the cost of nursing care within DRGs and found that there was a great degree of variability in severity (as defined by nursing care hours required) both within and among DRGs (Bargagliotti & Smith, 1985; Lagona & Stritzel, 1984; Mitchell et al., 1985; Reschak et al., 1985). Because of generally small sample size and questionable methodology the results of these studies are not readily generalizable.

Further studies explored greater numbers of DRGs with larger sample sizes but with similar results. Mowry and Korpman (1985), Fosbinder (1986), McCormick (1986) and Sovie et al. (1985) all describe results which indicate variability of NCH within DRGs, suggesting that DRGs alone are not predictive of intensity. In addition, these authors described the reliability and validity of their PCS tools, lending further credibility to their results.

Fosbinder (1986) and Reschak et.al (1985) differentiate results between inliers and outliers (patients who exceed the DRG "trimpoint" or designated LOS). Outliers were found to have a higher degree of variation, which is not surprising since they are not within the DRG-specific expectations.

Trofino (1986) also found higher correlation of NCH per DRG between hospitals if outliers were not included. Most studies do not report whether outliers are included in the data. inclusion of only the inliers is recommended to increase homogeneity within the DRG being studied, since outliers by definition are not included in DRG categories and are subject to special reimbursement (Wilson, Prescott & Aleksandrowicz, 1988).

The most widely published work in the area of PCS has been done by Trofino (1986, 1987, 1989a, 1989b) who has consistently found PCS to be a reliable tool across institutions for identifying variations in severity by NCH. Trofino's major research effort over the past four years reported a positive correlation between NCH per DRG using varied PCS methodologies. Although Trofino's (1989a) most recent publication suggested that mean NCH do not vary as much as originally thought (generally nursing resource use was consistent within DRGs) the use of PCS methodology was again validated. Regardless of the result, Trofino's work has done much to establish that PCS is the appropriate tool for identification of intensity of nursing care.

It must be noted that while many authors have chosen to identify the variable cost of nursing care, in doing so they performed the necessary step of determining the intensity, or nursing care hours (NCH) which was then generally multiplied by

average salaries to determine costs (direct and or indirect depending on the study). In order to allow comparison across studies, Wilson et al. (1988) and Sovie et al. (1985) have recommended that NCH be reported as opposed to costs. NCH is a far more applicable standard since cost is affected by many variables which are not consistent between institutions.

As noted above, many authors have concluded that NCHs as identified by PCS may be an accurate reflection of severity of illness. Several of the authors addressed the relationship of NCH per DRG to LOS per DRG to establish whether PCSs can be used as indicators of overall severity of illness and whether nursing intensity (NCH) can be predicted from LOS. Results are mixed.

Mowry and Korpman (1985) found no significant correlation between average daily NCH and LOS. Rieder and Kaye (1985) also found no correlation between mean daily NCH and LOS. On the other hand, McKibben et al. (1985) found strong correlations between NCH and LOS for the majority of DRGs studied. Trofino's work (1989a) also reported a significant positive correlation between NCH and LOS per DRG among and within six hospitals. It must be noted that these two studies, which found positive correlations, also were the only studies which indicated that there was not as much significant variation of NCH within DRG as previously thought.

Recommendation

The question which must be addressed is which system of the many which have been discussed is the most appropriate for use in the modification of DRGs for severity and therefore reimbursement accuracy. In addition to supportive research cited above several authors advocate the use of PCS for identification of severity for the following reasons:

1. PCS incorporates nursing assessment and treatment of the human response in aspects of care not covered by DRGs such as psycho-social, cultural-spiritual, and cognitive-perceptual needs (Curtin, 1983; Mowry & Korpman, 1985)

2. PCS is mandated by JCAHO as a means of determining staffing needs and as such is established in the vast majority of hospitals in this country. Therefore, PCS exists side by side with DRGs in most hospitals and is the most likely vehicle for adapting DRGs to severity or intensity of illness and resultant care needs (Curtin, 1983; Thompson, 1984; Trofino, 1986, 1989a, 1989b)

3. PCS requires no additional personnel or training to code or perform chart review since it is collected daily on nursing units in most hospitals (Thompson, 1984).

4. PCS identifies variation in intensity of illness per DRG through NCH requirements.

The use of PCS must have several guidelines to ensure reliability and accurate data for comparison across studies.

Tools should be factor-evaluation type to maintain objectivity (Trofino, 1986; Giovannetti, 1979) and should be part of the permanent patient record to enable retrospective audit as well as provide documentation for justification of costs. The tool should encompass the nursing process thereby including psychological-social and educational aspects of nursing care as well as accounting for indirect care needed for documentation and evaluation. Documentation of the reliability (at least every other month if less than 90%) and validity is absolutely necessary to ensure accuracy and reliability of results. Systems which classify prospectively must have concurrent retrospective classifications periodically to ensure minimal variance (Trofino, 1986, 1989a).

Conceptual Framework

Theories of organization can be applied to the hospital to gain an understanding of hospital functions. Modern organization theory, also known as systems theory, describes the organization as a system with diverse interrelating subsystems that all contribute to the whole organization (Ziegenfuss, 1985). Systems theory maintains a holistic orientation with emphasis on how the subsystems interrelate, integrate, and relate to the environment in which the system functions.

Kast and Rosenzweig (cited in Ziegenfuss, 1985) describe a socio-technical-system view which defines the organization or system as being composed of five subsystems. Those subsystems are described as follows:

1. goals and values - A combination of the goals and values of the members of the organization as well as those of society. The organization must accomplish goals set for it by society in order to generate resources.
2. technical- Knowledge required to perform tasks that transform inputs (from the environment to the system) to outputs (generated from the system to the environment). The knowledge required is determined by the task requirements of the organization.
3. structural -Ways in which the organizational tasks are divided (differentiation) and coordinated (integration).

The structure is the basis for formal relationships between the technological and psychosocial subsystems.

4. psychosocial - The organizational climate within which people perform roles and activities.

5. managerial - Relates the organization to the environment. Involves goal setting, planning, and designing structure and control processes to coordinate the other four subsystems.

As a whole, these subsystems and their interrelationships are the organization. The system exists within an environment, and the system and it's environment are in constant interaction. Kast and Rosenzweig (1979) also define nine characteristics of the environment:

cultural - The values and norms of the society

technological - The level of technological and scientific advancement of the society.

educational - The general educational level of the society

political - The political climate of the society.

legal - Specific laws governing the society and control of organizations.

natural resource - The nature, quantity and availability of natural resources, including climate.

demographic - Number, distribution, age and sex of members of the society.

sociological - Class structure and mobility, definition of social roles.

economic - The general economic framework of the society.

Systems theory suggests that all organizations co-exist and interact with their environment, therefore the environmental characteristics will inevitably influence the service or product provided by the organization. DRG's were created as a result of several factors in the hospital and general healthcare environment. Increasing technological capabilities within the realm of health care has resulted in more successful treatment for a wider range of diseases than ever before, albeit at a staggering cost. An increase in the educational level of the society as well as education regarding health care generates more demand for the services available.

