Patterns of Patient Acuity in Twelve Cardiac Diagnosis Related Groups

by

Roberta Marie Phillips Nepple, R.N., B.S.

A Thesis

Presented to
the Faculty of the School of Nursing of
Oregon Health Sciences University
in partial fulfillment
of the requirements for the degree of
Master of Nursing

June 14, 1985

APPROVED:

[redacted]

Mark C. Hornbrook, Ph.D., Associate Professor, Thesis Advisor

[redacted]

Joyce Semradek, R.N., M.S.N., Associate Professor, First Reader

[redacted]

Donna Schantz, R.N., M.N., Associate Professor, Second Reader

[redacted]

Ca[redacted]ean, School of Nursing

This study was supported by
traineeships from the United States
Public Health Service Grant Numbers
2ALL NU 00250-07 and 2ALL NU 00250-08.

ACKNOWLEDGEMENTS

For their contribution to my personal and professional growth, my appreciation goes to my thesis committee.

To Mark Hornbook, my thesis advisor, for continually challenging me toward greater and still greater levels of research understanding.

To Joyce Semradek, for her superb research skills and for her quiet, yet strong support and encouragement.

To Donna Schantz, for being always available to "just listen" and for helping me keep this experience in an appropriate perspective.

To my friends and colleagues at Veteran's Administration Medical Center, Portland, especially Faith, Louise, and Joan, my mentors, and to the nursing staff on Ward 25-D--for their constant encouragement and understanding which fortified me during this experience, goes my deep thanks.

A special thanks goes to my mother, for her constant prayers and love, to Nancy and to Jim for knowing I "could do it," and to my late father who I know is proud, but not surprised, that his daughter has attained this goal. Over the years, you, my dear family, with the help of God, have supplied me with the basic human materials that have made me what I am today.

My deepest thanks and appreciation goes to my husband, Don, who was my strength throughout every crisis, who always lovingly

supported and encouraged me, and who endured more than his share of being ignored and/or "tuned-out" during the past year. For willingly putting our life together "on hold" while I was a student, you have my love.

TABLE OF CONTENTS

Chapter		Page
	Specific Aims	47
	Homogeneity	48
	Ranking	48
	Predictive Validity	49
	Approach	50
	Study Designs	50
	Setting and Sample	51
	Data Collection Procedure	52
	Measurement and Instruments	52
	Analysis	55
IV.	Results	57
	Overview	57
	Homogeneity	63
	Ranking	75
	Predictive Validity	86
	Discussion	94
V.	Summary, Conclusion and Recommendations	96
	Conceptual Perspectives	96

TABLES

Page

TABLES

Page

FIGURES

FIGURES | Page

CHAPTER I

Introduction and Statement of the Problem

Persistently rising health care costs have been a focus of concern in the public policy arena for many years. One of the latest cost containment initiatives is found in the Social Security Amendments of 1983 which mandated the Diagnosis Related Groups (DRGs). This legislation included the establishment of a prospective payment system (PPS) for hospitals, that is, a method of paying hospitals an amount established in advance of the provision of services to Medicare beneficiaries. This is a remarkable shift from the initial guaranteed actual cost reimbursement that was a hallmark of the Medicare system at its inception and places the risk for keeping costs down on the hospital rather than on the reimbursement authority.

Diagnosis Related Groups classify cases into groups expected to consume similar amounts of total hospital resources, based on medical diagnosis, and as such, is a workload-related resource allocation method of reimbursement. The overriding objective of such an allocation methodology is the improvement of hospital and, ultimately, health care system efficiency.

The primary objective in the construction of the DRGs was a definition of case types, each of which could be expected to receive similar volume and mix of services during a hospital stay. Primary grouping emphasis was placed on physician judgment in specifying variables defining classes of inpatients expected to have similar patterns of care. Secondary emphasis was placed on statistical partitioning of cases based on the actual distribution of length of stay, a primary dimension of resource use, within each Major Diagnostic Category (MDC), to identify subgroups. Further partitioning included the elimination of deaths, cases with obvious coding errors, extremely long lengths of stay, and missing data (Hornbrook, 1982). The variables used in assigning the DRGs are the patient's principal diagnosis, secondary diagnoses, surgical procedures and age. Using these variables only in the scheme for classifying cases, the developers of the DRGs did not examine specific components of providing hospital care, such as nursing intensity.

The federal government's shift to payments of hospitals prospectively by Diagnosis Related Groups has substantially altered the incentives facing hospitals regarding use of their services under Medicare (Riley & Schaefers, 1983). Under the original Medicare reimbursement system, hospitals were reimbursed for the total cost of the beneficiary's care. This resulted in a disincentive to control costs, and even a license to waste. The new PPS system establishes strong cost control incentives by setting a predetermined dollar amount for each case type, regardless of the length of stay, within established guidelines or variance in resource use for each DRG and regardless of the actual cost of care. The system will be phased in over three years (1983-1986) during which time payment rates will be a blend of hospital-specific costs and national and regional DRG prices (Davis, 1983).

When reimbursement based totally on DRGs occurs in 1986, the prospective payment made by Medicare to hospitals, determined by each hospital's specific case mix, will be considered payment in full. The hospital cannot ask for a higher payment per DRG nor can it charge the beneficiary more than the deductible established by statute and/or a coinsurance payment. If through efficient management, however, the hospital's operating costs are less than the Medicare payment, the hospital can keep the difference, thus an incentive for efficient management is established. Hospitals must absorb cost overruns resulting from inefficiency or higher than average severity or complexity of cases within a DRG.

Additionally, pursuit of greater efficiency in the provision of care to Medicare recipients, the dominant goal of the DRG system, may potentially have an effect on the provision of care to all consumers in acute care hospitals. Third-party payers are reviewing the prospective payment system, and many are structuring their payment rates for all hospital services using DRG methodology (Tomsky, 1983). This development means that in the near future, a majority of hospital admissions may be covered by a DRG-type prospective payment system.

The ultimate effects of the changes to prospective reimbursement by Diagnosis Related Groups are unknown. Dowling (1974) however, suggests that a per case reimbursement scheme will be likely to effect changes of increased numbers of cases treated, decreased length of stay, decreased intensity of services, decreased scope of service, decreased levels of amenities, decreased quality level, decreased investment in facilities and equipment, decreased teaching programs and increased efficiency. The hypothesized "decreased intensity of service" and "decrease in quality of patient care" due to the reduction of available funds will likely influence nursing directly and are of special interest here.

Under a prospective payment system where cost control becomes a paramount issue and a large portion of hospital costs are labor costs, labor-intensive Nursing Service Departments have been singled out as a major focus of efforts to reduce hospital operating expenditures (Mullane, 1975; Swansburg, 1978). Nursing department budgets have been estimated by various measures to represent as much as fifty to seventy per cent of total hospital operating expenses, yet the actual cost of nursing care for particular cases is unknown. This is because nursing costs have traditionally been embedded in daily hospital room charges.

With the probability of fewer hours of nursing care per patient, on average, arising from hospitals' cost control efforts, it is imperative that nursing resources be allocated first to those patient-care activities requiring unique nursing knowledge and skills. Housekeeping and dietary functions, for example, which are now considered by some hospital administrators to be within the responsibilities of the nursing staff, will need to be reassigned to more appropriate (i.e., less expensive) types of support staff. This redistribution of activities is essential to free nurses to provide increased proficiency of care to patients which will result in measurable outcomes of increased patient well-being and satisfaction.

For the past two decades, nursing attention has focused on the development of patient classification systems to address the need for a method to appropriately allocate nursing resources. The importance of patient classification is that it enables definition of the relevant product of the nursing department in terms of the types of cases treated at specified levels of quality. Resource allocation can proceed on a scientific rather than historical or political basis.

Giovannetti (1979) has defined nursing "patient classification" as the categorization of patients according to an assessment of their nursing care requirements over a specified period of time. She further defines the term "patient classification system" as the identification and classification of patients into care groups or categories, and the quantification of these categories as a measure of the nursing effort required.

A term sometimes used synonymously with patient classification and patient categorization is patient acuity. The concept of acuity is based on individual patients' needs for nursing support. It is a variable, shift-by-shift measure based on intensity of care needed, and includes nursing activities relating to assessment, intervention, and evaluation of nursing care. These activities include but are not limited to health teaching, emotional support and counselling, interpretation and implementation of the medical regimen, interventions for physical functioning and comfort and so forth. As such, acuity is a predictor of nursing resource use.

Two critical dimensions of resource use are length of stay and patient condition. The medical model (DRGs) incorporates these dimensions then focuses on actual resource use during the length of stay for specific case-types. Nursing classification, on the other hand, is based on professional determination of needs for services rather than patient demand or actual resource use. Length of stay is also an important dimension of nursing resource use because nursing resources are consumed as long as the patient is in the hospital, regardless of his or her level or intensity of nursing resources used. This may mean that professionally determined needed services may not be received as a result of limited human or material resource availability.

Among patients within any given diagnostic category, there may be considerable variations in care needs and/or resource use. Variability in acuity is multifaceted. On an individual case level, variability can be illustrated by the changes in care needed over the course of hospitalization, as severity of illness varies. Assume for a moment that the typical medical patient requires a high intensity of nursing care upon admission and for the initial days of his/her hospitalization; then each day, the patient progressively regains health status, resulting in a gradual decline in need for nursing interventions--lower intensity of care--until discharge. The patient's initial acuity level on admission (high) would gradually become lower, reaching a discharge acuity level (low). Thus, a variation in acuity per patient in any diagnostic category is acknowledged.

A more graphic example of individual case variable acuity might be found by considering a typical elective surgery case. The patient may exhibit an acuity level of moderate intensity the first day of hospitalization, related to preoperative teaching, explanation of diagnostic tests, procedures and so forth, then a slight drop in acuity of care needs immediately preoperatively, followed by a sharp rise in intensity of nursing care support immediately postoperatively. Acuity would then gradually decrease to the point where the patient could carry out self care activities and be discharged. This case may have the same overall average length of stay for the stay as the previous example, yet patterns of care and DRG category are quite different.

The above examples illustrate acuity variability during the hospital stay for individual cases. It is possible that if there is a variation in acuity during the hospital stay, within any given individual case, when cases are grouped into DRG categories, there will be a variation in average acuity of cases within and across DRG classes. Because of individual case variation in acuity, cases within any specific DRG may have different patterns of acuity and average acuity which could determine the average acuity of the total DRG category. It is also possible that cases in different DRGs may have the same overall acuity based on need for nursing support, which could suggest a need for combining particular DRGs in any proposed scheme using acuity as the grouping criterion.

The different bases of the two classification systems--DRGs and acuity--suggests that they may not correspond with each other. Some DRGs may be too heterogeneous for meaningful planning and budgeting for nursing resources. Other DRGs may be indistinguishable from a nursing perspetive and thus irrelevant. To begin exploring these possibilities, this study focuses on the variation in average acuity of cases within and across DRG categories.

Two considerations must be acknowledged when examining average acuity for groups of cases. First, degree of illness or intensity of nursing care needed may vary appreciably from patient to patient in any diagnostic category. The average acuity of any group will be affected by cases with very high or very low acuity. The mean or average acuity of a group with one or two high acuity cases, at any point in time, may misleadingly suggest that that group's acuity is higher than actual acuity would be for that group at another time. That is, one or two high acuity patients can pull average acuity up. In the same manner, one or two low acuity patients can bring the average or mean acuity for the group down to lower than actual, over time.

Second, length of stay is a critical factor when examining average acuity per case of any group, but a length of stay measure alone may mask considerable variations in various types of resources, especially nursing. A patient in any class that remains at a high level of acuity for an extended length of time, for example, a patient that can not be weaned from a respirator, would tend to elevate the average acuity of the total DRG class simply because of the long length of stay. Similarly, a patient that remained at the lowest acuity for an extended period of time, for example, receiving rehabilitative services not associated with his/her principal diagnosis-based DRG, would tend to lower the average acuity of the total DRG group. Another possibility exists when considering length of stay as a factor in determining variability in acuity. A critically ill patient in any diagnostic group who dies within the first two days of hospitalization might exhibit the highest level of acuity throughout a relatively short hospital stay which would have an effect on the overall variability in acuity level and length of stay of all patients in that particular diagnostic category.

Other factors that effect variability in acuity of any patient group are the general personal characteristics of the patients in the group. These factors, which are not included in the DRG, except as they may affect length of stay, may include care needed by a person who has a language barrier, such as not understanding or speaking English; the age of the patient--very young or very elderly; sensory deficits; alteration in coping ability; lack of social support; other altered emotional states or alteration in thought processes; impaired physical mobility, self-care deficits and so forth.

Experience suggests that a 65-year-old, alert, oriented, previously ambulatory patient with strong family support hospitalized to rule-out an acute myocardial infarction (DRG 140-angina pectoris) will require less nursing resources--will have lower overall acuity levels and length of stay--than a 65-year-old with the same DRG who is a confused, foreign-speaking person who has impaired mobility related to other physical problems. For the latter, more nursing resources will be consumed by the need to lessen the patient's confusion through frequent reorientation interventions, through efforts to establish mutual communication patterns (through interpreters, family, other special support persons) to facilitate patient teaching, and by reassurance activities as well as routine care procedures. Additionally, progressive assistance with ambulation will consume more nursing time because of the patient's impaired mobility.

This variability in acuity of patients with the same diagnostic category is one area that nursing must consider when assessing nursing resource needs within a prospective payment framework. The variation in acuity across DRGs is a second area that must be explored. If it is found that there is great variation in acuity across DRGs, it is important for nurse administrators to assess the degree of variation and to assess if nursing resource use is congruent with aggregate resource use for all DRG categories.

Statement of the Problem

Diagnostic Related Groups and patient classification by Acuity are both systems meant to be predictive of resource use; one predicts aggregate use of total hospital resources per case, the other, use of nursing services per shift. It is recognized that the DRG classification is a nationally standardized system in use in all acute care settings; in contrast, patient acuity systems vary in scope and in numbers of critical care indicators or descriptors of patients' dependency on nursing services according on the management philosophy of a particular nursing department; there is no nationally standardized nursing-patient acuity system.

Whereas there is no logical requirement that acuity and DRGs be in perfect congruence, considering the large proportion of total hospital financial resources invested in nursing services, it is appropriate to explore to what extent these two systems agree or disagree. If nursing care approximates 50 percent of hospital resources per case type, it is appropriate that acuity and DRG resource weights be highly correlated across case types. But, there are other very different resources that make up the remaining 50 percent--laboratory, pharmacy, radiology, physical therapy, occupational therapy, and so forth, and these may have differing implications for nursing activities. Patients with different illness intensity require different levels and mixes of these services. Hence, it is likely that even for patients in identical diagnosis categories, tremendous variations in use of nursing services may be observed.

Conceptual Perspective

An awareness of the particular conceptual model of health care in which each patient classification system has been framed is important to this study. The Random House Dictionary of the English Language (1968) defines "concept" as a general notion or idea or "an idea of something formed by mentally combining all its characteristics or particulars; a construct". This definition is consistent with the common view that a concept is an abstraction that represents a certain classification or grouping of some phenomena. The medical model of health care which reflects characteristics of disease process, etiology or cause, treatment, cure and so forth, was employed in the conceptualization of the DRGs for classifying patients based on diagnosis information. Conceptually, a nursing model of health care groups patients based on individual patients' need for and response to nursing interventions and encompasses monitoring, support, reassurance, patient education, general caring, and so forth, as the classification methodology, regardless of disease process, as well as on the medical diagnosis.