As the demographic characteristics of the society gradually shift toward an increasingly aged population with multiple chronic illnesses the demand for healthcare will increase even further. The demand for healthcare services has increased and the cost for that care drastically increased also. Therefore, the political climate of the society (which is responsible for a large part of the payment for healthcare services) focused on cost containment. DRGs were developed as an alternative reimbursement strategy intended to meet society's demand to decrease the cost of healthcare.

The hospital organization must accomplish the goals set for it by society to survive. Society's goal for cost containment in healthcare has been assimilated into the goals and values subsystem of the organization, as evidenced by implementation of the DRG reimbursement system. The DRG system has caused massive changes within the hospital system and has impacted every subsystem in the hospital organization.

The managerial subsystem which relates the organization to the environment has had to redesign the delivery of healthcare to control costs within limitations imposed by the DRG system. Redesigning the delivery of healthcare by the managerial subsystem has affected each of the other four subsystems. The technical subsystem has changed in terms of the knowledge required to perform tasks in the most efficient way possible. Kramer and Schmalenberg (1987) have shown that nurses at magnet hospitals identify awareness of cost containment strategies as the most profound change in their knowledge base and practice since 1983, when DRGs were instituted. The structural subsystem changes include implementation of alternative care delivery systems such as increased outpatient procedures, and development of hospital based home health agencies and free standing emergency care centers (Wilson, 1988). The psychosocial subsystem is continuously adapting to changes in organizational climate as members of the organization are faced with the constant change in the other subsystems and the ever

present stress of delivering care more efficiently for less reimbursement (Nursing Life, cited in Kramer & Schmalenberg, 1987).

McCarthy (1988) summarized the changes in the healthcare system since the implementation of DRGs. From 1983 to 1987 hospitals have complied with DRG-imposed controls by decreasing costs in terms of overhead and personnel. Total hospital Full Time Equivalents (FTE, one FTE represents 2080 hours of work per year) have been reduced 114,000. The number of beds has decreased by 45,000 in that same time period. In addition to these decreases in operational costs, changes in methods of delivering care from 1983 to 1987 have accounted for deceased admissions by an average of 2.2% per year (as compared to an average increase of 5.2% per year from 1972 to 1982). LOS has dropped from 10.2 days in 1982 to 8.8 days in 1986. In 1987 a slight increase to 8.7 days is thought to reflect the increased level of illness of hospitalized patients by 1987.

Regardless of the successful attempts of hospitals to conform to DRG guidelines, serious problems have arisen within the hospital itself in terms of inadequate reimbursement and financial loss. Hospitals are failing at an alarming rate. One hundred twenty-eight urban and 116 rural facilities have closed since 1983, a 200% increase form 1980-1983 figures (AHA, cited in McCarthy, 1988). An environment which has lost a hospital then suffers in terms of decreased access to

healthcare. Even if a hospital does not close, the burden of operating under a deficit undermines any attempt to meet debts or maintain an adequate physical plant (McCarthy, 1988).

After five years of continuous interaction between the hospital and its environment, the changes in hospital systems have led to minor changes in DRG reimbursement. But because the key factor of identification of intensity of illness is lacking within the current reimbursement system, these reimbursement changes have been inadequate. It has become obvious that reform of the DRG reimbursement system, in the form of identification of nursing resource use, is imperative. (Shaffer, 1988)

Summary and implications for study

DRG's do not account for variation in nursing resource use or intensity of illness. The DRG system must be linked with a system that will identify nursing resource use to enable accurate cost containment strategies as well as accurate treatment cost estimates and reimbursement rates.

The intent of this study is to compare two separate and distinct Patient Classification System ratings of Nursing Care Hours (NCH) for patients within selected Diagnostic Related Group classifications at two different institutions. It is anticipated that this will further Trofino's (1986, 1989a, 1989b) findings that Patient Classification System methodology is a reliable indicator of nursing resource use within

Diagnostic Related Groups. Variability of LOS within DRGs between the hospitals will also be examined to determine if variation in NCH is related to LOS.

Research questions

1. Is there a significant difference in mean values and variability of predicted nursing resource use (Nursing Care Hours) identified by two different Patient Classification Systems for selected Diagnostic Related Groups?
2. Is there a significant difference between sites in the mean values and the variability of Length of Stay within selected Diagnostic Related Groups?
3. Are predicted Nursing Care Hours identified by two different Patient Classification Systems correlated to Length of Stay within each selected Diagnostic Related Group?

Definition of terms

Diagnostic Related Groups (DRGs). Classification system developed by Yale University researchers to place disease processes into twenty three major disease categories (MDCs) organized by body systems. The twenty three MDCs are further broken down into 467 DRG's, with each DRG containing over twenty medical diagnoses. It is assumed that all patients within the same DRG will consume the same amount of resources, therefore each DRG has a fixed payment amount which is reimbursed to hospitals. This amount of reimbursement is considered payment in full regardless of the actual cost of care. The DRG system has been adopted by the federal government as the method of payment for treatment of Medicare patients

Patient Classification System (PCS). A PCS is a nursing classification system which categorizes patients according to their nursing care needs, or nursing resource use. The PCS included in this study utilize tools which list critical indicators used to objectively identify nursing care requirements for each patient. The total of the indicators is used to place the patient into one of several categories which have associated research-based relative weighting statistics. The relative weighting is then used to determine workload, i.e. Nursing Care Hours per patient.

Nursing Care Hours (NCH). The amount of time a nurse spends caring for a specific patient. NCH are determined through time standards associated with the Patient Classification System.

Length of Stay (LOS). The number of days a patient is in the hospital for one admission.

Inliers- Patients whose LOS is within the limits established for the specific DRG they are assigned.

Outliers - Patients whose LOS or total cost of current admission exceeds the limits established for the specific DRG to which the patient is assigned.

CHAPTER 3

METHODOLOGY

Study sites

The study was conducted in two Joint Commission on Accreditation of Hospital Organization (JCAHO) accredited private not-for-profit community hospitals in the Midwest. The hospitals were chosen for participation on the basis of the following criteria: (a) Use of a factor-type PCS with documented validity and reliability. Results of daily classification using the PCS must be a part of the permanent patient record or retrievable through the billing procedure; (b) PCS includes assessment parameters of emotional and teaching needs; (c) amount of NCH assigned to each patient per day must be retrievable (a constant assigned to the PCS system levels).

Because one of the variables in this study is LOS, factors which may affect LOS at each hospital were examined. The number of nurses available to care for patients may affect the time of discharge or admission, therefore affecting LOS. Specific factors relative to the effects of the national nursing shortage were examined at each site. RN turnover rates (including open positions) for 1989 were less than one percent at site A, and three percent for site B during 1989. Both institutions general hourly wages for RNs were competitive with (similar to) other area hospitals. Hospital policy at both institutions was to

replace RN shift vacancies with RNs, and the critical care areas were not closed at any time during 1989 because of census which exceeded staffing capabilities. Therefore,the nursing shortage did not appear to affect either site during the study period of January through June, 1989.

Approval of the research proposal was obtained from the Human Subjects Review Board of Grand Valley State University and from each participating institution through appropriate institutional committees (see Appendices A,B and C).

Study design and sequence

This descriptive study compared NCH predicted (dependent variable) by two different PCS's (independent variable) for selected DRGs to determine if a significant variability in NCH exists for the DRGs being studied.