In this study, the term "nursing model" of patient classification is a concept that stands for the cognitive and functional activities required of nurses, for patients, from which the quintessence of nursing practice is implied, i.e., "the diagnosis and treatment of human responses to actual or potential health problems" (American Nurses' Association, 1980). By contrast, the term "medical model" of patient classification is a concept that represents various patient characteristics or states that imply causes or levels of illness and the need for medical practice interventions. These conceptual differences suggest that the two systems may not reflect congruity in classifying patients on resource use. Factors influencing the determination of a patient classification system for each specific model are depicted in a conceptual model shown in Figure 1. Additional conceptual differences will be addressed in later sections.

Neither the medical model nor the nursing model can be considered mutually exclusive for classifying patients into resource-use groups. Although medical factors provide information which can guide nursing activities, it is not necessary that all medical factors be known before a nurse clinician can begin providing assessment and intervention activities which will contribute to a patient's health status outcome. Likewise, knowledge of nursing factors and activities is not necessarily needed to determine the medical factors However, patient data

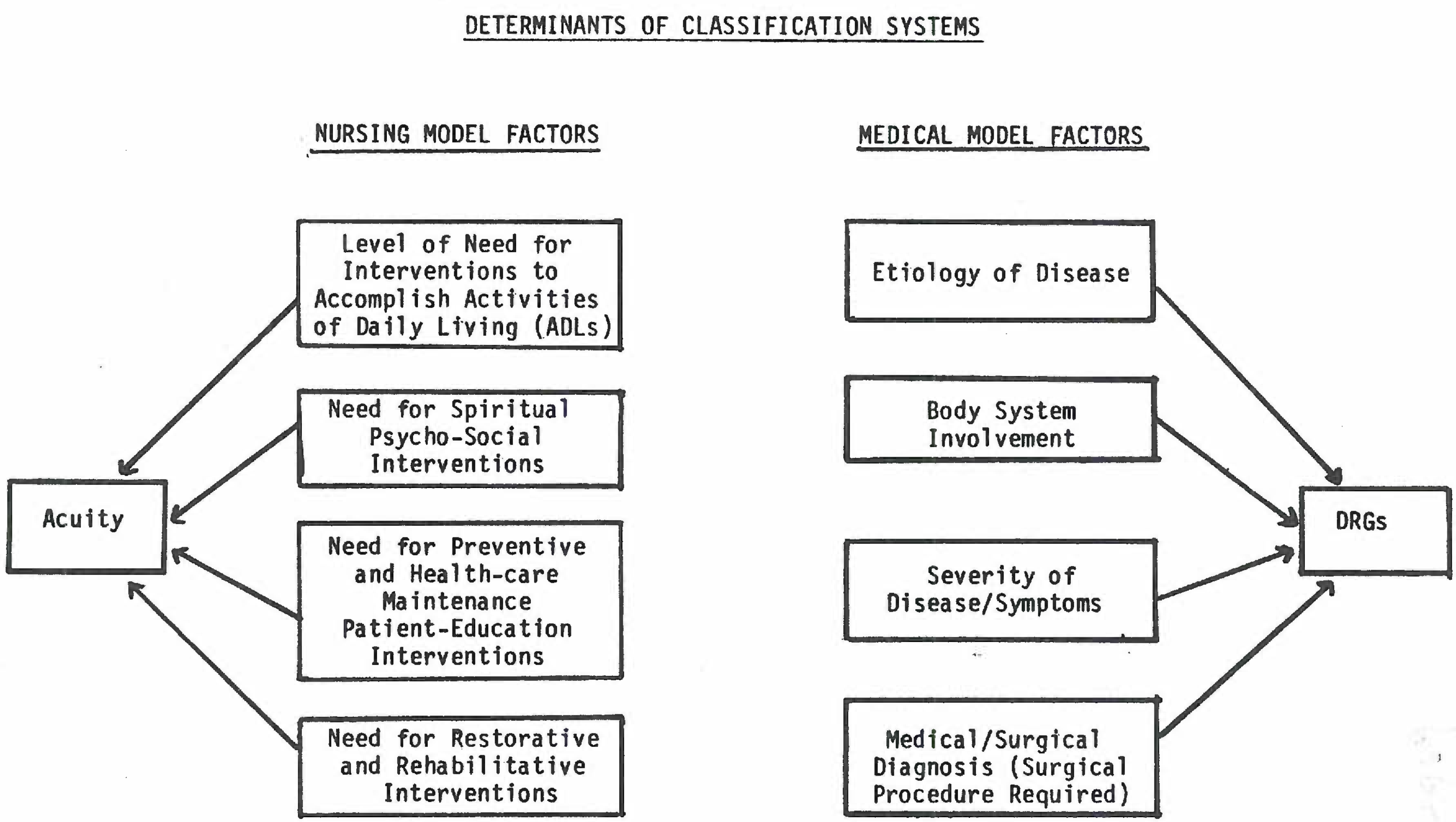

Figure 1. Conceptual model--factors influencing determinants of patient classification systems.

from nurse clinicians can contribute to the determination of factors identified for the medical model of classification. Ideally, the medical model of health care and the nursing model of health care should be complementary. A model which equally addresses both the medical factors and the nursing factors could provide a more complete basis for classifying patients on resource use and an explanation of the phenomena of health care.

Classification Theory

The conceptual rationale for this study is based on classification theory and on performance criteria for any classification measure. In addition, an original conceptualization of a medical model and a nursing model of health care for classifying patients is suggested.

Principles of Classification Theory

An understanding of the theory of classification in general is important as it aids in explaining the rationale for classification schemes and their purposes. Classification has been defined as the ordering or arrangement of objects into groups or sets on the basis of their relationships (Sokal, 1974). Giovannetti (1978) expanded Sokal's definition to include the ordering of concepts as well as objects into groups or sets based on relationships among the concepts or objects. The process of classification attempts to group together similar objects, to separate dissimilar objects, and to provide a degree of separation proportionate to the degree of dissimilarity. The relationships among objects or concepts which can determine their similarity or dissimilarity can be based on observable or inferred properties.

The fundamental purpose of any classification is to describe the relationship of objects or concepts to each other and to similar objects. Of interest in this study is to determine whether a medical model--DRGs--for classifying cases based on total resource use shows a relationship to a nursing model--acuity--for classifying cases based on nursing resource needs. A central concept in the two classification schemes is resource use determination. Although DRGs indicate total resource use and acuity indicates nursing resource use, these are similar concepts, and a positive relationship of case classification should be demonstrated between the separately motivated health-care model schemes. That is, it would be expected that cases classified as high intensity in the DRG scheme would also be classified as high intensity in the acuity scheme.

Since one goal of classification is to simplify abstract relationships between concepts to allow the use of general statements about the classes of objects or concepts, the finding of a correspondence between the two classification schemes could lead to defining a collective medical-nursing classification scheme. If this study demonstrates this possibility, groups of cases could be labeled to enhance communication about the groups, thus, accomplishing another aim of classification--economy of memory (Sokal, 1974).

Problems of Classification

A fundamental problem in communicating classification is that of viewpoint (Giovannetti, 1978). The degree of similarity or dissimilarity of two objects or concepts is dependent on the viewpoint and aims of the classifier. Different viewpoints or aims invariably result in different degrees of importance placed on the observable or inferred property of the objects or concepts. For example, if a hospital fiscal officer, a physician and a nurse clinician each were asked to classify a group of patients, the fiscal officer may identify only two classifications--patients able to pay their hospital bill and patients unable to pay their hospital bill; the physician might identify three classifications--patients hospitalized for diagnostic work-up, medical patients and surgical patients; and the nurse might be more interested in classifying the groups of patients according to potential for physical restoration to health and according to health teaching needs.

Classification can be viewed as a mechanism for communicating similarities and dissimilarities among objects or concepts. Four fundamental problems in classification have been compared to fundamental problems encountered in communication in general (Giovannetti, 1978). Problem one (1), that of viewpoint, has been discussed. Other problems are those of (2) generics, (3) semantics, and (4) syntax. In general, classification schemes are directed at solving the generic problem of grouping objects into classes. For example, when patients or cases or objects or concepts are arranged in classes and subclasses based on DRGs or acuity, the members of the classes and subclasses can be easily named and related to each other when considering resource use. Classification also provides for ease of manipulation and a convenient means of information collection and retrieval on a specific concept of interest. An example of a generic problem would be the grouping of patients into classes, each of which would predict expected nursing resource use over a specific period of time, that is, acuity classification.

The third fundamental problem, semantics, is concerned with terminology. The standard nomenclature used to describe the phenomena of interest generally dictates the terminology used in a particular classification scheme, e.g., International Classification of Disease, 9th Revision, Clinical Modification (ICD-9-CM) for the DRG Scheme; Oregon Health Sciences University Patient Classification and Staffing System guidelines for acuity. Caution must be exercised to assure that the terminology of any classification scheme is not ambiguous; the meaning of the grouping must be clear.

Finally, syntactical ambiguity of terminology must be avoided in the construction of the terms used in the classification scheme. When multi-word terms are used to describe a class or subclass, it should be clear what word or words modify which other word (Giovannetti, 1978), and clear separation of individual words used to identify a class or subclass is imperative. For example, one acuity sub-class parameter in the OHSU Classification system is "teaching/emotional support". The user of this classification scheme must know that these descriptors mean the patient's need for "teaching and/or emotional support", not that the patient needs to be "taught emotional support".

Table 1 shows each fundamental problem in classification identified by Giovannetti and the rationale used by each patient classification system--DRGs and acuity--to address the specific problems. Differences in the approaches to classification of patients are readily identified. A primary basis for these differences is believed to be that of viewpoint--medical viewpoint versus nursing viewpoint.

<u>Types of Classification</u>

Sokal (1974) suggests that the most important principle in classification theory is the distinction between monothetic and polythetic classification. These two types of classification schemes are defined as follows:

> Monothetic classification schemes are those in which the classes established differ by at least one property which is uniform among the members of each class.
>
> Polythetic classification schemes are those in which the classes are groups of concepts or objects that share a large proportion of their properties but do

Table 1

Comparison of Approaches to Address Problems of Classification by Two Classification Systems--Diagnosis Related Groups and Acuity

Classification Problem	Medical Model	Nursing Model
Viewpoint	- Resource use - Reflective of aggregate hospital resource consumption - Motivated by medical/surgical diagnosis and etiology	- Resource needs - Predictive of nursing resource consumption only - Motivated by patient's care requirements and need for support
Generics	Classification of cases into homogeneous groups to reflect total hospital resource consumption for prospective payment reimbursement	Classification of patients into "intensity of nursing care needs" to reflect nurse staffing resources needed
Semantics	Based on existing International Classification of Disease; group assignments based on principal diagnosis, secondary diagnoses, surgical procedures and age	Based on patient's level of need for nursing interventions in areas of hygiene activities, nourishment, elimination, vital signs and other physiological monitoring, medications and IV's, teaching/emotional support and treatments
Syntax	Commonly used medical diagnosis used to group cases; exceptions in a group and with or without procedure clearly stated (example - circulatory disorder except acute myocardial infarction, with catheterization, without complex diagnosis-DRG 125	Descriptors used to describe different levels of support needed are broken into unambiguous terms (example - teaching/emotional support parameters--least intensive level--"routine explanations, patient is capable of understanding" most intensive level--"extraordinary factors: life threatening complications; sensory deficit; language barrier (ET tubes/trach); or "denial, isolation"

not necessarily agree on any one property. (Sokal, 1974)

Monotheticity is a measurement ideal and is difficult to achieve when attempting to classify human phenomena. An example of a monothetic classification scheme would be to classify patients on the basis of sex alone; two classes or groups would be established--male and female. Although perhaps an oversimplification in today's society, in general, persons in each class would have exactly the same sex and each class would be a different sex. A relationship between the two sex-determined groups could be validly predicted.

Classes established in the health care system to reflect resource use have used polythetic schemes. With a polythetic patient classification scheme there is more opportunity for variability of classes in the measurement criteria of interest. For example, patients in individual classes and across classes will display less homogeneity in acuity or total resource use than if a monothetic scheme is attempted to explain acuity or total resource use. Further, when comparing two polythetic classification schemes to determine if there is congruence between the two schemes in ranking cases with respect to resource use, there is greater opportunity for variation in the rank ordering of classes within the two systems. Finally, whereas, in the use of a monothetic classification scheme, the classifier can reliably predict the relationship between members of each class, in a polythetic scheme, the probability of non-homogeneity of members in the classes increases the likelihood that the existence of a relationship between the classifications of interest cannot be validly predicted. A polythetic patient classification scheme, such as DRGs or acuity, groups together and labels cases that share a large proportion of the properties of interest, but do not necessarily agree on any single property. In the DRG classification the labelling communicates to the health care administrator with a knowledge of the DRG Relative Weights that a case in DRG 143 (chest pain) will likely consume less aggregate resources, certainly will receive less revenue, than a case in the DRG 108 (cardiac valve procedure with catheterization and with pump). Likewise, labelling of patients into acuity level classes communicates to a nursing administrator that more nursing resources will be needed on a unit with a high number of acuity level II or III patients than on a unit where all patients are classified as level one (I) acuity. The hospital administrator and nursing administrator do not need to know the particular illness or needs characteristics of each patient in any specific care group to make decisions about resource use; the classification scheme communicates needed information on which to base their decision-making.

Measurement Criteria

The perspective taken in this study views patient acuity as the need for nursing support/care, and as such as a measure for predicting nursing resource use and the DRG case-mix scheme as a measure of total hospital resource consumption. Desirable properties of any measurement method include reliability, validity (Giovannetti, 1979; Hornbrook, 1983; Polit & Hungiar, 1983). Hornbrook (1983) also includes the criteria of sensitivity, cost-effectiveness, flexibility and acceptability in his discussion of performance criteria for a case-mix measure such as DRGs. Reliability and validity are briefly discussed to further relate to the conceptual perspective.

Reliability

Reliability can be defined in terms of accuracy. This property refers to the consistency or repeatability of a measure. Three primary types of reliability are properties of stability, homogeneity and equivalence (Giovannetti, 1979). Stability refers to the consistency of measures on repeated application. An example is the test-retest procedure. Homogeneity, in measurement, refers to the degree to which objects are observed to be similar, i.e., characterized by low variability. Equivalence refers to the "extent to which different investigators using one instrument to measure the same individual at the same time, or different instruments applied to the same individual at the same time yields consistent results". An example is interrater reliability (Giovannetti, 1979). The reliability issue of homogeneity of acuity and length of stay within and across DRGs is explored to determine the degree of correspondence between the two systems for classifying patients on resource use.

Validity

Validity refers to the degree to which a measure actually measures what it is supposed to measure. As is the case with the concept of reliability, there are three common types of validity--content, criterion-related and construct (Giovannetti, 1979). Briefly stated, content validity refers to a measure's ability to adequately represent the domain it is supposed to measure, that is, its "representativeness and comprehensiveness of the content of the measuring instrument" (Hornbook, 1982). Construct validity refers to "the degree to which an instrument measures the construct under investigation" (Polit & Hunglar, 1983).