Two DRGs shown to have high variability of NCH as well as two which have been shown to have low degree of variability (McKibben et al., 1985; Trofino, 1989a) were studied at both sites. The DRGs were:

High variability

DRG # 14 Specific cerebrovascular disorders, except TIA

DRG # 127 Heart failure and shock

Low variability

DRG # 122 Circulatory disorders with acute MI, no complications

DRG # 140 Angina Pectoris

DRG casemix reports from each site were used to identify all patients within the four specified DRGs for the data collection period of January 1, 1989 through June 30, 1989.

To increase homogeneity of the population sample being studied, only patients whose length of stay were within DRG trimpoints and those patients who were cared for in acute care inpatient areas (including ICU and medical units) were included. After elimination of outliers from the casemix report a random numbers table (matched to the last three digits of the Medical Record number of the patient) was used to randomly select the sample of 30 subjects per DRG per institution. This stratified random sampling procedure enabled greater generalization of the findings.

The daily acuity or NCH of each patient in the sample population was identified by a computer report which linked the patients billing information and DRG information together through use of the medical record number. This computer report provided the following information: DRG number, patient name, age, LOS, daily unit location of subject and corresponding acuity level or NCH for each day.

The original inclusion of the patient name was necessary to enable elimination of the small percentage of patients whose care was supervised by an RN case manager which may have affected LOS outcomes. These case managed patients were eliminated along with DRG outliers prior to the random selection

procedure for sample selection. Confidentiality was maintained through coding of each set of patient data with the medical record number for that patient with the prefix "A" or "B" to designate the two different data collection sites for tabulation of data. The patient name was not included in any tabulation or data analysis by the researcher. As an additional precaution to protect patient confidentiality all computer generated lists with patient names were destroyed after corresponding data with the medical record number was entered into the researcher's computer data base.

A mean NCH for each DRG was calculated for each site using the individual NCH values of all patients within that DRG. The LOS of each patient was calculated, and the mean LOS for each DRG at each site was also determined.

Instruments

The PCS tool used at each site was an internally developed factor-type tool. Copies of both tools are appended (see Appendices E and F). The two tools were similar with regard to the number and characteristics of indicators. Site A had 40 indicators and Site B had 37. General categories of indicators included activities of daily living (ambulation, feeding, elimination), skin and wound care, assessments, monitoring, patient sensory deficits, teaching and emotional needs. Out of 77 total indicators, 66 were similar (85.7%). Differences were in terms of levels within general categories (for example,

frequency of monitoring). In addition, each tool had independent indicators (total of 11) not included on the other tool.

Time values for indicators similar between the two tools were identical for 39.4% of the indicators. Indicators which vary in time values had a range of five to 75 minutes, with an mean of 20 minutes and a mode of five minutes. These differences in time values, as well as the differences in independent indicators of each tool may affect the overall point total for a patient, which may affect the category and therefore NCH for that patient. However, both PCS tools had a range of total points for each category. This category range minimizes the effects of both high and low values, making instances of several points of variance per patient less significant.

Site A

Site A was a 204 bed community hospital which offered services in Medical, General Surgery, Pediatrics, Obstetrics/Gynecology/Post Partum, Psychiatry, Orthopedics, Critical Care and Emergency Care. Site A used a factor-type tool, developed internally in 1983. Modifications were made to the original tool in subsequent years to maintain content validity. One instrument was used for all units, with the exception of the Emergency Department and Labor and Delivery. A specific psychiatric tool was under development during the data collection period, although it was not used in the study.

The tool consisted of 40 indicators which were descriptive of a patient's possible nursing needs (see Appendix E). Indicators were defined and illustrated with examples on a four page Patient Condition Indicator guide available on each unit. Each indicator had an assigned weighting factor which was time-related, and statistically derived from time studies. Indirect time allowances were also incorporated into the weights. Validation of the time related weights occurred on a routine basis (every 3-4 years at most) under the guidance of the MSN prepared Coordinator of Nursing Systems with consultation of a time management engineer. The most recent revalidation was in 1986.

Classification was performed on a daily basis (before 11am or within eight hours of admission) for a 24 hour period. Modifications could be performed on a shift by shift basis as required by change in patient condition. Indicators applicable to the patient were highlighted with a lightpen an a computer screen. The most recent previous classification was maintained on the screen for comparison until replaced with the current classification. The computer prevented some types of mis-classification by disallowing certain combinations of indicators (for example, medium and high frequency of mobility assistance cannot be chosen).

The total of indicator weights for each patient was calculated by computer program and converted into one of five

categories (based on ranges of total indicator weights). The category appeared on the computer screen and was manually entered into the patient chart for billing purposes. Category totals were then downloaded, or transferred, to a central personal computer for hours per shift and skill mix calculations which determined staffing for each unit.

Content validity of the PCS was documented during the original development of the tool, and maintained by annual review of indicators by the PCS Committee, comprised of expert staff nurses and the Coordinator of Nursing Systems. Addition and deletion of indicators occurred as current changes in practice dictated. New indicator weights were determined through time studies. Thus content validity and criterion-related validity were maintained.

Interrater reliability was determined by monthly audit, performed by PCS Committee members. Total agreement between actual and audited classification category was reported. The range during the period of data collection was from 84% to 99%, with an average for the six month period of 91%. Individual criteria selection agreement (interrater reliability) was also determined for each audited chart to determine accuracy of prospective classification as compared to retrospective classification. Individual follow-up with the nurse who completed the classification addressed inconsistency with interrater reliability.

Site B

Site B was a 304 bed community hospital which offered services in General Surgery, Medical, Pediatrics, Obstetrics and Newborn Nursery, Intensive Care, Telemetry, Orthopedic, Rehabilitation, Hemodialysis, and Emergency Care. Site B utilized an internally developed PCS based on the Medicus tool. Medicus was in use at Site B until 1988 at which time the institution chose to discontinue use of the Medicus PCS. The tool itself was retained but paired with internally developed staffing algorithms based on weighting of the indicators on the Medicus tool. The hospital-specific weights for the indicators were determined on site through observational time studies performed by a time management engineer and an outside consultant.

The tool was a factor evaluation tool which used 37 critical indicators to objectively categorize a patient into one of five categories (Appendix F). Although the same tool was used throughout the institution, there were unit-specific category spreads with shift-specific minutes of care for each category.

Classification of patients using the critical indicators was performed on a daily basis (prior to 09:45) on unit based computer terminals. Nurses chose indicators appropriate for each patient. Definitions and guidelines for use of the indicators were available on each unit. The unit classification

information was downloaded to a central personal computer on which calculations were performed to determine total number of patients per category per unit, and total minutes of care per unit per shift for a 24 hour period. Additional calculations were performed on the personal computer to determine staffing needs based on the shift specific total minutes of care for each unit.

Content validity of the tool was documented by Medicus, most recently in 1983 with demonstrated predictive validity of 89-95% (S. Wayde, Medicus Nurse Consultant, personal communication, January, 1990). In addition, the criterion-related validity of the time standards associated with the use of this tool at Site B were validated in 1988 with observational time studies.