Although content validity is most relevant when designing tests to measure knowledge of a specific content area, the issue of content validity can arise when considering measures of attributes or behaviors other than knowledge. Many traditional and current acuity classification instruments reflect functional (task-oriented) activities but minimally address the measurement of cognitive and "caring" activities performed by nurses. To develop a content valid instrument for measuring nursing activities which reflect resource use, an instrument maker would need to carefully consider all of the specific functional and cognitive activities in which nurses engage while providing nursing services.

A number of factors might enter into the conceptualization of a content valid instrument to measure the construct of nursing resource use. For example, the instrument should include the measurement of all functional activities such as bathing, feeding, and medication administration performed by the nurse in the patient's behalf. It should also include the "caring" activities, e.g., reassurance and other emotional support given, family involvement in the disease process and so forth. The instrument should also reflect planning and decision making activities as well as activities such as patient teaching and documentation of the services provided, and the patient's response to those services. To increase the validity of the measure, the professional level (Associate Degree, Bachelor of Science in Nursing, Master of Nursing) of the care provider should be measured so that a relationship between nursing activities performed and professional level of care provider could be determined. Polit and Hunglar (1983, p. 398) state, "The significance of construct validity is in its linkage with theory and theoretical conceptualization". As nursing theory in general approaches more advanced levels of development, measurements of specific constructs, such as nursing resource use, will possess greater degrees of measurement validity than is possible at this time.

Criterion-related validity refers to the degree to which quantitative results on a measure are correlated with some external criterion. Both concurrent and predictive validity are subcategories of criterion-related validity.

Concurrent validity is established by comparing one classification instrument with another instrument designed for the same purpose. An essential component of the criterion-related approach is the availability of a reasonably reliable and valid criterion with which the measures on the target instrument can be compared. For this study, DRG classification is posited to be a reliable and valid instrument for purposes of comparison with alternative patient classification systems, such as acuity.

Predictive validity refers to the adequacy with which a measure can predict some criterion variable observed in the future (Polit and Hunglar, 1983). Kerlinger (1974, p. 447) suggests that it is unfortunate that the word "prediction" is so strongly associated with the future because in science, "prediction does not necessarily mean forecast". In this study, predictive validity refers to the validity with which a subset of DRGs can predict nursing resource use as measures of acuity and length of stay.

Purpose of the Study

An implication of the DRG prospective payment system is that nursing departments must begin to produce more specific utilization and cost data so careful analyses of nursing resource intensity per DRG, as well as the variation of resource use within and between DRGs are possible. Without objective data to describe the variations of nursing resource use within and between DRGs, hospital administrators and nursing service directors may presume to use the relative resource structure of the DRGs as an indicator of relative nursing intensity. This plausibility should be subject to empirical test to provide a basis on which to accept or reject this presumption.

The purpose of this study is to look specifically at the way in which the two classification schemes, DRGs and Acuity, group patients with respect to homogeneity of resource intensity and at the ranking relationships of the two schemes on measurements of relative resource use. Identification of how the two systems compare on these issues should reveal the validity with which relative nursing intensity can be predicted by using the relative resource structure of the DRGs.

CHAPTER II

Review of the Literature

This literature review provides an overview of the basic structure and essence of Diagnosis Related Groups and of nursing patient classification systems. The conceptual differences between the two systems are also discussed.

Patient Classification-The Medical Model

Diagnosis Related Groups were initially developed in the late 1960's and mid-1970's at the Yale University Center for Health Studies and at Yale-New Haven Hospital (Plomann & Shaffer, 1983). As a tool for utilization review and quality of care studies, there was no objective to include a specific nursing needs classification in the DRG scheme. In late 1981, new DRGs were refined by the Health Systems Management Group of the Yale University School of Organization and Management, under a grant from the Health Care Financing Administration (HCFA).

The data base to construct the DRG scheme contained approximately 702,000 hospital records from New Jersey and Connecticut and from federally funded patients in fifty institutions in a PSRO region. The objective of the approach used was to examine the interrelationships of the variables in the data base and to determine which ones were related to some specific measure of interest, e.g., length of stay, surgical procedure performed, and so forth (Fetter, Shin, Freeman, Averill, & Thompson, 1980).

The DRGs start with 23 Major Diagnostic Categories (MDCs) which represent mutually exclusive and exhaustive groupings of the International Classification of Disease, 9th Revision, Clinical Modification (ICD-9-CM) codes by organ system since this follows the organization of medical specialties. No specific attempt was made in the classification scheme to specifically identify resource use aspects of nursing or other health care specialties.

The second step in the DRG strategy was to make the initial split within most MDCs on the basis of performance of an operating room procedure. A physician team ranked the possible surgical procedures within each MDC from lowest to highest intensity; employing this continuum, on discharge, patients are classified on the basis of the most resource intensive procedure received that is related to the principal diagnosis. The third step was specification of lists of medically significant complications and comorbidities to be used in grouping patients and identifying case types. Age and death were also included as criterion variables for the DRGs. The patient's principal diagnosis, secondary diagnosis, surgical procedure and age were the basis on which DRGs were assigned.

A primary goal of the development of the DRGs was to place patients in groups based on their consumption of resources. Hornbrook (1982) however cautions that "DRGs must be used with the full realization that they represent treatment patterns more than disease patterns". That is, the permanent pacemaker implant group does not require that a pacemaker was the only method for treating the arrhythmia cases; it means only that the patients must have received a pacemaker implant.

A total of 470 DRGs have been defined, however, only 468 of them represent actual case types. DRG 469 is a classification where the principal diagnosis is invalid as a discharge diagnosis; DRG 470 is unclassifiable because of missing or invalid information. As currently defined, the DRGs provide a manageable number of patient classes (470) that are exhaustive and mutually exclusive with respect to the types of patients seen in acute care settings (Fetter, et al., 1980).

The DRG scheme purports to classify patients into homogeneous groups with respect to aggregate resource use. The recentness of DRG classification, however, suggests a potential for future system refinement (Joel, 1983). DRGs reflect the state of medical technology and practice at the time of their development, therefore, Plomann & Shaffer (1983) suggest that to account for advances in diagnostic procedures and treatment modalities, DRGs will have to be reformulated in the future. For example, the recently introduced technology of using laser to treat some coronary artery disease which previously would have been treated by coronary artery bypass surgery might create a subclass to DRG 109, cardiothoracic procedure without pump. This new subclass might be labeled "DRG 109A, cardiothoracic procedure without pump, with laser procedure". This procedure may decrease the number of bypass surgeries performed which may profoundly decrease the number of that high cost surgical DRG procedure and expenditures for related health services such as intensive care nurses.

As suggested earlier, this medical model of classifying patients may not be congruent with the nursing model of classifying patients. The former classifies patients on the basis of diagnosis-related information, the latter on individual patients' need for nursing intervention regardless of diagnosis.

Patient Classification-The Nursing Model

Since the early 1950's, patient classification using patient illness acuity has occupied a prominent place in nursing literature. Patient classification has been described as the grouping of patients according to some observable or inferred properties or characteristics. According to Giovannetti (1979), "the term patient classification means the categorization of patients according to some assessment of their nursing care requirements over a specific period of time", while the term patient classification system "refers to the identification and classification of patients into care groups or categories as a measure of the nursing efforts required."

The purpose of all (nursing) patient classification systems is to categorize patients according to the magnitude of their dependency on the nursing care system. The total number and variety of classification systems presently in existence is unknown. However, Aydelotte (1973) surveyed and critiqued approximately 200 articles and research reports on methods of arriving at the number of nursing staff needed and for monitoring staffing determinations and found most of them to be inadequate. She noted that "in none of the literature was there a description of an exciting, innovative, conceptual model for use in the development and examination of staffing methodologies."

Patient classification methodologies have covered a wide range. The "intuitive method", in which the more seriously ill patients were situated close to the nurses' office to facilitate more frequent observations, was employed during and for many years after the Florence Nightengale era (Barr, Moors, & Rhys-Hearn, 1973). Recalling a problem in classification, that of "viewpoint", the primary disadvantage of the intuitive approach to patient classification is the tendency for different views to be taken by individual nurse clinicians as to what factors determine low and high patient dependency on nursing staff. More recently, "computer packaged" classification systems are being used in hospitals to establish patient dependency levels (acuity) and to determine numbers of nursing staff needed to care for specific groups of patients. (Table B-1 in Appendix contains a brief description of a variety of patient classification systems. Those selected from the many available were chosen mostly because they represent a diverse range of the approaches available. No attempt has been made to critique the methodologies used or the variety of conceptual issues which were considered in their development.)

For many years nursing administrators assumed that the only information needed to make staffing decisions was the average number of nursing hours required by each patient (e.g., medical patient, surgical patient, obstetric patient) and the number of patients in the hospital (Stimson & Stimson, 1972). Specifically, in 1950 the American Hospital Association and National League for Nursing Education collaborated in preparing guidelines for hospital nursing using a method of calculating the numbers of nursing personnel needed by multiplying the average number of nursing hours required per patient per day by the number of patients served (American Hospital Association and National League for Nursing Education, 1950). This methodology was an improvement over the intuitive method but did not fully account for variations in intensity in nursing care required. Rising health care costs and shortages of manpower during the decade of the fifties motivated the first actual efforts to classify patients according to intensities of nursing care requirements (Wright, 1974; George & Kuehn, 1955; Claussen, 1955). These early attempts to classify patients were significant for several reasons. First was the idea that there are similarities in care requirements of individual patients which allows for the concept of grouping patients in clusters. Second, it was recognized that a patient's degree of illness (acutely ill, moderately ill, mildly ill) does not necessarily reflect the intensity of nursing care demands and subsequent time required to provide nursing care. That is, a patient whose emotional state is not congruent with his/her physical state, even though he/she may be classified as moderately ill, may require as much or more nursing time than a patient who is considered to be more seriously ill. Finally, the research activities of nursing leaders during this period, a time of rapid development and refinement of measurements to determine and help communicate the domain of nursing, provided a foundation from which future nursing leaders have been able to progress toward a comprehensive definition of nursing.

The work of Flagle and his associates at Johns Hopkins University during the 1950's was perhaps the most significant contribution to the development of patient classification systems. They observed that there was a wide swing in demand for nursing care within each ward from day to day because of variations in distribution of patients in various need categories. They formulated a direct care index based upon the need for total care, or partial care, or self-care. This index was the first developed to estimate the number of direct nursing care hours required on each ward each day to meet predetermined standards of care. In Flagle's study, direct nursing care required was calculated by multiplying the number of patients in each category by the average number of minutes of nursing care required, and summed. A significant finding in their study was that workloads were statistically independent in various units in the same hospital. That is, a heavy workload on one unit was not associated with a heavy workload in another unit (Flagle, 1960). This finding was important to nursing because it was among the first to show that variation among categories can be such that even if the total number of patients remains the same, no single staffing level is satisfactory at all times. In addition to demonstrating that patient care was not a function of census alone, as a result of the variation in demand for care relative to average demand, Flagle's study revealed that the main determinant of nursing workload was the number of intensive care level patients (Giovannetti, 1979).

Since Flagle's initial work, patient classification systems for nursing have almost always been developed in conjunction with a quantification system that estimates nursing care time associated with each category of care. Some systems are extremely simple, some are highly intricate, some are public, some are copyrighted, some are more easily adaptable to specialty units and long-term care than others, and all involve a degree of subjectivity in nursing judgment that must be considered in their implementation.

Conceptual Differences

Employing the basic nursing model/medical model differences as a base on which to build a comparison of the two patient classification systems, specific differences are discussed. Perhaps one of the most significant conceptual differences between the systems is that DRG classification for each case is assigned after provision of hospital services (ex post) and is based on objective medical record data to reflect total resource consumption whereas, acuity is a subjective measure assigned to a case before provision of nursing care (ex ante) to predict nursing resource consumption only. Further, DRGs are a nationally standardized measure of resource use subscribed to across hospitals whereas, patient acuity is a nonstandardized measure, predictive of nursing resource use per shift, which varies from hospital to hospital depending on the management philosophy and classification system chosen by the particular nursing service. A major issue yet to be addressed is that patients' variable needs for nursing care were not directly entered into the conceptualization and development of the DRG system. The present study compares one hospital's patient acuity classification system for a subpopulation to the DRG system of patient classification for that population. A valuable future step would be to develop a classification system that would identify nursing activities which most accurately reflect what nursing is and what services nurses perform to return a patient to an optimal level of functioning.

Further, DRG case-mix is defined as the relative proportion of different types of cases--medical diagnosis/surgical diagnosis--treated at a particular acute care hospital, whereas patient acuity can be defined as the relative proportion of different acuity levels of nursing care needed by individual patients, regardless of diagnosis. Hypothetically, a hospital with a greater number of critically ill medical cases than surgical cases under DRG case-mix would be reimbursed at less dollars because surgical DRGs are assumed to consume greater overall resources than medical DRGs.

Since hospitals were first reimbursed on the basis of DRGs, patient days have been used to apportion nursing costs among the DRGs and to calculate the amount paid for nursing care (Grimaldi & Micheletti, 1982). This per diem reimbursement makes no allowance for variations in a patient's diagnostic classification of medical or surgical relative to severity of illness or for need for nursing care. It is possible, for example, that a patient with heart failure/shock--(medical diagnosis-DRG relative weight 1.0408; length of stay-7.8 days) receiving IV vasoconstricting drugs which must be adjusted by the registered nurse within parameters written by the physician--will consume more nursing resources than a patient with a diagnosis (DRG) of appendectomy without complicated principal diagnosis, age less than 70, without comorbidities and complications (surgical diagnosis-DRG relative weight 1.0818; length of stay-7.4 days), even though the two patients have nearly identical DRG weights and lengths of stay. Quality care and nurse practice acts dictate that a registered nurse (R.N.) must provide assessment and interventions for the heart failure/shock patient in this example. A Licensed Practical Nurse or R.N., however, would have the appropriate education and skills to provide the majority of care for the appendectomy patient. Nursing resources consumed would be based on both the level of intensity of the patient's needs and the education and clinical-skills level of the nurse providing the required care.

Conceptually, the care intensity measure in the DRG scheme is based on the patients' medical diagnoses and surgical procedures performed; evidence of within-diagnosis variance in care intensity is not well explained when only these variables are employed. The intensity measure in the acuity scheme is the magnitude of the patient's need for nursing services to restore him/her to an optimal state of wellness without regard for medical diagnoses or surgical procedure performed. Plomann and Shaffer (1983) point out that the DRG system considers nursing to be part of hospital overhead costs and does not evaluate diagnoses according to their intensity requirements of nursing services. The per diem allocation does not provide reimbursement differences for nursing services consumed, for example, between a sighted, English-speaking diabetic out of control, and a blind, Vietnamese-speaking diabetic out of control, given both patients have the same length of stay. The nursing time required to provide quality care to the latter patient would certainly exceed the nursing time required to provide the same level of care to the former. If the basic treatment regimens are the same for both patients, factors other than diagnosis and length of stay may affect the level of care intensity required by individual patients and delivered by the nurse.