Interrater reliability was documented through concurrent peer review of classifications by designated staff auditors on a biweekly basis. A random sample of records were reviewed based on a percentage of total unit census. Reliability of 85% or better during this study's data collection period was documented in areas included in the study. Individual criteria selection agreement (criteria reliability) was also determined for each audited chart to determine the accuracy of prospective classification as compared to retrospective (audit) classification. Individual variances were addressed with the nurse to improve future interrater criteria reliability.

Data Analysis

Data were collected from charts generated by discharges from January 1, 1989 through June 30, 1989. Lists of cases which were included under the four specific DRGs being studied were obtained from each institution's Medical Records department. Random selection was instituted as described in under the Study Design section. These data were manually entered on specific data collection sheets (see Appendix D), and then entered into the SPSS/PC+ database for analysis.

Data collected for this study were ratio level data. Mean, variance, standard deviation, and minimum and maximum values were determined for NCH per DRG and LOS per DRG for each site. Two-tailed t-tests were conducted within each DRG data set to determine if there were significant differences between sites in mean NCH and mean LOS by DRG. Standard deviations were calculated and used as the measure by which to compare variability in NCH and LOS for each site by DRG. A Pearson product-moment correlation was performed between NCH and LOS for each DRG to determine if there was a relationship between LOS and NCH. Significance level for these data was set a $p<.05$, consistent with studies which have no direct impact on human treatment.

The mean has been chosen as the measure of central tendency for this ratio level data as opposed to the median or mode. The median ignores actual values above and below it which

may have impact when manipulating ratio level data. The mode is generally not a good measure of central tendency with ratio level data. Although extreme values above and below the mean can affect the mean, outliers have already been eliminated from the sample, therefore a realistic representation of the mean which takes into account patient variability, was expected. In addition, the DRG system is based on means, therefore, comparison of values within DRGs should also utilize the mean as the measure of central tendency.

Minimum, maximum and range of total NCH and LOS for each patient by DRG for each site were also included as indicators of variance within each DRG. As noted above, the mean is expected to be representative of the entire sample within each DRG by site, however, it is important to examine individual variability as well to determine if a system based on means provides adequate reimbursement.

CHAPTER 4

RESULTS

Characteristics of Sites

This descriptive study was carried out using two study sites which were private not-for-profit community hospitals in the Midwest accredited by the Joint Commission on Accreditation of Hospitals Organization. Sites were chosen for inclusion in the study based on the following criteria:

1. Use of a factor-type PCS tool with documented validity and reliability.

2. Results of daily classification and the associated hours of nursing care must be retrievable through the medical record or the billing process.

3. PCS included the assessment of emotional and teaching needs.

Based on similar values for RN turnover, RN vacancy rates and salaries and census related closures at both sites, it was assumed that the national nursing shortage did not affect either site during the data collection period. Therefore, factors impacting LOS were not believed to be related to a shortage of nursing staff.

Data from a total of 227 patient records were included in the study. Initially the study population was set to be 30

cases per site for each of the four DRGs (total of 240 cases). For DRG #14, Cerebrovascular Accident, there were not thirty inlier cases at either site, therefore all inlier cases were included. At Site A some cases in each of the remaining three DRGs were discarded due to incomplete data, reducing the number of cases included in the sample. The number of cases per DRG by site for the sample were: Cerebrovascular Accident (DRG #14), Site A 26 cases, Site B 27 cases; Acute MI (DRG #122), Site A 29 cases, Site B 30 cases; Congestive Heart Failure (DRG #127), Site A 29 cases, Site B 30 cases; Angina (DRG #140), Site A 26 cases, Site B 30 cases.

The DRG LOS trimpoint for Cerebrovascular Accident (DRG #14) is 7.0 days. For the 53 cases in this DRG the LOS ranged from two to seven days. Total NCH ranged from 3.7 hours to 77.0 hours. Acute MI (DRG #122) has a LOS trimpoint of 6.8 days. The LOS for the 59 cases in this DRG ranged from one to seven days. Total NCH ranged from 4.3 hours to 61.2 hours. CHF (DRG #127) has a DRG LOS trimpoint of 6.2 days. The 59 cases in the CHF group had a LOS range of one to seven days. Total NCH ranged from 6.1 hours to 53.2 hours. The DRG LOS trimpoint for Angina (DRG #140) is 4.1 days. For the 56 cases in this DRG the LOS ranged from one to five days. The Total NCH ranged from 2.2 hours to 37.9 hours.

Research Questions

Three research questions were investigated in this study. The first question was: Is there a significant difference in the mean values and variability of nursing resource use (Nursing Care Hours) identified by two different Patient Classification Systems for selected Diagnostic Related Groups?

Mean NCH for each DRG by site were calculated. Because of the unequal number of cases in the site groups the assumption of equal variance was tested. Results were insignificant for all DRGs except Cerebrovascular Accident (DRG #14). Separate variance t-test was conducted on the means of the two groups for this DRG. For the three remaining DRGs the assumption of equal variances was verified, therefore pooled variance t-tests were performed.

Data analysis indicated that there were no significant differences between sites in mean NCH predicted by the two PCSs for three of the four selected DRGs (see Table 1). The t-tests for those three DRGs (Acute MI, DRG #122; CHF, DRG #127; and Angina, DRG #140) were statistically insignificant at the $p<.05$ level. Cerebrovascular Accident (DRG #14) displayed statistically significant differences in mean NCH between sites.

Mean NCH (Table 1) were consistently slightly higher at Site A than at Site B. Site A also consistently exhibits more variability per DRG than Site B. The greatest degree of

variability in NCH per DRG exists in Cerebrovascular Accident, DRG #14.

Table 1

T-test for Nursing Care Hours for Selected Diagnostic Related Groups at Two Study Sites

DRG by Site[a]	Mean	SD	t-test	p
CVA (#14)				
Site A	6.53	3.21	2.09	.044*
Site B	5.09	1.43		
Acute MI (#122)				
Site A	8.09	2.62	1.25	.216
Site B	7.31	2.16		
CHF (#127)				
Site A	5.79	1.92	.66	.509
Site B	5.46	1.82		
Angina (#140)				
Site A	6.56	1.69	1.44	.156
Site B	5.94	1.55		

*p<.05

[a] # indicates DRG classification number

The second research question examined was: Is there a significant difference between sites in the mean values and the variability of Length of Stay for selected Diagnostic Related Groups?

As with NCH, mean LOS and variability in LOS per DRG were also consistently higher at Site A than at Site B, as shown in Table 2. The assumption of equal variances was tested and found to be insignificant for this variable. T-tests performed on mean LOS between sites for each DRG indicated that these differences in mean LOS were not statistically significant. There is less variability noted in LOS by DRG than in NCH by DRG as the standard deviations appear to be more similar when compared between sites.

Table 2

T-test for Length of Stay for Selected Diagnostic Related Groups at Two Study Sites

DRG by Site[a]	Mean	SD	t-test	p
CVA (#14)				
Site A	4.65	1.90	.82	.417
Site B	4.26	1.61		
Acute MI (#122)				
Site A	4.14	1.75	1.69	.096
Site B	3.37	1.75		
CHF (#127)				
Site A	4.52	1.48	1.23	.224
Site B	4.07	1.34		
Angina (#140)				
Site A	2.77	1.07	.26	.799
Site B	2.70	.95		

$p < .05$

[a] # indicates DRG classification number

The third and final research question was: Are predicted Nursing Care Hours identified by two different Patient Classification Systems correlated to Length of Stay within each selected Diagnostic Related Group?