Another concept significant in determining expected resource allocations (DRGs) and cost per case is length of stay (LOS). In the medical--DRG--model, costs and resource allocations are determined on a case by case basis regardless of length of stay, as long as the patient's stay is within accepted length of stay parameters. In the nursing model, however, resources are allocated according to individual patients' acuity on a shift by shift basis for the entire hospital stay. Acuity, which is an ongoing measure predictive of resource use, is more likely to change during the course of the hospital stay than is a patient's diagnosis--DRG--which is a terminal measure of resources consumed.

It is possible that Acuity is actually reflected within the DRG scheme but that it is obscured by the emphasis placed on the illness/diagnosis and etiology classification terminology used. For example, DRG 143, chest pain, calls into action basic nursing routines of symptom and system monitoring, reassurance, patient education activities, and so forth which are standards of practice in cardiac nursing. Expected activities dictated by a patient's need for nursing support cannot so readily be anticipated however for patients in DRG 138, cardiac arrhythmia + conduction disorder, age >65. One patient in this DRG may be experiencing his/her first illness episode of a lifetime and may have nursing needs of only system and symptom monitoring and reassurance, while another patient in the same DRG may have multisystem complications as a result of the aging process which necessitates greater nursing support to address multiple problems related to or resulting from the basic cardiac arrhythmia. In the former case, the relatively stable acuity classification may be a simple refinement of the medical classifications; in the latter case however, the possible variation in nursing needs makes it difficult to speculate whether or not acuity is actually manifested in the relative intensity measure of the DRG classification.

Because nursing resource consumption can vary among patients within the same DRG depending upon overall acuity level and length of stay, the concept of variability of acuity is important because it may influence average acuity and may not be well accounted for in a per diem reimbursement system. Overall, these differences suggest that the two sets of assessed demands upon resources (nursing acuity level and DRG) may not follow parallel courses.

Nursing and the DRG Methodology: Patient Classification in Transition

The introduction of the prospective payment system has caused nursing and other health care administrators to focus their thinking and efforts from classifying patients for predicting nursing resource use to identifying actual nursing resource consumption in relation to the Diagnosis Related Groups. Nurses have expressed dissatisfaction with the "per diem" method of apportioning nursing costs in the DRG methodology. While nursing resource consumption continues to be averaged among all patients on a daily basis, it is difficult to predict the intensity of nursing resource consumption on a patient-specific basis using traditional methods of patient classification developed by nurses. This consequently makes it impossible to exert maximum control over the nursing budget (Joel, 1983).

Research has shown that DRGs do not take into account the range of severity of illness within a specific DRG. Piper (1983) suggested that, with respect to costs, DRGs can group certain patients together unfairly. To more accurately identify resource consumption within a DRG, efforts by Horn and her colleagues at Johns Hopkins Hospital University School of Hygiene and Public Health have resulted in the development of a Severity of Illness scale. The scale includes patients' degree of dependency on nursing as one of its criteria (Horn, Sharkey, Bertran, 1983). Because the Severity of Illness index is inherently subjective and has no reliable predictive value for government costing and budgeting purposes, the Department of Health and Human Services has not recognized the concept in pricing health care services.

Piper (1983) has suggested the need to coordinate DRGs and nursing patient classification as an essential step in assuring patients will be adequately cared for and hospitals will have sufficient income to deliver that care in the future. The most notable effort in this respect thus far has been undertaken by the New Jersey Health Department under a Health Care Financing Administration (HCFA) contract to conduct a multiyear project which began with the Patient Classification System Acuity Instrument Nursing Pilot Study. The original intent of the study was to develop a DRG-specific nursing allocation model to attempt to relate a patient's consumption of nursing resources to his or her medical diagnosis. The fourth generation of that study resulted in the RIMs (Relative Intensity Measures) methodology (Caterinicchio, 1983). By 1982, RIMs provided a case-mix system that quantifies nursing resource use on a patient-specific basis which is completely separate from the DRG (Joel, 1982).

A RIM is actually one minute of nursing resource use. In the research, MDCs were subsequently combined, in whole or in part, to form nine Nursing Resource Clusters. Reported minutes of nursing care patients received were standardized for differences in nursing skill mix, then regressed against variables believed to influence the amount of nursing care received, e.g., length of stay, age of patient, number of diagnoses and number of procedures. In the RIMs methodology, length of stay was identified as the most valid predictor of nursing resource consumption (Grimaldi & Micheletti, 1982).

RIMs are a hospital cost allocation model--not a traditional classification system for computation of staffing requirements. Rather than a day to day or shift to shift index of staffing needs, they provide a patient-specific, aggregate, interval measure of nursing resource consumption. Although controversy exists concerning the methodology in developing RIMs (Grimaldi & Micheletti, 1982; Grimaldi & Micheletti, 1983; Caterinicchio, 1983), RIMs data begins to document nursing's contribution to hospital fiscal solvency.

Curtin (1983) has proposed an alternative method which will relate nursing resource use to the prospective payment methodology of DRGs which is a parallel structure model of DRGs in nursing care. She proposed there be 23 Major Nursing Care Categories (NCCs) to correlate within the 23 Major Diagnostic Categories (MDCs), subdivided into general Nursing Care Stretegies (NCSs) to correlate with the Diagnostic Related Groups. NCSs are defined as detailed nursing care plans which should include the direct and indirect patient care needed. Further, she proposed that NCSs should reflect the nursing time needed to deliver quality care to patients to accomplish specific patient outcomes. Based on a Nursing Patient Classification system because it directly reflects the nursing resources allocated to a specific patient with a specific diagnosis, Curtin's model proposed assigning dollar figures to the acuity classification and then converting the patient's intensity index to a monetary amount in order to calculate total nursing costs (Riley & Schaefers, 1983). This method provides an alternative to the RIMs methodology and may be found to be more cost-effective in "start up" time since it could be adapted to a hospital's existing patient acuity system.

Successful conversion of an existing acuity classification system to a system which directly reflects nursing resources allocated to a specific patient with a specific diagnosis is in part dependent upon the assurance that the acuity system accurately reflects the nursing resources consumed and that cases are accurately assigned to specific DRGs.

To summarize, efforts by nursing and other health care system leaders to classify patients to reflect nursing resource use is in a transitional stage. Administrators are no longer satisfied to know how many resources are needed, they want to know the actual level of nursing resources consumed. Horn and her associates have attempted to provide this information by including patients' dependency on nursing as a criterion in the Severity of Illness Scale. Proponents of the RIMs methodology have attempted to merge the semantics of DRGs and patient acuity classifications to establish a hospital cost allocation model to address the transitional generic problem. Rather than merge the semantics and syntactical characteristics of the two systems, Curtin's (1983) proposal of a method to relate nursing resource use to the prospective payment methodology of DRGs has resulted in a set of new terminology (NCCs, NCSs) to reflect direct and indirect patient care needs which will demonstrate nursing resources consumed.

It is appropriate here to assess the approaches the nursing transitional systems of grouping patients have taken in addressing the problems of classification in general identified in the conceptual perspectives section of this study. Recall that the classification problems relate to (1) viewpont, (2) generics, (3) semantics and (4) syntax.

The viewpoint of the transitional schemes remains patient-centered and from a nursing perspective. The generic problem has shifted from classifying patients for predicting nursing resources needs to efforts to identify actual nursing resources used.

The problems of "semantics" and "syntax" have experienced the greatest alterations. "Level of care" based on patient need (I-minimal, II-moderate, III-maximum) is the traditional terminology (semantics) used and understood by the profession to classify patients. The transitional schemes introduce a number of new semantical and syntactical terms to describe approaches to patient grouping, e.g., Relative Intensity Measures (RIMs), Major Nursing Categories (MNCs), Nursing Care Strategies (NCSs) and so forth. These terms are currently being refined through research to reflect the allocation of nursing resources for individual patients. As defined in the literature, the terms seem clear and unambiguous; their true connotation however will become apparent only after further testing and a determination of their degree of acceptance by the nursing community.

The transitional schemes propose to group patients using a modified case-mix strategy based, at least in part, on the concepts established in the DRG methodology. Published works addressing this transitional phase in grouping of patients have not clearly documented the importance of the variability in acuity within and across patient groups. Numerous reasons for variations in acuity have been addressed. One intent of this study is to contribute to an understanding of the relationship between DRGs and acuity for classification of patients by exploring the degree of correspondence between use of the two systems as mechanisms for grouping patients to determine resource use.

Chapter III

Aims and Approach

The conceptual rationale for the study is derived from the literature by Sokal (1974) and Giovannetti (1978, 1979) on classification criteria and from that by Giovannetti (1979) and Hornbrook (1982) on measurement criteria. Three primary concepts of classification and measurement are examined: (1) homogeneity of patient groups, (2) ordering or ranking of patient groups, and (3) predictive validity with respect to the degree with which DRGs can predict length of stay and patient acuity in the study population.

A second conceptual perspective relates to the differences between a medical model and a nursing model for classifying patients and provides a further framework for the study.

The overall aim of this study is to compare two patient classification systems--Diagnosis Related Groups and Acuity--with respect to their degree of correspondence in grouping patients according to patterns of resource intensity. The critical dimensions of hospital use in this study are length of stay and acuity, where acuity is defined as need for nursing care. Three specific aims are identified to compare the two classification systems.

The DRGs claim to have grouped cases into classes which are more similar than different with respect to total resource use. To determine whether there is a relationship between DRG classification and patient classification based on acuity, it is necessary to determine if an acuity measure groups cases in any particular DRG into classes which are more similar than dissimilar with respect to nursing resource use.

To address the concept of homogeneity of patient groups, the first specific aim is:

1. To determine whether cases within a DRG are more alike with respect to acuity than cases in different DRGs. Does the DRG scheme account for a significant proportion of the variance in acuity? Is within-DRG variation in acuity smaller than between-DRG variation in acuity? The ultimate aim here is to determine whether the DRGs have classified cases into groups that are more alike than different with respect to nursing acuity.

Diagnosis Related Groups have been ranked according to a relative resource weight system to demonstrate expected total resource use for each group. Relative acuity within DRGs can also be ranked and will reflect expected nursing resource use for each group. Determination of the rank or ordering relationship will facilitate the comparison of resource intensity of the two patient classification systems, and, therefore, address the issue of concurrent validity.

To address the concept of ranking or ordering, the second specific aim of the study is:

2. To determine whether the relative resource weights established by Medicare DRGs correspond to relative nursing resource use as measured by patient acuity weights and length of stay in each DRG. Are high acuity cases also high resource intensive under the DRG scheme? Does the relative resource structure of the DRGs correspond with the relative nursing needs structure?

This study will explore whether different instruments applied to the same populations at the same time yield consistent results.

The ability of a measure to predict some outcome that is hypothesized to be related to the fundamental concept is referred to as predictive validity (Hornbrook, 1982). The fundamental concept under study here is resource use--both nursing and total resource use. Numerous studies have demonstrated that length of stay is the most consistent predictor of nursing resource consumption (Caterinicchio & Davis, 1983; Grimaldi & Micheletti, 1982). In formulating the DRGs, length of stay was also a variable used in defining total resource consumption (Fetter, et al, 1983). An interest in exploring patient acuity as a predictor of nursing resource use lead to the third specific aim of the study, that is:

3. To evaluate the predictive validity of the DRGs within two special care units--the Coronary Care Unit and the Coronary Recovery Room--for the outcomes of length of stay and patient acuity in a university

teaching hospital.

If the conclusions drawn from an analysis of the findings relevant to these aims indicate a high degree of correspondence in grouping patients according to patterns of resource intensity, then hospital and nursing administrators can presume that the relative resource structure of the DRGs can be used as an indicator of relative nursing intensity for predicting nursing resource needs. If however, the conclusions indicate a low or minimal degree of correspondence in grouping patients according to resource intensity, this may suggest the need for further development of the transitional nursing classification systems to reflect resource allocation or for proposals of other alternative systems for quantifying nursing activities to reflect nursing resource use.

Approach

Study Design

An exploratory correlational design is employed in this study. The purpose of this methodological study is to describe the relationship between patient acuity classification (the nursing model) and DRG classification (the medical model) for specific DRGs and to evaluate the validity of the DRG scheme of classifying patients on its ability to predict nursing resource use. Specifically, the study is concerned with determining the congruence between two methodologies--medicine and nursing--for classifying patients with respect to resource use.

Setting and Sample

The Oregon Health Sciences University Hospital (OHSU) is the setting for this study. University Hospital is an urban, teaching hospital in a major metropolitan area in the Pacific Northwest. The hospital has a staffed bed capacity of 427 beds. It is a regional treatment, teaching and resource center for Oregon, Washington and Idaho. OHSU Hospital has four adult inpatient critical care units. They are Coronary Care Unit (CCU), Cardiac Recovery Room (CRR), Surgical Intensive Care, and Medical-Surgical Intensive Care. The intensive care units are staffed with registered nurses only.

To keep the study manageable, two subunits of the hospital (CCU and CRR) were selected for data collection. The CCU is an eight bed unit; the CRR is a five bed unit. During the six-month data collection period, the average occupancy rate for the CCU was 74.12 percent, representing 1104 census days. Average R.N. staffing allocation per day to the CCU was 19.24 nurses over this period. The average occupancy rate for the CRR was 67.4 percent, accounting for 620 census days, with an average R.N. staffing allocation of 16.66 nurses per day. Data relating to all adult patients discharged from the Cardiac Care Unit (CCU) and the Cardiac Recovery room (CRR) for a six month period, March, 1983 through August, 1983, were collected. Patients who received care in these units constituted 4.6 per cent of total patients cared for in the hospital during the period of the study. The specific units were selected to include both medical and surgical components of the DRG methodology. A sample of convenience of secondary data for patients discharged from CCU and CRR was analyzed. Only those DRGs with ten or more cases were included in the analysis. This sampling method resulted in a sample of 188 cases in the CCU and a sample of 74 cases in the CRR.

Data Collecting Procedure

Patient acuity level data were abstracted from concentrated nursing care (CNC) charge slips (see Appendix C) which were completed by the primary nurse for each patient admitted to the study units and which are retained by the nursing office. Discharge information, including Major Diagnostic Category (MDC), DRG, sex, age, unit and total length of stay, number of diagnoses, number of procedures done, date of hospital admission and discharge, discharge status and payment source, was obtained from the hospital's computerized discharge abstract system.

For this study, Diagnosis Related Group Classification is defined as the DRG principal diagnosis recorded on the hospital discharge abstract. Some general limitations of reliability and validity in discharge abstract recording has been documented in the literature (Institute of Medicine, 1977, 1980; Demlo, Campbell & Brown, 1978; Connell, Blide & Hanken, 1984; Corn, 1984). Findings of these studies reveal that existing hospital discharge data are adequate in describing general utilization patterns by age and sex, and in the comparison of overall length of stay among hospitals. Demlo, however, (1978) found that "diagnostic specific discrepancies are of sufficient magnitude to preclude the use of such data for detailed research and evaluation or to measure diagnostic case-mix as an indication of intensity of services that could then form the basis for determining reimbursement rates".

A review of the quality assurance program in the Medical Records Department at University Hospital reveals a documented 90 to 93 percent accuracy rate for discharge abstract recording. This accuracy rate is substantially higher than the accuracy rate reported in the literature and will enhance the reliability and validity of the findings of this study.

The DRGs analyzed in this study were those DRGs in the data set in which ten (10) or more cases were identified on discharge abstracts using principal diagnosis. Patient acuity classification for analysis is measured by the CCU and CRR Nursing Patient Classification and Staffing System at Oregon Health Sciences University Hospital acuity tools (see Appendix A). These indexes provide a measure of the degree of nursing care intensity in a range of I to IV; level I reflects the least intensity of nursing support needed, level IV reflects the highest intensity of nursing support needed and is reserved for those cases which require a nurse patient ratio of 2:1. The measurement tools specific to the individual units are similar; however, some descriptors are weighted differently to more accurately reflect the specific care needs of cases in the respective units.

To compare the two classification systems, four nursing model--acuity--measures and two medical model--DRG--measures are identified as variables relevant to this study. The nursing model dependent variables are initial acuity, total acuity, unit length of stay, and total length of stay. The DRG variables are the DRG relative weight factors and DRG geometric length of stay specified by HCFA for the medical program.

Initial acuity is defined as the average acuity of a case in the intensive care unit during the first three eight-hour shifts or any part of the first three shifts after admission. If the patient was in the unit only one shift, that shift acuity is the initial acuity. If the case was in the unit only two shifts, the acuity of each shift was summed and divided by two to reflect initial acuity. If the case was in the unit three shifts, the acuity of each shift was summed and divided by three to determine initial acuity. For each DRG, the resulting initial acuities were summed and divided by the number of cases in that DRG in the units during the study period to provide the DRG-specific initial acuity.

Total acuity for each DRG group is defined as the average acuity of each case for its total hospital stay summed and divided by the number of cases in each specific DRG. Unit length of stay is defined as the number of days a "case" was in the CCU or CRR. If a patient was admitted to both units during a single hospital stay, each admission was treated as a "case" for that DRG, therefore, some "cases" analyzed in specific DRGs may have been one patient who was cared for in both units. Total length of stay is defined as the number of days a case was in the hospital.

Diagnosis Related Group relative weight is the measure indicative of total resource consumption assigned specifically to each DRG. The DRG geometric length of stay indicates the maximum number of days a case can be hospitalized, within the parameters established by the methodology, for which the hospital receives full reimbursement. The numerical values for DRG relative resource weights and DRG geometric length of stay are from the Federal Register (Vol. 48, No. 171, September 1, 1983 Rules and Regulations).

Analysis

Descriptive statistics were computed on the sample of cases. Frequencies, mean, standard deviations, median and mode were calculated on age, sex, total length of stay, unit length of stay, initial acuity and total acuity.

To determine the relationship between unit length of stay, total length of stay, initial acuity and total acuity, Pearson's Product Moment Correlation Coefficients were computed. To test for homogeneity of variance on the dependent variables initial acuity, total acuity, unit length of stay and total length of stay, Cochran's C and the Bartlett's-Box F statistics were computed. The tests were used to determine if cases which are purported to be placed in homogeneous groups by DRG classes also display homogeneous grouping on the variables initial acuity, total acuity, unit length of stay and total length of stay.

One way analysis of variance (ANOVA) was computed to examine the differences in acuity and length of stay variables across and between DRGs, providing an F-ratio.

CHAPTER IV

Results and Discussion

This chapter describes the findings of the study. The purpose of this study is to conduct a comparision of two patient classification systems on three levels--homogeneity of patient groups (Aim 1), equivalence ranking of patient groups (Aim 2), and predictive validity of a relationship between the classification measures (Aim 3). A general overview of the sample is presented first, followed by the findings relevant to each aim.

Overview

The initial data set consisted of four hundred (400) cases for which both concentrated nursing charge slips and computerized hospital discharge abstracts were available. Seventy-eight (78) Diagnosis Related Groups (DRGs) from 17 Major Diagnostic Categories were represented in the initial sample (see Appendix D). Employing the criterion that only those DRGs with ten or more cases would be analyzed, the final data set consisted of two hundred sixty-two (262) cases, representing twelve DRGs from MDC 5. The DRG number, DRG name, and frequency of each group is presented in Table 2.

Of the 262 cases, 74 (28.2%) were treated in the Coronary Recovery Room. One hundred eighty-eight (71.8%) were treated in the Cardiac Care Unit. Two hundred fifty-two (96.22%) were discharged alive, ten (3.8%) died while hospitalized. Two cases (0.8%) were discharged against medical advice.

One hundred sixteen (44.3%) cases were males; 146 (55.7%) were

Table 2

Diagnosis Related Group, Name, Number of Cases, Percent of Sample

DRG	Diagnosis Related Group	Number of Cases	Percent of Cases
104	Cardiac Valve with Pump, with Catheterization	18	6.9
105	Cardiac Valve with Pump, without Catheterization	12	4.6
106	Coronary Artery Bypass Graft with Catheterization	41	15.6
107	Coronary Artery Bypass Graft without Catheterization	24	9.2
108	Cardiothoracic Procedure except Valve and Coronary Bypass Graft	12	4.6
116	Permanent Pacemaker Implant without AMI, CR, Congestive Heart Failure	13	5.0
124	Circulatory Disorder except Acute Myocardial Infarction, with Catheterization, with Complex Diagnosis	29	11.1
125	Circulatory Disorder except Acute Myocardial Infarction, with Catheterization, without Complex Diagnosis	19	7.3
127	Heart Failure and Shock	22	8.4
138	Cardiac Arrhythmia and Conduction Disorder, Age Greater Than 65 and Comorbidities	19	7.3
140	Angina Pectoris	34	13.0
143	Chest Pain	19	7.3
	Total	262	100.0

females. Age ranged from 20 years to 88 years. For each Diagnosis Related Group, mean age and gender characteristics of the sample are presented in Table 3.

Length of stay was measured in days. Unit length of stay is defined as the number of days a "case" was in the Coronary Care Unit (CCU) or Coronary Recovery Room (CRR). If, during a single hospitalization a patient was admitted to both units, each admission was treated as a "case" for that DRG. Unit length of stay ranged from one day to twelve days. Total length of stay is defined as the number of days a case was hospitalized. Total length of stay ranged from one day to seventy-two days.

Acuity is defined as predicted need for nursing care, with a scale of one to four; level one indicates the least intensity of need, level four indicates the highest intensity of nursing care--a nurse-patient ratio of 2:1. Initial acuity is the average acuity of a case in a study unit during the first three eight-hour shifts or any part of the first three shifts after admission. Mean initial acuity ranged from 1.18 to 2.92 on a scale of 1 to 4. Total acuity for each DRG is the average acuity of each case for its total hospital stay, summed and divided by the number of cases in each specific DRG. Mean total acuity range was from 1.09 to 1.95. See Table 4.

Frequency distributions for the number of diagnoses and for the number of procedures recorded on the discharge abstracts for the 262 cases can be found in Tables 5 and 6 respectively.

Table 3

Age and Sex Characteristics of Cases in Each Diagnosis Related Group

Diagnosis Related Group		Age In Years			Sex	
Number	Name *	Range	Mean	Median	Female	Male
104	Valve with Pump, with Catheterization	30-83	51.3	51.8	17	1
105	Valve with Pump, without Catheterization	20-88	51.8	51.8	10	2
106	CABG with Catheterization	37-73	63.0	62.5	22	19
107	CABG without Catheterization	49-78	63.5	60.5	18	6
108	Cardiothoracic Proc. exc. Valve and CABG	21-66	48.8	49.0	4	8
116	Perm. Pacemaker Implant w/o AMI, CHF	57-85	70.1	72.0	6	7
124	Circulatory Disorder exc. AMI w/Cath. and Complex Diagnosis	20-81	55.3	57.0	23	5
125	Circulatory Disorder exc. AMI w/Cath. without Complex Diagnosis	20-78	51.6	57.0	10	9
138	Cardiac Arrhythmia and Cond. Disorder, Age Greater Than 65 and Comorbidities	30-80	64.9	68.0	7	12
140	Angina Pectoris	34-86	62.0	60.0	14	20
143	Chest Pain	22-72	53.2	54.0	7	12
				Total	146	116

* DRG names abbreviated for ease in communication

Table 4

Unit and Total Length of Stay Characteristics of Cases In Each Diagnosis Related Group

Diagnosis Related Group		Unit LOS			Total LOS		
Number	Name	Range	Mn	Mo	Range	Mn	Mo
104	Cardiac Valve with Pump, with Catheterization	1-8	4.50	3	5-56	22.56	32
105	Cardiac Valve with Pump, without Catheterization	3-6	4.75	4	8-72	21.92	9
106	Coronary Artery Bypass Graft w/Catheterization	1-11	4.42	2	3-29	13.88	13
107	Coronary Artery Bypass Graft w/o Catheterization	2-11	4.83	5	6-49	14.96	8
108	Cardiothoracic Procedure except Valve and Coronary Bypass Graft, with Pump	1-7	3.92	2	8-17	13.17	10
116	Permanent Pacemaker Impl. w/o AMI, Congestive Heart Failure	1-9	3.39	2	2-11	5.92	3
124	Circulatory Disorder exc. AMI with Catheterization, with Complex Disease	1-12	6.10	8	3-21	9.72	10
125	Circulatory Disorder exc. AMI with Catheterization, without Complex Disease	1-12	3.00	2	2-13	5.79	3
127	Heart Failure & Shock	1-9	3.82	3	2-29	8.55	6
138	Cardiac Arrhythmia and Conduction Disorder, Age Greater Than 65	1-4	2.21	2	1-14	5.00	2
140	Angina Pectoris	1-6	2.32	2	1-27	5.74	2
143	Chest Pain	1-3	1.90	2	1-7	2.74	2

Table 5

Frequency Distribution for Number of Diagnoses (Final Sample)

Number of Diagnoses	(N)	Percent
1	10	3.8
2	17	6.5
3	34	13.0
4	28	10.7
5 (or more)	173	66.0

Note. Mean=4.29; Median=4.74; Mode=5; Std De.=1.15; Range=4
For the above table the maximum number of diagnoses recorded on discharge abstracts was five.

Table 6

Frequency Distribution for Number of Procedures (Final Sample)

Number of Procedures	(N)	Percent
0	62	23.7
1	40	15.3
2	25	9.5
3	134	51.1
4 (or more)	1	0.4

Note. Mean=1.89; Median=2.53; Mode=3; Std De.=1.27; Range=4
For the above table the maximum number of procedures recorded on discharge abstracts was four.

Approximately 4 percent (N=10) of the cases had only one diagnosis; 66 percent (N=173) had at least five documented diagnoses. This large percentage of patients with multiple health problems may in part explain variations in acuity which will be addressed later in the study.

Over 50 percent of the cases (N=135) had three or more procedures documented on the discharge abstracts. Approximately one fourth (23%) of cases had no procedures while hospitalized.

<u>Homogeneity</u>

One criterion in the development of the DRGs was that each group be homogeneous with respect to overall resource use, that is, cases grouped into a given DRG should be more alike in overall use of hospital resources than cases grouped in different DRGs. Nursing care is an important component of hospital resources; therefore, nurse administrators must be concerned with determining if cases in a specific DRG are homogeneously grouped with respect to acuity, that is, are cases in a given DRG more alike with respect to nursing resource use than cases grouped in different DRGs. Ideally, the variation in the nursing resource measure of cases in a given DRG would be minimal since the DRG groups were established to reflect minimal variation in total resource use. Since the DRGs were not developed with any reference to nursing intensity, the first objective of this study is to examine the correspondence between DRGs, which are based on length of stay, and acuity which is a measure of expected nursing intensity. To compare the DRG classification system with an acuity system, each Diagnosis Related Group in the study was examined to determine the homogeneity of DRG-specific groups of patients with respect to acuity. A further step was taken to determine if cases were homogeneously grouped with respect to length of stay.

The specific aim to address the concept of nursing homogeneity of groups was to determine whether cases within a DRG are more alike with respect to acuity than cases in different DRGs. The ultimate aim here is to determine whether the DRGs have classified cases into groups that are more alike than different with respect to nursing acuity.

Nursing homogeneity of groups was examined on three levels. To test for homogeneity across DRGs, variation in acuity was evaluated using analysis of variance (ANOVA). Because group sizes are not equal in this study, the assumption of homogeneity of variance was tested to determine if sample size was associated with the degree of variance within groups. Coefficients of variation were computed to determine which DRGs have the greater degree of within-group homogeneity with respect to nursing resource use.

As shown in Table 7, the analysis of variance (ANOVA) indicates that within-DRG variance on each dependent variable is smaller than between-DRG variance. The F-ratio value for each variable (Unit Length of Stay, F = 8.601; Total Length of Stay, F = 10.625; Initial Acuity, F = 16.321; Total Acuity, F = 9.042) exceeds the tabled F value at 11 and 250 degrees of freedom. These

Table 7

Analysis of Variance For The Four Dependent Variables

UNIT LENGTH OF STAY

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES
Between Groups	11	415.6546	37.7868
Within Groups	250	1097.5515	4.3902
Total	261	1513.2061	

F-Ratio 8.60 *** Variance accounted for by DRG = 24%

TOTAL LENGTH OF STAY

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES
Between Groups	11	8497.4588	772.4962
Within Groups	250	18176.0068	72.7040
Total	261	26673.4656	

F-Ratio 10.625 *** Variance accounted for by DRG = 28%

INITIAL ACUITY

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES
Between Groups	11	78.2630	7.1148
Within Groups	250	108.9835	0.4359
Total	261	187.2465	

F-Ratio 16.321 *** Variance accounted for by DRG = 39.1%

TOTAL ACUITY

SOURCE	D.F.	SUM OF SQUARES	MEAN SQUARES
Between Groups	11	22.8580	2.0780
Within Groups	250	52.2509	0.2090
Total	261	75.1089	

F-Ratio 9.042 *** Variance accounted for by DRG = 27.3%

*** $p < .01$

findings indicate the population means are significantly different and offer some evidence that the groups are homogeneous. It appears that a substantial proportion of variance is accounted for by DRGs; however, there is some support for within-DRG homogeneity. (Means and standard deviations are given in Table 8.)

To determine the amount of variance accounted for by the DRGs, the following formula was used (Hays, 1973, p. 486):

$$\text{est } W^2 \text{ (Omega)} = \frac{\text{Sum of Squares Between} - (11) \text{ Mean Squares Within}}{\text{Sum of Squares Total} + \text{Mean Squares Within}}$$

For the study population, the DRGs accounted for 24 percent to 39 percent of the variance found on the four dependent variables (See Table 7).