A Pearson product-moment correlation was performed between NCH and LOS for each DRG among sites to determine if there was a relationship between LOS and NCH. Values for the product-moment correlation were all less than one. The probability levels for these correlations were statistically insignificant for all DRGs except Acute MI (DRG #122), which is significant at the .05 level (see Table 3).

Table 3

Product-moment Correlation for Nursing Care Hours and Length of Stay for Selected Diagnostic Related Groups at Two Study Sites

DRG[a]	r	p
CVA (#14)	-.008	.953
Acute MI (#122)	-.267	.041*
CHF (#127)	-.109	.412
Angina (#140)	.019	.886

*p<.05

[a] # indicates DRG classification number

These values indicate that there does not appear to be any strong correlation between NCH and LOS for any of the four DRGs studied. Three of the four DRGs; CVA (#14), Acute MI (#122), and CHF (#127) exhibit weak negative correlations between LOS

and NCH. Of these three negative correlations, Acute MI (DRG 122) is the only DRG which exhibits a statistically significant relationship, although not a strong one. Therefore it would seem that LOS is not a good predictor of NCH for the four DRGs studied.

CHAPTER 5

DISCUSSION AND IMPLICATIONS

Discussion

This research study examined the variability of NCH within selected DRGs using PCS methodology. Results indicate that two separate and distinct PCSs predicted similar NCH for patients in three out of four DRG categories, and that the NCH were not related to LOS. These findings are similar to results of the work of McKibben et al. (1985) and Trofino (1989a) in terms of a statistically significant difference in mean NCH for CVA (DRG #14) between sites. Interestingly, the other DRG identified as having high variability in terms of mean NCH, CHF (DRG #127) did not display a statistically significant difference in mean NCH between sites in this study. Acute MI (DRG #122) and Angina (DRG #140) displayed no statistically significant differences in mean NCH and between sites as expected based on results of previous studies.

Although the PCSs in this study predicted about the same mean NCH for each DRG, the standard deviations and the range of total NCH per patient within each DRG studied indicates a great deal of variability of NCH within each DRG, especially DRG #14, CVA.

These results may be due to several factors. The high degree of variability in NCH for CVA (DRG #14) indicated by the

large standard deviation at Site A and range of 73.3 hours total NCH per patient may be related to the age of the patients in that classification. However, age may not be the variable of interest, it is more likely to be multiple variables such as comorbidities and complications which frequently occur with increasing age. This information was not collected for this study and therefore no relationship could be identified.

The trend of Site B having consistently lower mean NCH and lower variability in NCH for each DRG may also be related to differences in institutional and physician treatment patterns, or services available at the two sites. Conversely, it may result from differences in the PCS and the data they collect. However, Site B is also consistently lower in mean LOS and variability in LOS by DRG than Site A. Although there is no correlation between LOS and NCH for these two sites, similar trends in both variables may indicate that the hospitals differ in treatment of the four DRGs studied.

Findings of this current study also differ from those of McKibben et al. (1985) and Trofino (1989a) in that no significant differences existed in mean LOS per DRG between sites. This lack of significant differences in mean LOS may indicate compliance with DRG/LOS guidelines which may have evolved since the completion of previous studies.

Although Trofino (1989a) reported strong correlations between mean NCH and LOS the findings in this study were statistically significant only for Acute MI (DRG #122). The correlation was a weak negative correlation (-.267) with a $p<.05$. This may indicate that the patients with high NCH values had the shortest LOS and or the patients with low NCH values had the longest LOS. The selection of sites for this study may have impacted the results of NCH for DRGs Acute Myocardial Infarction (#122) and Angina (#140) which are both cardiac diagnoses. Both sites are community hospitals which do not have cardiac surgery capabilities, therefore, any patient with a cardiac diagnosis such as acute myocardial infarction requiring emergency cardiac catheterization or cardiac surgery is transferred to another facility where such services are available. The transfer of a patient out of a facility before the comprehensive general plan of care is completed can obviously affect the mean NCH for these DRGs since the full spectrum of care is not delivered at the study site. It is possible that all of the critically ill cardiac patients are transferred to other facilities, leaving an artificially inflated or deflated value for mean NCH for these DRGs depending on the amount of care the patient would have received if he had remained at the study institution.

Low variability in LOS for all four DRGs studied coupled with the lack of strong correlations between LOS and NCH suggests increasing compliance by physicians and institutions

with DRG/LOS guidelines despite the level of nursing resource use (or severity of illness) indicated by NCH. These findings are consistent with systems theory in general, and with the Socio-technical Systems theory. While recent studies indicate less variability of NCH within DRGs previous studies had indicated a greater degree of variability. This may indicate that variability in NCH per DRG has decreased as hospital systems change the delivery of care to attain compliance with DRG guidelines through increased efficiency. Studies which have been performed to examine whether this compliance indicates increased efficiency or decreased quality have conflicting findings (Jones, 1989).

Issues regarding quality of care further validate the use of systems theory to explain changes in the healthcare organization. The political, social and economic factors in the environment define quality in terms of accessibility of care and outcomes of care. These environmental factors have provided feedback to the healthcare organization regarding the acceptability of the level of quality of the care provided. As the healthcare organization has received this feedback it has continued to strive to provide efficiency while maintaining an acceptable level of quality.

Application to Practice

The results of this study suggest that both PCS tools predict about the same NCH for each DRG studied. Therefore, the PCSs are probably a good predictor of intensity for these selected DRGs. It is possible that with further validation PCS could be established as the indicators of intensity or variability within DRGs and linked with the DRG system to provide the missing link of severity of illness measures. Further research is needed, however, to determine if standardization of PCSs is necessary to accomplish this task, or if dissimilar PCSs predict similar NCH. Trofino's (1989a) research suggested that dissimilar PCSs may be a reliable predictor of similar NCH, and so standardization may not be necessary. Thompson and Diers (1988) suggested that even with the differences in PCSs across institutions it is generally possible to collapse classification data into categories of relative nursing intensity (four or five levels of care nationwide).

The major problem in identifying the costs of nursing care has been the lack of consistent measures of patient complexity (Thompson, 1984), which varied PCSs may be able to provide. Identification of the cost of nursing care enables tracking of costs and thereby control of costs. This study builds on results of previous studies which indicated that varied PCSs may

provide consistent measures which could be used for these purposes.

Variations in NCH are assumed to reflect variations in patient complexity. PCS coupled with a Nursing Minimum Data Set with specific parameters of nursing data as advocated by Werley, Lange and Westlake (1986) would enable further research to define variables which are involved in nursing care variations. The nursing Minimum Data Set could also be used to document the quality of nursing care by identifying variables of care for each individual patient (Jones, 1989).