To test the assumption of homogeneity of variance for one way ANOVA, both Bartlett-Box F and Cochran-C procedures were employed. Results of the tests, in Table 9, indicate that the assumption of homogeneity of variance is violated, with this violation being most pronounced in the dependent variable total length of stay. Violation of the homogeneity of variance assumption has negligible consequences on the probability statements associated with Type I errors when the group sizes are equal; however, because group sizes are not equal for this study, some attention must be paid to the violation of this assumption. In general, when the larger group sizes are associated with large variances, the actual alpha level is less than the nominal alpha level (Glass & Hopkins, 1984). In

Table 8

Means and Standard Deviations for Unit Length of Stay (LOS), Total Length of Stay (LOS), Initial Acuity and Total Acuity

			Unit LOS		Total LOS		Initial Acuity		Total Acuity	
DRG	GROUP	N	$\bar{x}$	(sd)	$\bar{x}$	(sd)	$\bar{x}$	(sd)	$\bar{x}$	(sd)
104	Cardiac Valve w/Pump, with Catheterization	18	4.50	(1.95)	22.56	(15.28)	2.56	(0.80)	1.48	(0.54)
105	Cardiac Valve w/Pump, without Catheterization	12	4.75	(0.97)	21.92	(23.67)	2.92	(0.68)	1.93	(0.10)
106	Coronary Artery Bypass Graft w/Catheterization	41	4.41	(2.50)	13.88	(6.22)	2.08	(0194)	1.69	(0.66)
107	Coronary Artery Bypass Graft w/o Catheterization	13	4.83	(2.14)	14.96	(11.43)	2.40	(0.86)	1.15	(0.24)
108	Cardiothoracic Procedure except Valve and Bypass Graft	24	3.91	(2.07)	13.16	(3.10)	1.81	(0.89)	1.82	(0.41)
116	Permanent Pacemaker Implant w/o AMI; Congestive Heart Failure	13	3.38	(2.10)	5.92	(3.33)	1.18	(0.36)	1.15	(0.24)
124	Circulatory Disorder except AMI w/Catheterization and Complex Disease	29	6.07	(3.27)	9.72	(4.03)	1.28	(0.45)	1.28	(0.42)
125	Circulatory Disorder except AMI w/Catheterization; without Complex Disease	19	3.00	(2.47)	5.79	(3.21)	1.23	(0.42)	1.17	(0.30)
127	Heart Failure and Shock	22	3.82	(2.04)	8.55	(7.07)	1.71	(0.68)	1.71	(0.50)
138	Cardiac Arrhythmia and Conduction Disorder; Age Greater Than 65	19	2.21	(0.86)	5.00	(3.76)	1.23	(0.39)	1.18	(0.31)
140	Angina Pectoris	34	2.32	(1.25)	5.74	(6.20)	1.30	(0.47)	1.25	(0.40)
143	Chest Pain	19	1.89	(0.57)	2.74	(1.41)	1.11	(0.27)	1.09	(0.26)

contrast, when larger groupings are associated with smaller variances, the actual alpha levels are larger than the nominal alpha levels. For this study, larger sample sizes did tend to be associated with the larger variances on all of the dependent variables.

Table 9

Values for Bartlett-Box B and Cochrans C Tests for Homogeneity of Variances for the Variables Unit Length of Stay, Total Length of Stay, Initial Acuity and Total Acuity

TEST	UNIT LOS	TOTAL LOS	INITIAL ACUITY	TOTAL ACUITY
Bartlett-Box F	7.894 (p = 0.00)	19.250 (p = .000)	6.113 (p = 0.000)	6.224 (p = 0.000)
Cochrans C	0.2239 (p = 0.000)	0.5029 (p = 0.000)	0.1789 (p = 0.010)	0.2025 (p = 0.001)

To identify DRGs which have greater homogeneity within groups with respect to acuity and length of stay, Coefficients of Variation (expressed as a percentage) were computed for each DRG group. In general, low coefficients of variation would reflect a greater degree of homogeneity within a DRG, whereas, a high coefficient of variation would indicate less homogeneity in a DRG on the variable of interest.

Unit Length of Stay. The coefficients of variation for this variable ranged from 20.32 for DRG 105 (valve procedure with pump, without catheterization) to 82.40 for DRG 125 (circulatory disorder except acute myocardial infarction with catheterization but without complex disease) (See Table 10). Seven DRGs had unit length of stay coefficients of variation values of greater than 50 percent (DRGs 106, 108, 116, 124, 125, 127 and 140). This suggests there is a high degree of variation within some groups on this variable.

Total Length of Stay. The range of coefficients of variation on this variable was from 23.54 to 108.10 (See Table 10). Cases are most homogeneous in DRG 108 (cardiothoracic procedure except valve and coronary artery bypass graft). Cases are least homogeneous in DRG 104 (angina pectoris). Computation of the C.V. in two groups, valve with pump, without catheterization (DRG 105) and angina pectoris (DRG 140) resulted in values greater than 100 percent. This finding can be explained, at least in part, by the fact that two cases in DRG 105 had extremely long hospital stays (72 days) which has skewed the distribution. In the same manner, two cases in DRG 140 were each hospitalized 27 days which skewed the distribution of this group.

Overall, within the DRG classes, the degree of variation on the variable unit length of stay did not show a relationship to the degree of variation on the variable total length of stay. The high unit length of stay coefficient of variation in DRG 125 may in part be explained by the comprehensiveness of the category. There was a statistically significant relationship between unit length of stay

Table 10

List of Diagnosis Related Groups, DRG Relative Resource Weight Factors, Unit Length of Stay Coefficient of Variation (C.V.), and Total Length of Stay Coefficient of Variation Values

DRG	Name	Rel. wt.	ULOS C.V.	TLOS C.V.
104	Cardiac Valve with Pump, with Catheterization	6.8527	43.28	67.73
105	Cardiac Valve with Pump, without Catheterization	5.2308	20.32	108.07
106	Coronary Artery Bypass Graft with Catheterization	5.2624	56.63	44.82
107	Coronary Artery Bypass Graft without Catheterization	3.9891	44.28	76.39
108	Cardiothoracic Procedure except Valve and Coronary Bypass Graft, with Pump	4.3756	52.73	23.54
116	Permanent Pacemaker Implant without AMI, CR, Congestive Heart Failure	2.8665	62.13	56.19
124	Circulatory Disorder except AMI, with Catheterization, with Complex Disease	2.2200	53.92	41.49
125	Circulatory Disorder except AMI, with Catheterization, without Complex Disease	1.6455	82.40	55.40
127	Heart Failure and Shock	1.0408	60.46	82.72
138	Cardiac Arrhythmia and Conduction Disorder, Age Greater Than 65	0.9297	38.68	75.13
140	Angina Pectoris	0.7548	53.73	108.10
143	Chest Pain	0.6814	29.93	51.45

and total length of stay (r =.60) in this DRG which suggests that even though the variation in unit length of stay was high, overall total length of stay was not affected to the same degree, so that a smaller C.V. was observed for total length of stay, 55.4. However, in DRG 105, the group with the lowest coefficient of variation value on unit length of stay, the total length of stay C.V. was computed at 108.07. There was a moderate, however, not statistically significant relationship (r = .44) between unit and total length of stay in this DRG. This high total length of stay C.V. is in part a result of two cases, each which had extended periods of hospitalization--72 days.

Initial Acuity. On the variable initial acuity, the coefficients of variation range from 23.43 to 49.45 (See Table 11). Cases in DRG 105, valve with pump, without catheterization, are the most homogeneous with respect to initial acuity (C.V. = 23.43). The greatest variation in initial acuity is revealed in DRG 108, cardiothoracic procedure except valve and coronary artery bypass graft. This category places cases with a wide variance of medical needs into one DRG, and can include cases with procedures ranging from a relatively minor surgical intervention of cutting a "window" in the pericardium of the heart to drain accumulated fluid, to a major surgical procedure for reconstruction or repair of congenital anomalies in a person in their early twenties, to major thoracic surgery to treat traumatic cardiac tamponade. The intensity of nursing interventions for cases in this DRG such as frequency of medication administration, frequency of vital sign monitoring and treatments, other minor and major monitoring modalities, vary with the variation in surgical procedures. This helps to explain the heterogeneity of this group when assessing initial acuity.

Total Acuity. The range of the coefficient of variation on the variable total acuity is from 5.35 to 43.32 (See Table 11). The group most homogeneous with respect to total acuity is DRG 105, valve with pump, without catheterization, (C.V. = 5.3). DRG 108, cardiothoracic procedure except valve and coronary artery bypass graft, reveals the gratest variation in total acuity (C.V. = 43.32) and thus is the least homogeneous group.

Cases in DRGs which, from a clinical perspective, would have fewer nursing needs might be expected to have lower coefficients of variation (C.V.). In general, those cases might also be expected to have lower DRG relative weight values. DRGs 143 and 140 have the lowest relative resource weight values of the twelve study groups and from a clinical point of view, could be expected to have narrow ranges of nursing needs. As shown in Table 11, DRG 143 has a relatively low coefficient of variation but DRG 140 has the ninth highest C.V. on both the initial acuity and total acuity variables. In contrast, DRG 105, cardiac valve with pump, without catheterization, has the next to highest relative resource weight value of the 12 study DRGs and from a clinical nursing perspective cases in this group might be expected to have a wide variation of nursing needs; however, the data reveals that this group has the

Table 11

List of Diagnosis Related Groups, DRG Relative Resource Weight Factors, Initial Acuity (INIAC) Coefficient of Variation (C.V. in %), Acuity Total (ACT) Coefficient of Variation

DRG	Name	Rel. wt.	INIAC C.V.	ACT C.V.
104	Cardiac Valve with Pump, with Catheterization	6.8537	31.31	27.92
105	Cardiac Valve with Pump, without Catheterization	5.2308	23.43	5.34
106	Coronary Artery Bypass Graft with Catheterization	5.2624	45.27	39.45
107	Coronary Artery Bypass Graft without Catheterization	3.9891	35.66	22.53
108	Cardiothoracic Procedure except Valve and Coronary Bypass Graft, with Pump	4.3756	49.45	43.32
116	Permanent Pacemaker Implant without AMI, CR, Congestive Heart Failure	2.8665	31.18	20.81
124	Circulatory Disorder except AMI, with Catheterization, with Complex Disease	2.2200	35.65	32.89
125	Circulatory Disorder except AMI, with Catheterization, without Complex Disease	1.6455	33.91	25.75
127	Heart Failure and Shock	1.0408	39.99	29.00
138	Cardiac Arrhythmia and Conduction Disorder, Age Greater Than 65	0.9297	31.14	26.24
140	Angina Pectoris	0.7548	36.36	31.79
143	Chest Pain	0.6814	24.74	23.16

lowest coefficient of variation on both acuity measures. The findings in Table 11 suggest that there is variation in the overall relationship of within group homogeneity with respect to predicted nursing resource use on the two acuity measures. Furthermore, when variation in acuity is considered over the hospital course a consistent shift to a lesser degree of variation on the total acuity variable is observed in all 12 groups relative to initial acuity. This finding was expected because patients are acutely ill on admission to an intensive care unit, which requires more need for nursing care and perhaps results in a greater variation in care needs. However, as a patient's hospital stay increases and their state of health improves, both length of stay and need for lower levels of nursing care affect variation in acuity. Table 11 shows that within each group, there is a tendency to reflect less heterogeneity across groups when total acuity is measured as compared to initial acuity.

Of the 12 DRGs, four groups were found to place in the same order on the coefficient of variation continuum (from most to least homogeneous) in initial acuity and total acuity (DRGs 105, 106, 108, 140). DRG 105, (valve with pump, without catheterization) is the most homogeneous on both variables; DRG 108 (cardiothoracic procedure except valve and coronary artery bypass graft, with pump) is the least homogeneous on both variables, as previously mentioned. The next most heterogeneous group on both variables is DRG 106, coronary artery bypass graft with catheterization. At the low intensity end of the scale, angina pectoris cases (DRG 140), showed parallel ordering on the two measures and displayed a moderate degree of homogeneity with C.V. = 36.26 on initial acuity and C.V. = 31.79 on total acuity.

The coefficient of variation values for the DRG groups on all dependent variables reflected a wide spread. There is more of a relationship in variability between initial acuity and total acuity than there is revealed between unit length of stay and total length of stay; however the coefficient of variation statistic suggests that there is minimal correspondence between the two systems across the twelve groups.

Even though the DRG scheme accounts for a significant portion of the total variance, cases in some specific groups are more heterogeneous than homogeneous with respect to acuity and length of stay. For example, some high variance DRGs need further refinement to adequately capture nursing resource consumption.

Ranking

Diagnosis Related Groups have been ranked according to a relative resource weight system to demonstrate observed total resource use for each group. Thus, in addition to within-group homogeneity, the relative structure of resource use across DRGs is an important property of the classification scheme. To assess the concept of ranking, the relative resource weight values and geometric mean length of stay values were ranked from lowest to highest for the twelve groups and compared to mean patient acuity and mean length of stay. Since length of stay is a primary variable upon which the DRGs are based, the nursing and medical patient classification systems should be most closely linked on these variables if a strong relationship is to be demonstrated between the two systems.

To address the ranking equivalence concept, the specific aim was <u>to determine whether the relative resource weights established by Medicare DRGs correspond to relative nursing resource needs and use as measured by patient acuity weights and length of stay in each DRG.</u>

The measurement concept of interest in this aim was that of concurrent validity, and was approached by ranking nursing-determined patient acuity with DRG relative total resource use and by determining the rank relationship between the study total length of stay and the geometric mean length of stay for each DRG. The intent of the aim was to test if different instruments applied to the same populations at the same time yield consistent results. In a general sense, the different "instruments" were the relative resource weight and the geometric mean length of stay established by the DRGs and the acuity scheme and length of stay measures used in this study for grouping patients on nursing need.

Spearman's Correlation Coefficient was computed to determine the amount of concordance between the geometric mean length of stay and the study total length of stay and between DRG relative resource weight and mean total acuity for the twelve DRG groups.

The coefficient for geometric mean length of stay and total length of stay is r = 0.93 (p = .01, df = 10). The coefficient for DRG relative resource weight and mean total acuity is r = 0.72 (= .01, df = 10). Both Spearman's Correlation Coefficients are significant at the 1 percent level; however the findings suggest that there is a greater relationship between the length of stay measures than between the relative resource weight and acuity measures.

Mean acuity total ranked with Diagnosis Related Group relative weight for each DRG is shown in Figure 2. The rank relationship of mean total acuity with relative resource weight for the study DRGs is displayed in Table 12. Three groups, DRG 104 (valve with pump; with catheterization), DRG 124 (circulatory disorder, except myocardial infarction), and DRG 143 (chest pain) ranked in parallel order on both classification schemes. Among DRGs in this study, DRG 104 has the highest relative resource weight and DRG 143 has the lowest. The placement of these two DRGs on the nursing resource weight measure (mean acuity) is consistent with their highest and lowest placement on the DRG relative resource measure.