A key result is that NCH was not strongly related to LOS in this study. DRGs are a LOS based system predicated on averages. The key to the success of a prospective payment system is the assumption that average costs are adequate for balancing the actual casemix (Thompson, 1984). The questions which arise are twofold. First, is average LOS the appropriate indicator to use for reimbursement if it is not indicative of resources used, and second, whether a payment system based on averages is even acceptable. This procedure is regressive to past practices in which those who experienced minor illness subsidized the care of those who were extremely ill because all were billed a flat daily rate for hospitalization. Measurement of individual costs is the only way to track problem areas or changes in patterns of cost. There is a definite range of NCH and therefore costs per DRG, which could be addressed by

implementing two or more payment levels within each DRG, with needs identified by PCSs.

Although further research may be performed in this area to determine if severity of illness measures affect payment levels within DRGs, it must be noted that DRG reimbursement is not the only issue. The value of consistent identification of specific costs of nursing in terms of tracking costs and allocating revenues or resources cannot be overlooked.

Identification of actual nursing costs, as advocated in this study with the use of PCS, could be used by hospital accounting departments to establish nursing as a revenue center rather than a cost center. Allocation of a portion of the reimbursement which represents nursings' cost to the nursing budget would maintain nursing control over nursing resources. Although Trofino (1989b) cautions that nursing may not receive as much via reimbursement of actual costs as it currently does based on hospital allocation to cost centers, this practice would at least hold nursing responsible for the costs generated by the nursing division. With accurate tracking mechanisms provided by individual cost determination per patient, problem areas could be identified and nursing solutions to problems within nursing care more readily developed. Nursings' ability to track and control nursing costs are key to the further development of autonomy and professional practice.

As discussed previously, the apparent compliance with DRG LOS guidelines which may be without regard for intensity or severity (since there is more variability in NCH than LOS for the four DRGs studied) prompts consideration of the quality of care which is currently being delivered. As Trofino (1989a) mentioned, monitoring of quality indicators such as pain relief, patient knowledge at discharge and recidivism may be warranted to identify problem areas and design strategies for resolution to ensure adequate levels of quality in healthcare. In addition, use of outpatient services post discharge and related recidivism would also be helpful to monitor.

Quality Assurance activities in hospitals have never been more important than in today's DRG environment. Outcomes such as those discussed must be identified, monitored and linked to NCH to provide further data regarding the impact of the DRG system, and how it will best be refined to meet the needs of the consumers - both patients and third party payers.

Limitations

The findings of this study can only be generalized to the patient population of four selected DRGs at two Midwest hospitals during the first six months of 1989. The findings have further limitations including the sample size of less than thirty subjects for some of the DRGs, use of only two sites, and use of two different PCSs. Inclusion of a greater number of subjects could have been accommodated by increasing the time

span of the data collection to obtain a larger sample size from the community hospitals.

Only two institutions were used for comparison. It would be interesting to compare several institutions grouped by size and practice (e.g. teaching hospitals and non-teaching hospitals) to examine if DRGs yield similar results within similar types of institutions.

Results of this study may have been influenced by slight differences in the PCS tools used at the two sites. Although a comparison of tools was completed, there were areas of difference which may have impacted the results even though the tools generally contained the same amount and type of indicators. In addition, the higher frequency of classification at Site B (every shift) as opposed to Site A (daily) may have captured more sensitive information regarding the NCH at Site B, and affecting the total NCH per DRG.

Implications for Further Research

Further research is needed to support the use of PCSs as the indicator for severity within DRGs. More DRGs need to be examined, as well as using multiple sites with multiple PCSs to determine if standardization is necessary.

The relationship of special care days to overall LOS and NCH per DRG is also an area requiring further study. The question of whether or not DRGs cause admission of more acutely ill patients which increases the use of critical care should be

examined. Correlations between overall LOS and overall NCH to number of days on special care may provide useful information regarding likelihood of critical care admission to lengthen or shorten LOS and also to increase or decrease the average NCH for specific DRGs.

Patterns of resource use by DRG could be established if further study was done to correlate daily NCH to average NCH within each DRG. The patterns of resource use would be instrumental in establishing an "average" nursing resource use per DRG if use of PCSs for identification of specific resource utilization per patient is not adopted by the Federal government.

Correlation of quality measures (recidivism, use of outpatient services, achievement of identified outcomes) with DRG/LOS and NCH information is needed to provide invaluable information regarding the adequacy of DRG imposed LOS guidelines. The use of case management at many facilities may also be a key factor to evaluate outcomes as they relate to DRGs. Many case management programs already focus on specific DRGs in an attempt to streamline care while ensuring outcomes are met for each patient. Research in this area would enable further examination and possible refinements to the DRG reimbursement system.

Conclusion

This research investigation provided evidence that two different and distinct PCSs predicted similar NCH for patients within four selected DRGs at two Midwest institutions. The NCH values were not related to LOS, therefore LOS cannot be used as a predictor of patient utilization of nursing services at these study sites. Because the current DRG reimbursement system is a LOS based system which does not allow for differences in patient nursing needs, and because nursing is the primary reason for hospital admission, the DRG system requires adaptation to include these differences. The use of PCSs is suggested as a means to identify nursing resource use within DRGs.

APPENDICES

APPENDIX A

GRAND VALLEY STATE UNIVERSITY

1 CAMPUS DRIVE • ALLENDALE MICHIGAN 49401 • 616/895-6611

Appendix A

October 2, 1990

Gail H. Venner, R.N., B.S.N.
3180 Menomonee River Parkway
Wauwatosa, WI 53222

Dear Gail:

I received the additional information that was requested from you in order to approve your request for exempted review.

The Human Research Review Committee of Grand Valley State University is charged to examine proposals with respect to protection of human subjects. The Committee has considered your proposal, "Variability of Nursing Care Hours in Selected Diagnostic Related Groups using Patient Classification System Methodology", and is satisfied that you have complied with the intent of the regulations published in the Federal Register 46 (16): 8386-8392, January 26, 1981.

Sincerely,

[redacted]
Jacquie Johnson, Chair
Human Research Review Committee

APPENDIX B

community memorial hospital

Appendix B

"More Than A Hospital"
W180 N8085 Town Hall Road
P.O. Box 408
Menomonee Falls, WI 53051
414-251-1000

MEMORANDUM OF UNDERSTANDING

Between

COMMUNITY MEMORIAL HOSPITAL OF
MENOMONEE FALLS, INC.

And

GAIL VENNER, R.N.

Community Memorial Hospital of Menomonee Falls, Inc. agrees to allow Gail Venner to conduct the nursing research described below which is required for her M.S.N. in nursing from Grand Valley State University.

Purpose:

The purpose of the study is to examine the variability of Nursing Care Hours of four DRG's utilizing Patient Classification methodology to determine if this method is a valid and reliable framework for identification of nursing resource use per DRG.

Responsibilities:

Gail Venner will retrospectively review 20-30 charts from each of four select DRG's. The information will be used only for the purposes for which it is provided to the researcher, the information will not be released to a person not connected with the study, and the final product of the research will not reveal information that may serve to identify the patient whose records are being reviewed. A copy of the completed study will be sent to Community Memorial Hospital.

Community Memorial Hospital's responsibility is to provide Gail with the appropriate charts and space to review them.

This agreement may be terminated by either party upon written notice.

[redacted]
Gail Venner, R.N. Date

[redacted] 1/26/90
Nancy A. Wilde, M.S.,R.N. Date

APPENDIX C

Waukesha Memorial Hospital, Inc.