The acuity measure ranks four DRGs (DRG 106, 125, 108, and 116) lower than the DRG relative resource weight measure. Two groups, DRG 106 and 125 are categories which include the cardiac catheterization procedure. This procedure requires more total hospital resources than some of the other groups but from a nursing care perspective, total resource consumption related to the performance of this major surgical procedure may not significantly

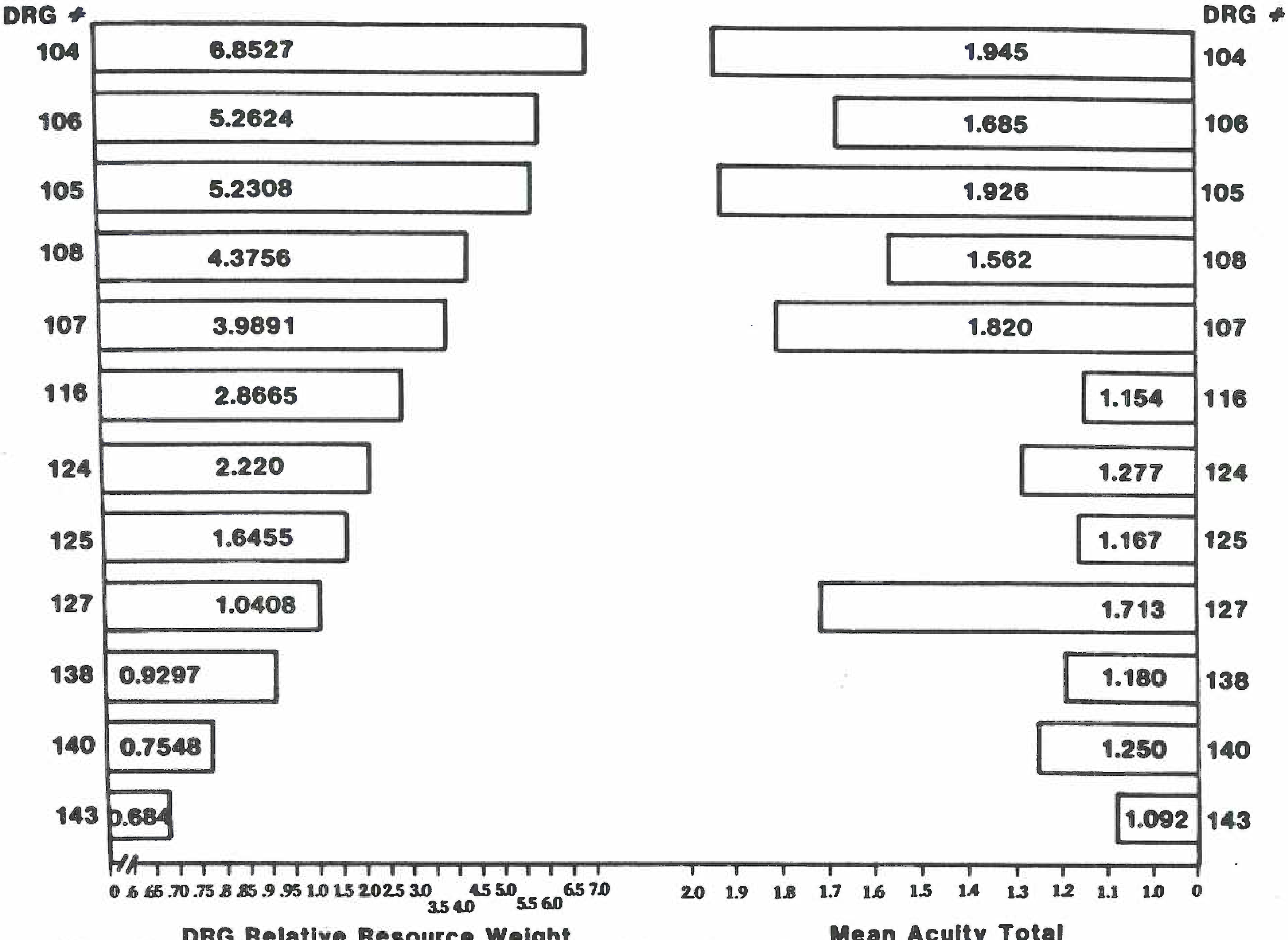

Figure 2. DRG Relative Resource Weight Ranked With Mean Acuity Total.

Note: Spearman's Rank Correlation Coefficient ($\rho = 0.72$, df=10) is significant at the 1% level.

Table 12

Rank Relationship of Mean Total Acuity (ACT) to DRG Relative Resource Weight

Ranked Same		Acuity Ranked Higher Than Relative Weight		Acuity Ranked Lower Than Relative Weight	
DRG	Name	DRG	Name	DRG	Name
104	Cardiac Valve with Pump, with Catheterization *	105	Cardiac Valve with Pump, without Catheterization *	106	Coronary Artery Bypass Graft with Catheterization *
124	Circulatory Disorder except AMI, w/Catheterization and Complex Disease **	107	Coronary Artery Bypass Graft without Catheterization *	108	Cardiothoracic Procedure except Valve and Coronary Artery Bypass Graft with pump *
143	Chest Pain **	127	Heart Failure and Shock **	116	Permanent Pacemaker Implant *
		138	CardiacArrhythmia and Conduction Disorder; Age Greater Than 65 **	125	Circulatory Disorder except AMI with Catheterization, w/o Complex Disease **
		140	Angina Pectoris **		

* Surgical DRG

** Medical DRG

increase nursing resource consumption, especially when compared to similar diagnoses not involving the catheterization procedure. Likewise, DRG 108, cardiothoracic procedure, except valve and coronary artery bypass graft, and DRG 116, permanent pacemaker implant, would consume greater surgical and other total hospital resources, but a comparable increase in relative nursing resources would not necessarily be evidenced when compared to nursing resources consumed by other cardiac medical diagnoses. The point here is that cognitive and functional activities required of nurses for any particular DRG are not necessarily dependent on the performance of a surgical procedure or other procedures which increase the consumption of total hospital resources.

Of the five DRG groups which ranked higher in relative nursing resource use on the acuity measure than on the relative total resource weight measure, two are classified surgical DRGs and three groups are classified medical DRGs (see Table 12). The two surgical groups, DRG 105 (valve without catheterization) and DRG 107 (coronary artery bypass graft without catheterization), while reflecting ranked acuity values greater than the total resource rank values, may more appropriately reflect the degree to which the two systems lack correspondence in measuring nursing resource use, assuming that the acuity measure appropriately reflects nursing resource use. The third group, a medical group, heart failure and shock (DRG 127), from a clinical nursing perspective, can, at one extreme include cases which require relatively minimal nursing monitoring or at the other extreme of the health continuum, those cases which can be classified as critical (life-threatening) and which require a two to one nurse-patient ratio. The variation in nursing support needed for cases within this DRG could, in part, explain its rank position of higher than relative resource weight in relation to its DRG relative weight rank position.

For the patient with a diagnosis of angina (DRG 140) or heart failure and shock (DRG 127), ongoing physical and emotional assessment and interventions, which are primarily a nursing responsibility in an intensive care unit, is essential if the patient is to experience a successful outcome. Of the twelve DRGs studied, angina ranks second in intensity (least to most intensive) on the relative resource weight structure (DRGs) but fifth in intensity (least to most intensive) on the nursing relative acuity structure. DRG 127 ranked fourth in intensity on the relative resource weight structure but when the groups are ranked by mean total acuity to reflect nursing resource consumption, DRG 127 is ranked in ninth place. That is, only three study groups consumed more nursing resources than did cases in DRG 127, however the relative resource weight measure indicates eight of the study groups should consume more total resources than DRG 127. Where no surgical procedure is performed, that is, where nursing assessment and intervention is a primary determinant of resources used, the findings suggest that the acuity and DRG measures may not correspond to a sufficient degree to use the DRGs as an indicator or predictor of nursing resource consumption because nursing intensity has not adequately been quantified and factored into the DRG relative weight scheme.

Circulatory disorder except acute myocardial infarction (DRG 124) ranked sixth on both the relative total resource use and the relative acuity, nursing consumption, measures. Five DRGs which involve surgical procedures (DRGs 104, 105, 106, 107, 108) rank at the more resource intensive end of the ranking spectrum on both relative resource weight and relative acuity weight, however, a sixth surgical group, DRG 116, permanent pacemaker implant, ranked seventh on the relative resource weight scale (least to most intensive) but ranked only second on the acuity scale. This may suggest that some surgical Cardiac DRGs are not weighted to accurately reflect nursing consumption or alternatively, that the nursing acuity tool does not adequately reflect the degree of nursing resources consumed by these groups of cases.

The highest ranked acuity group (DRG 104) is also the highest ranked relative resource group and the lowest ranked relative resource group (DRG 143) has the lowest relative acuity ranking. The remaining nine groups, however, show varying degrees of resemblance in ranking on the two resource consumption scales. Therefore, no definitive patterns of ranking relative resource weights with relative acuity weights can be determined overall.

Length of Stay. A comparison of the rank relationship between the study mean total length of stay and the geometric mean length of stay established by the DRG scheme is graphically displayed in Figure 3. Four DRG groups had a mean study length of stay less than the geometric mean length of stay established for the particular groups. See Table 13 for DRGs and the difference in days hospitalized. This finding is important to nursing and hospital administrators since hospitals are paid the full reimbursement amount, regardless of when a case is discharged, within the parameters established by the Medicare reimbursement system--that is, a hospital may realize a "profit" if cases are discharged before the geometric mean length of stay is reached. The study mean length of stay of 6.5 days less than geometric mean length of stay for DRG 106 and of 4.6 days less than geometric mean length of stay in DRG 116 can mean substantial cost savings and profit for the hospital.

Of equal importance is the finding that six DRGs had study length of stay values greater than the geometric mean length of stay by at least 0.5 days (see Table 13). The DRGs are 104, valve with pump, with catheterization; DRG 105, valve with pump without catheterization; DRG 107, coronary artery bypass graft without catheterization; DRG 124, circulatory disorder except acute myocardial infarction, with catheterization and complex disease; DRG 127, heart failure and shock; and DRG 125, circulatory disorder except acute myocardial infarction with catheterization, without complex disease. The identification of six groups with a study length of stay greater than geometric mean length of stay is an

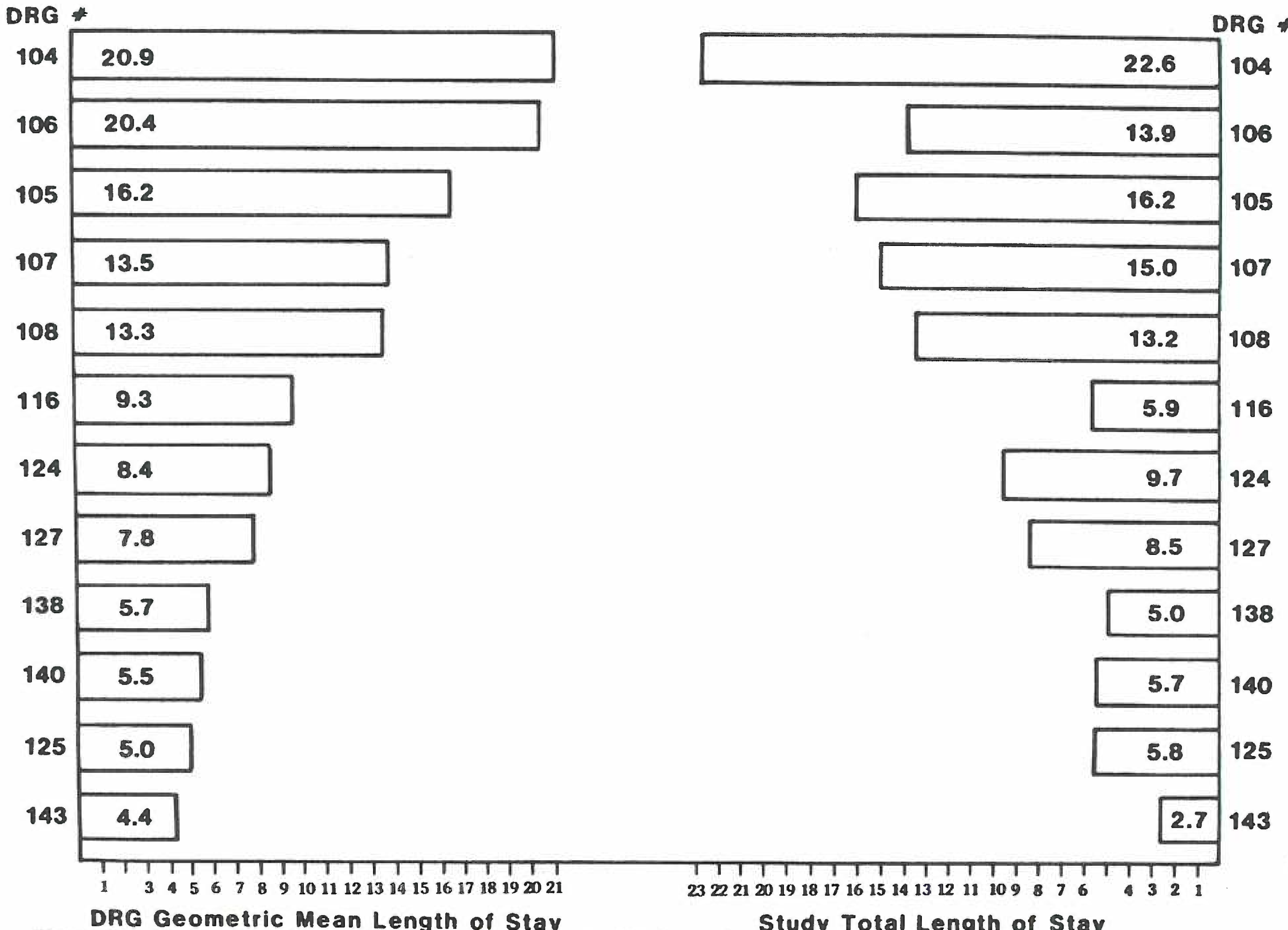

Figure 3. DRG Geometric Mean Length of Stay Ranked with Total Study Length of Stay.

Note: Spearman's Rank Correlation Coefficient ($\rho = 0.93$, $df = 10$) is significant at the 1% level

Table 13

Ranked Relationship of Mean Total Length of Stay (TLOS) to DRG Geometric Mean Length of Stay

Ranked Same		TLOS Ranked > Geometric Mean LOS		TLOS Ranked < Geometric Mean LOS	
DRG #	Name	DRG #	Name	DRG #	Name
108	Cardiothoracic Procedure except Valve and CABG, with Pump * (0.1 days <)	104	Cardiac Valve with Pump, with Catheterization * (1.7 days >)	106	Coronary Artery Bypass Graft with Catheterization * (6.5 days <)
140	Angina Pectoris ** (0.2 days >)	105	Cardiac Valve with Pump, without Catheterization * (5.8 days >)	116	Permanent Pacemaker Implant * (4.6 days <)
		107	Coronary Artery Bypass Graft without Catheterization * (2.5 days >)	138	Cardiac Arrhythmia and Conduction Disorder; Age Greater Than 65 ** (0.7 days <)
		124	Circulatory Disorder except AMI, w/Catheterization and Complex Disease ** (1.3 days >)	143	Chest Pain ** (1.7 days <)
		125	Circulatory Disorder except AMI, with Catheterization, w/o Complex Disease * (0.8 days >)		
		127	Heart Failure and Shock * (0.7 days >)		

* Surgical DRG

** Medical DRG

(Differences in parentheses)

important finding since Medicare reimbursement is based on length of stay--cases that have hospital stays beyond the geometric mean length of stay parameters may create a loss of revenue for the hospital, depending upon the actual cost of care for any specific case.