725 American Avenue
Waukesha, Wisconsin 53188
Telephone: 414 544-2011

Appendix C

April 24, 1990

Ms. Gail Venner
3180 Menomonee River Parkway
Wauwatosa, Wisconsin 53222

Dear Ms. Venner:

The Research Committee at Waukesha Memorial Hospital has approved your proposal entitled Analysis of Nursing Care Hours Per Diagnostic Related Group Using Patient Classification System Methodology. The approval is conditional upon your direct contact with Kate Moore, M.S.N., at 544-4033 to coordinate collection of data which may confound the design of your study.

The Committee wishes you to understand that at completion of your work, a final copy must be submitted for our files.

Congratulations on a thoroughly organized and well designed proposal!

Respectfully,

[redacted]

Timothy E. Tyre, Ph.D.
Chairman, Research Committee

TET/lm

APPENDIX D

Appendix D

Data Collection Sheet

DRG # _____

MR # _____ A/B

Age _____

LOS _____

Unit	Acuity/Category	NCH

APPENDIX E

Appendix E

PATIENT CLASSIFICATION CRITERIA

				PATIENT NAME									
	Nursing Unit_____ Team_____ R.N._____ Date_____ Auditor_____ Staff Nurse_____ I 0-8 III 20-41 V 60+ II 9-19 IV 42-59												
	CONDITION INDICATORS			Wgt.									
1		Admission Initial		3	3	3	3	3	3	3	3	3	3
2	Admission	Case Manager Admission		4	4	4	4	4	4	4	4	4	4
3	Discharge/Transfer		Simple	1	1	1	1	1	1	1	1	1	1
4	In/Out/Discharge Plan		Complex	3	3	3	3	3	3	3	3	3	3
5			Partial	1	1	1	1	1	1	1	1	1	1
6	Mobility Assistance		Complete	3	3	3	3	3	3	3	3	3	3
7	Frequency of Mobility		Medium	1	1	1	1	1	1	1	1	1	1
8	Assistance		High	2	2	2	2	2	2	2	2	2	2
9		W/Assist		1	1	1	1	1	1	1	1	1	1
10	Bath	Total		2	2	2	2	2	2	2	2	2	2
11		Oral/Tube/w Assist.		1	1	1	1	1	1	1	1	1	1
12	Nutrition	Oral/Tube/Total		3	3	3	3	3	3	3	3	3	3
13	Monitor Q/hr			8	8	8	8	8	8	8	8	8	8
14	Vital Signs QID or more			4	4	4	4	4	4	4	4	4	4
15	Specimen Collection			1	1	1	1	1	1	1	1	1	1
16	Tube Care			3	3	3	3	3	3	3	3	3	3
17			Simple	3	3	3	3	3	3	3	3	3	3
18	Wound and Skin Care		Complex	5	5	5	5	5	5	5	5	5	5
19	Oxygen Therapy			2	2	2	2	2	2	2	2	2	2
20	Incontinent/Diaphoresis			6	6	6	6	6	6	6	6	6	6
21	Intake and Output			1	1	1	1	1	1	1	1	1	1
22	Intravenous/Irrigation		One	4	4	4	4	4	4	4	4	4	4
23			Two	6	6	6	6	6	6	6	6	6	6
24			Three	8	8	8	8	8	8	8	8	8	8
25	IV-Meds	capped IV and/or 1 IV med		2	2	2	2	2	2	2	2	2	2
26		IV meds/IV drip s titration		4	4	4	4	4	4	4	4	4	4
27		chemo/IV drips c titration		6	6	6	6	6	6	6	6	6	6
28	Surgery/Procedure			1	1	1	1	1	1	1	1	1	1
29	Isolation			3	3	3	3	3	3	3	3	3	3
30	Confused/Disoriented/Retarded			5	5	5	5	5	5	5	5	5	5
31	Sensory Deficits			4	4	4	4	4	4	4	4	4	4
32			Simple	2	2	2	2	2	2	2	2	2	2
33	Special Teaching Needs		Complex	5	5	5	5	5	5	5	5	5	5
34			Simple	2	2	2	2	2	2	2	2	2	2
35	Special Emotional Needs		Complex	5	5	5	5	5	5	5	5	5	5
36		q 1/2° checks		16	16	16	16	16	16	16	16	16	16
37	Psychiatric Needs	Restraints		16	16	16	16	16	16	16	16	16	16
38		Ventilator		8	8	8	8	8	8	8	8	8	8
39	Critical Needs	Swan-Ganz		10	10	10	10	10	10	10	10	10	10
40	Case Manager Outcome Assessment			2	2	2	2	2	2	2	2	2	2
			TOTAL										

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APPENDIX F

Appendix F

DATE _____ / _____ / _____

SIGNATURE _____

UNIT CODE

PATIENT CLASSIFICATION

* FOR ITEMS BRACKETED ONLY ONE MAY BE MARKED *

Admission or Transfer In	1
Discharge or Transfer Out	2
Less Than 2 Years	3
Age 2 - 6 Years	4
Unconscious	5
Confused/Disoriented	6
Sensory Deficits	7
Partial Immobility	8
Complete Immobility	9
UP AD LIB	10
Up with Assistance	11
Bed Rest	12
Bath with Assistance	13
Bath Total	14
Assistance w/ Oral/Tube Feed	15
Total Oral/Tube Feed	16
I & O Simple	17
I & O Complex	18
IV's & Site Care	19
Specimen Collection — Simple	20
Specimen Collection — Complex	21
Isolation	22
Incontinent/Diaphoretic	23
Simple Wound and/or Skin Care	24
Extensive Wound and/or Skin Care	25
Tube Care	26
Oxygen Therapy	27
Respirator	28
Trach. ET Tube	29
Vital Signs, Q1¼ - 2 Hr.	30
Vital Signs, Q1 Hr. or More Often	31
Monitoring — Non-Invasive	32
Invasive Monitoring	33
Prep. for Test/Procedure	34
Special Teaching Needs	35
Special Emotional Needs	36
Multi-System Instability	37
	38

BED NO.	PATIENT NAME	PATIENT I.D. NO.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

SCHEDULED STAFF
DATE: ___/___

ACTUAL STAFF
DATE: ___/___

		SCHEDULED	ACTUAL
DAY	1		
	2		
	3		
	4		
	5		
EVE	1		
	2		
	3		
	4		
	5		
NIT	1		
	2		
	3		
	4		
	5		

LIST OF REFERENCES

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Bailie, J.S. (1986). Determining Nursing Costs: the Nursing Intensity Index. Patients and Purse Strings: Patient classification and cost management, 1986 NLN Publication #20-2155, 197-211.

Bargagliotti, L.A. & Smith, H. (1985). Patterns of nursing costs with capitated reimbursement. Nursing Economic$, 3(9), 270-275.

Beck, D.F. (1985,January). The hospital's financial future; DRGs and beyond. Health Care Supervisor, 8-22.

Caterinnicchio, R.P. (1984). RIMS: pricing of inpatient nursing services under diagnostic related grouping prospective hospital payment. Health Care Financing Review, 6 (1), 61-70.

Cromwell, J., & Price, K.F. (1988). The sensitivity of DRG weights to variation in nursing intensity. Nursing Economic$, 6 (1), 18-26.

Curtin, L.L. (1983). Determining costs of nursing service per DRG. Nursing Management, 14(4), 16-20.

Curtin, L.L., & Zurlage, C. (1984). DRGs: The reorganization of health. Chicago: SN Publications.

Davis, R.G. (1985). Congress and the emergency of public health policy. Health Care Management Review, 10 (1), 61-72.

Fosbinder, D. (1986). Nursing costs per DRG: A PCS and comparative study. Journal of Nursing Administration, 16(11), 18-23.

Giovannetti, P. (1979). Understanding Patient Classification Systems. Journal of Nursing Administration 9(2), 4-9.

Green, J., McClure, M., Wintfield, N., Birdsall, C., & Rieder, Captain K.A. (1988). Severity of illness and nursing intensity: going beyond DRGs. Patients and Purse Strings, NLN Publication 1988, #20-2191, 207-230.

Grimaldi , P.L., & Micheletti, J.A. (1983). DRGs - A practitioner's guide. Chicago: Pluribus Press.

Halloran, E.J. (1985). Nursing workload, medical DRGs and nursing diagnosis. Research in Nursing and Health, 8, 421-433.

Horn, S.D. (1983). Overview of current models for prospective payment. Nursing Reasearch and Policy Formation: The case of prospective payment. Papers of the 1983 scientific session of the American Academy of Nursing.

Horn, S.D. (1987, April). DRGs: How will they be modified for severity? Presentation at Nursing Management Congress and Expo'87, New York.

Higgerson, M.J. & VanSlyck, A. (1982). Variable billing for services: a new fiscal direction for nursing. Journal of Nursing Administration, 12(6), 20-27.

Joel, L.A. (1984). DRGs and RIMs: Implications for nursing. Nursing Outlook, 32(1), 42-49.

Jones, K.R. (1989). Evolution of the prospective payment system: Implications for nursing. Nursing Economic$, 7(6), 299-305.

Kramer, M., & Schmalenberg, C. (1987). Magnet Hospitals talk about the impact of DRGs on nursing care - part I. Nursing Management, 18(9), 38-42.

Lagona, T.G., & Stritzel, M.M. (1984). Nursing care requirements as measured by DRG. Journal of Nursing Administration, 14(5), 15-18.

Lucke, K., & Lucke, J. (1986). Severity of illness and nursing intensity as predictors of treatment costs. Patients and Purse Strings: Patient classification and cost management. 1986 NLN Publication #20-2155, 181-195.

McCarthy, C.M. (1988). DRGs - five years later. The New England Journal of Medicine, 318(25), 1683-1686.

McClosky, J.C. (1989). Implications of costing out nursing service for reimbursement. Nursing Management 20(1), 44-49.

McCormick, B. (1986, November 5). What's the cost of nursing care? Hospitals, 48-52.

McKibben, R.C., Brimmer, P.F., Galliher, J.M., Hartley, S.S., & Clinton, J. (1985). Nursing costs and DRG payments, AJN, December 1985, 1353-56.

Mignon, J. (1987). Costing out nursing services: what are we learning? Illinois Nurse Anesthetist Chart, Jan. 1987, 3-5.

Mitchell, M., Miller, J., Welches, L., & Walker, D.D. (1984). Determining cost of nursing care by DRGs. Nursing Management, 15(4), 29-32.

Mowry, M.M., & Korpman, R.A. (1985). Do DRG reimbursement rates reflect nursing costs? Journal of Nursing Administration, 15 (7 and 8), 29-35.

Prescott, P.A. (1986). DRG prospective reimbursement: the nursing intensity factor. Nursing Management, 17(1), 43-48.

Reitz, J.A. (1985a). Toward a comprehensive nursing intensity index; part I, development. Nursing Management, 16(8), 21-30.

Reitz, J.A. (1985b). Toward a comprehensive nursing intensity index: part II, testing. Nursing Management, 16(9), 31-42.

Reschak, G.L.C., Biordi, D., Holm, K., & Santucci, N. (1985). Accounting for nursing costs by DRG. Journal of Nursing Administration, 15(9), 15-19.

Rieder, K.A., & Kaye, T.L. (1985). Exploring the issue: Severity of illness within DRGs using a nursing patient classification system. In F.A. Shaffer (Ed.), Costing out Nursing: Pricing Our Product (pp. 85-99). New York: Slack, Inc.

Riley, W.J., & Schaefers, V. (1983). Costing nursing services. Nursing Management, 14(12), 40-43.

Riley, W.J., & Schaefers, V. (1984). Nursing operations as a profit center. Nursing Management, 15(4), 43-46.

Roveti, G.C., Horn, S.D., & Kreitzer, S.L. (1980). "AS-score", a multi-attribute clinical index of illness severity. Quality Review Bulliten, 6(7), 25-31.

Shaffer, F.A. (1988). DRGs: A new era for healthcare. The Nursing Clinics of North America, 23(3), 453-464.

Smith, C.E. (1985). DRGs - making them work for you. Nursing 85,(1), 34-41.

Sovie, M.D., & Smith, T.C. (1986). Pricing the nursing product: charging for nursing care. Nursing Economic$, 4(5), 216-226.

Sovie, M.D., Tarcinale, M.A., VanPuttee, A.W., & Studen, A.E. (1985). Amalgam of nursing acuity, DRGs and costs. Nursing Management, 16(3), 22-42.

Stanfill, P.H. & McDonnel, J.W. (1985). Determining nursing costs: A strategy for professional survival. Oncology Nursing Forum, 12(5), 79-82.

Thompson, J.D. (1984). The measurement of nursing intensity. Healthcare Financing Review, Nov. 1984, annual supplement, 47-55.

Thompson. J.D. & Diers, D. (1988). Management of nursing intensity. Nursing Clinics of North America, 23(3), 473-491.

Trofino, J. (1986). A reality based system for pricing nursing service. Nursing Management, 17(1), 19-24.

Trofino, J. (1987, April). A reality based system for pricing nursing service, year 3. Presentation at Nursing Management Congress and Expo'87, New York.

Trofino, J. (1989a). JCAHO nursing standards, nursing care hours and length of stay per DRG, part I. Nursing Management, 20(1), 29-32.

Trofino, J. (1989b). JCAHO nursing standards, nursing care hours and length of stay per DRG, part II. Nursing Management, 20(1), 33-37.

US Bureau of the Census (1981). Statistical abstracts of the U.S. 1981, 102nd edition, Washington DC, US Government Printing Office, pg. 99.

Werley, H.H., Lang, N.M., & Westlake, S.K. (1986). The nursing minimum data set conference: executive summary. Journal of Professional Nursing, 4(2), 217-224.

Wilson, L., Prescott, P.A., & Aleksandrowicz, L. (1988). Nursing, a major hospital cost componenet. Health Services Research, 22(6), 773-796.

Wilson, T.A. (1988). Nursing megatrends induced by Diagnostic Related Groups. Focus on Critical Care, 15(3), 55-61.

Ziegenfuss, J.T. Jr. (1985). Diagnostic Related Groups and Hospital Impact, an Organizational Analysis. New York: McGraw Hill.