A relationship between ranking the two schemes was identified within three of the twelve DRGs (104, 124, 143) on the two resource intensity measures and in two DRGs (108, 140) on the two length of stay measures. On both the length of stay measures and the resource intensity measures, the nursing model system ranked DRGs 105, 107, and 127 higher than the medical model system. The medical model system, however, ranked DRGs 106 and 116 higher than the nursing model on both measures. A consistent pattern of corresponding rank-relationships across the dependent variables was demonstrated in only five of the study DRGs. However, Spearman's Correlation Coefficients suggest that the ranked relationships between the nursing model measures and the medical model measures for this sample of cases do have a significant degree of correspondence which would support the overall use of the DRG scheme for predicting nursing resource use as indicated by length of stay and patient acuity.

<u>Predictive Validity</u>

The third aim was <u>to evaluate the predictive validity of the DRGs within two special care units--the Coronary Care Unit and the Coronary Recovery Room--for the outcomes of length of stay and</u>

patient acuity in a university teaching hospital. An initial approach in exploring this aim was to determine the relationships among the four dependent variables--initial acuity, total acuity, unit length of stay, and total length of stay within each DRG. Table 14 shows the Pearson's Correlation Coefficients for these variables for the 12 DRGs.

Initial Acuity/Total Acuity. In all DRG groups except 105, cardiac valve with pump; without catheterization, a significant positive relationship was found between initial acuity and total acuity ($r = .60$ to $.99$, $p < .001$). This may indicate that initial acuity can be used as a predictor for projecting staffing needs based on acuity over the total hospital stay. It is possible that these high correlations were the result of using initial acuity data in the computation of total acuity. Since the effect of initial acuity is a function of the proportion of observations per case on the two acuity measures, a review of the raw data was undertaken to determine if most cases had acuity measures for six or more shifts. Mean total length of stay was greater than two days (six shifts) in each DRG, which suggests that total acuity is not a reiteration of initial acuity.

Unit Length of Stay/Total Length of Stay. Four DRGs show a significant relationship between unit length of stay and total length of stay--DRG 106 ($r = .60$, $p < .001$), DRG 124 ($r = .45$, $p < .01$), DRG 125 ($r = .60$, $p < .001$), and DRG 140 ($r = .56$, $p < .001$). As shown in Table 14, the Pearson's r between unit length of stay

Table 14

Pearson's Correlation Coefficients

DRG 105

Cardiac Valve with Pump, without Catheterization (N=12)

	Total LOS	Unit LOS	Total Acuity	Initial Acuity
Total LOS	-	0.44	0.12	-0.59*
Unit LOS	-	-	0.19	0.20
Total Acuity	-	-	-	0.17

DRG 106

Coronary Artery Bypass Graft with Catheterization (N=41)

	Total LOS	Unit LOS	Total Acuity	Initial Acuity
Total LOS	-	0.61****	-0.13	0.07
Unit LOS	-	-	-0.04	0.13
Total Acuity	-	-	-	0.84****

DRG 104

Cardiac Valve with Pump, with Catheterization (N=18)

	Total LOS	Unit LOS	Total Acuity	Initial Acuity
Total LOS	-	0.05	-0.55**	-0.29
Unit LOS	-	-	0.43	0.59***
Total Acuity	-	-	-	0.60***

* $p < .05$
** $p < .01$
*** $p < .005$
**** $p < .001$

Table 14

Pearson's Correlation Coefficients (Continued)

DRG 116

Permanent Pacemaker Implant without AMI, CHF (N=13)

	Total LOS	Unit LOS	Total Acuity	Initial Acuity
Total LOS	-	0.16	0.29	0.54
Unit LOS	-	-	-0.29	-0.06
Total Acuity	-	-	-	0.75***

DRG 107

Coronary Artery Bypass Graft without Catheterization (N=24)

	Total LOS	Unit LOS	Total Acuity	Initial Acuity
Total LOS	-	-0.02	-0.14	-0.20
Unit LOS	-	-	-0.24	-0.03
Total Acuity	-	-	-	0.65****

DRG 108

Cardiothoracic Procedure except Valve

And Coronary Bypass Graft (N=12)

	Total LOS	Unit LOS	Total Acuity	Initial Acuity
Total LOS	-	0.24	0.40	0.34
Unit LOS	-	-	0.04	0.20
Total Acuity	-	-	-	0.95****

* $p < .05$
** $p < .01$
*** $p < .005$
**** $p < .001$

Table 14

Pearson's Correlation Coefficients (Continued)

DRG 127

Heart Failure and Shock (N=22)

	Total LOS	Unit LOS	Total Acuity	Initial Acuity
Total LOS	-	-0.01	0.39*	0.19
Unit LOS	-	-	0.33	0.04
Total Acuity	-	-	-	0.74****

DRG 125

Circulatory Disorder except AMI with Catheterization, Without Complex Disease (N=19)

	Total LOS	Unit LOS	Total Acuity	Initial Acuity
Total LOS	-	0.60****	-0.09	-0.06
Unit LOS	-	-	-0.10	-0.07
Total Acuity	-	-	-	0.99****

DRG 124

Circulatory Disorder except AMI with Catheterization, With Complex Disease (N=29)

	Total LOS	Unit LOS	Total Acuity	Initial Acuity
Total LOS	-	0.45**	0.43**	0.36*
Unit LOS	-	-	-0.06	-0.09
Total Acuity	-	-	-	0.80****

* $p < .05$
** $p < .01$
*** $p < .005$
**** $p < .001$

Table 14

Pearson's Correlation Coefficients (Continued)

DRG 143

Chest Pain (N=19)

	Total LOS	Unit LOS	Total Acuity	Initial Acuity
Total LOS	-	0.38	0.62***	0.56**
Unit LOS	-	-	0.07	0.75
Total Acuity	-	-	-	0.99****

DRG 140

Angina Pectoris (N=34)

	Total LOS	Unit LOS	Total Acuity	Initial Acuity
Total LOS	-	0.56****	0.36*	0.44***
Unit LOS	-	-	0.48***	0.54****
Total Acuity	-	-	-	0.92****

DRG 138

Cardiac Arrhythmia and Conduction Disorder

Age Greater Than 65 (N=19)

	Total LOS	Unit LOS	Total Acuity	Initial Acuity
Total LOS	-	0.26	-0.001	0.10
Unit LOS	-	-	0.27	0.52*
Total Acuity	-	-	-	0.90

* $p < .05$
** $p < .01$
*** $p < .005$
**** $p < .001$

and total length of stay demonstrated an insignificant negative relationship in DRGs 107 and 127 ($r = -.02$, $p = .47$; $r = -.01$, $p = .48$ respectively). These findings suggest that overall, unit length of stay is not a predictor of total length of stay, which has implications for determining nursing resource use.

Total Length of Stay/Initial Acuity. A statistically positive relationship between total length of stay and initial acuity was exhibited in DRG 124 ($r = .36$, $p < .05$), DRG 140 ($r = .44$, $p < .005$), DRG 143 ($r = .56$, $p < .01$), whereas a statistically significant inverse relationship was demonstrated in DRG 105 ($r = -.59$, $p < .05$). Inverse, though not statistically significant, relationships were revealed between total length of stay and initial acuity in DRG 104 ($r = -.29$, $p = .12$), DRG 107 ($r = -.20$, $p = .18$) and DRG 125 ($r = -.06$, $p = .40$).

Unit Length of Stay/Initial Acuity. A statistically significant relationship between unit length of stay and initial acuity was demonstrated in only three DRG groups--DRG 104 ($r = .59$, $p < .005$), DRG 138 ($r = .52$, $p < .05$), and DRG 140 ($r = .54$, $p < .005$). Insignificant inverse relationships were revealed in DRG 107, 116, and 125. The finding of significant relationships in only three of the twelve groups has implications for nursing administrators when assessing the accuracy of the in-house acuity measuring tool to reflect nursing resource use and when assessing the utilization of intensive care units. Under the current Medicare reimbursement system, efficient use of material and human resources is of paramount concern. Since care in intensive care units is known to be one of the largest consumers of hospital resources, a statistically significant positive relationship between these two variables is desirable, but was not found in this study.

Total Length of Stay/Total Acuity. Statistically significant relationships between total length of stay and total acuity are demonstrated in DRG 124 ($r = .43$, $p < .01$), DRG 127 ($r = .39$, $p < .05$), DRG 140 ($r = .36$, $p < .05$) and DRG 143 ($r = .62$, $p < .01$). A statistically significant inverse relationship is revealed in DRG 104 ($r = -.55$, $p = .009$). The significance of this inverse relationship is advanced with caution because two cases in DRG 104 were hospitalized an extended length of time--56 days each. The length of stay variance for this group (233.44) may help to explain the inverse relationship found; however the total acuity variance for this group was 0.295 which indicates that nursing support--acuity--is not unequivocally related to length of stay in all cases.

Without knowledge of actual patterns of acuity of individual cases within specific DRGs, no implications for nurse administrators can be concluded from the relationship between total length of stay and total acuity across the 12 DRGs. The significant inverse relationship between these variables may however suggest the need to explore the standards of nursing and medical practice for these DRG cases, throughout the hospital stay.

Additionally, the assessment tool for determining acuity may need to be reevaluated to determine if it adequately measures the cognitive and functional activities which nurses perform.

This aim addressed the evaluation and validation of the DRG patient classification scheme as a measure for predicting length of stay and need for nursing support--acuity--in the study population. The objective was to determine if a relationship existed between the two systems for classifying patients with respect to resource use. The DRG classification scheme was taken as the given--the independent variable. Variables measured by the Nursing Service Patient Classification System and the study population length of stay were the dependent variables.

Consistency in displaying the relationship between the two systems was a focus for this aim. For the DRG scheme to have predictive validity for determining nursing resource consumption, a general, overall pattern of relationships should be displayed in the majority of DRG classes on the four dependent variables.

<u>Discussion</u>

The findings suggest that there is more correspondence between the two classification systems on the length of stay variables than there is on the acuity variables when groups are ranked from lowest to highest values on these variables. However, when the variance in length of stay within groups and the variance in acuity within groups is evaluated, less variance within groups is demonstrated on the acuity data than on the length of stay data. Further, in an examination of the relationships between the four dependent variables within the twelve DRGs, the only consistent relationship found was initial acuity to total acuity.

While there is some support for general within-DRG homogeneity, a substantial proportion of the discordance between the two classification systems is accounted for by the DRG classification scheme. On the consistency of relationship issue, no consistent patterns of the relationships between the two patient classification systems on the variables considered can be identified to suggest a high degree of correspondence for grouping patients into groups more similar than dissimilar.

CHAPTER V

Conclusions and Recommendations

This methodological study has focused upon two patient classification systems meant to be predictive of inpatient resource use; one system, Diagnosis Related Groups, predicts aggregate use of hospital resources per case, the other, patient classification by Acuity, predicts use of nursing resources per shift. While there is no a priori reason to believe acuity and DRGs are in perfect congruence, a goal of nursing administrators should be that there is a high degree of concordance between the nursing resources consumed for particular groups of patients and the expected total resource consumption on which the criteria for hospital reimbursement is determined. Therefore the overall aim of this study was to compare two patient classification systems with respect to their degree of correspondence in grouping patients according to patterns of resource intensity. Identification and quantification of the degree of congruence between the two systems will assist nurse managers in making decisions regarding nursing staffing and budgeting.

Conceptual Perspective

While in the past, several studies have examined patient classification from a strictly medical or strictly nursing perspective, none have attempted to determine the degree of correspondence with which two classification systems, one from each perspective, reflect across and within DRG group similarity with respect to length of stay and relative intensity measures.

To guide the study, a two-fold conceptual perspective was developed from experience and from a review of the literature. First, classification and measurement theories provided a framework upon which to compare the two classification systems. Second, to demonstrate the differences between a nursing model for classifying patients and a medical model for classifying patients, an original conceptual model was developed. This model can be found in Figure 1.

The conceptual perspective provided the organization of the design of the study, the choice of a study population, the methods of data analysis, and the interpretation of the results of the study. The specific design chosen was exploratory and correlational.

The study was prompted by the introduction of the new Medicare reimbursement system and by the questioning of concordance between the DRG scheme and the acuity scheme for classifying cases into like groups with respect to resource use. Three concepts of classification and measurement were explored: (1) homogeneity of patient groups based on acuity, (2) ranking of patient groups also based on acuity, and (3) predictive validity, that is, to evaluate the DRGs for predicting nursing resource use as measured by length of stay and acuity in the study population.

The study population was all cases, which met the study criterion, discharged from the CCU and CRR over a six month period in 1983. Specific Diagnosis Related Groups were included only if the number of cases in that group was ten or more. Data were collected from computerized hospital discharge abstracts and corresponding Concentrated Nursing Charge slips for each case. Of seventy-eight Diagnosis Related Groups identified, twelve DRGs in MDC-05 met the study criterion; a total of 262 cases were analyzed.

Relative resource weight values and geometric mean length of stay values, defined by the DRG scheme, were the medical model variables considered. Nursing model dependent variables were observed unit length of stay, total length of stay, initial acuity, and total acuity for predicting nursing resource consumption.

Data were analyzed descriptively with mean scores, standard deviations, frequencies, percentages and ranking. Within groups and between group variances were statistically analyzed using analysis of variance (ANOVA), Bartlett's Test and Cochran's C. Coefficients of variation were computed to determine the degree of variation within groups on the four dependent variables. Relationships between the four dependent variables were analyzed utilizing Pearson's Product Moment Correlation Coefficients. Spearman's Rank Correlation Coefficient was computed to measure the degree of concordance between the two classification systems for the length of stay and relative intensity variables.

Summary of the Findings

The major finding was that the two patient classification systems did not consistently group cases in a corresponding manner.

Using Pearson's r, a significant relationship between the four nursing model dependent variables was demonstrated in only one DRG (140). On the other eleven DRGs studied, no consistent patterns of relationships between the four dependent variables were revealed. In all DRGs except DRG 105, a relationship between initial acuity and total acuity was revealed suggesting that, of the four dependent variables, initial acuity is the best predictor of total acuity. The findings of the tests for within and between group homogeneity suggest that a significant amount of variation in acuity and length of stay can be explained by the DRG scheme. Although there is some evidence of within group homogeneity, the degree of homogeneity varies across the twelve groups.

While the two highest nursing resource use groups (104, 105--surgical groups) was also the two highest total resource use groups and the lowest nursing resource use group (DRG 143--medical group) was the lowest total resource use group, the remaining nine groups did not show a corresponding relationship on the two classification measures when considered on a group by group basis.

The finding that all DRGs that ranked lower in nursing-measured acuity than on the relative resource weight scale are surgical DRGs, or have a major procedural component (cardiac catheterization) in the classification labeling, suggests that as total resource consumption increases, there may not be a correlation between nursing resource consumption and total resource consumption. Acuity ranked higher than relative resource weight in three medical DRGs where nursing intervention for patient management is a primary determinant of resource use; this also may suggest that the DRGs do not accurately reflect a nursing intensity component in the weighting system.

No correlation is evidenced when comparing the rank relationship of acuity to resource weight of DRG 104 (valve with pump, with catheterization) to DRG 105 (valve with pump, without catheterization) and for DRG 106 (coronary artery bypass graft with catheterization) to DRG 107 (coronary artery bypass graft without catheterization). Considering a with-catheterization--without-catheterization issue, a parallel rank relationship was found between acuity and relative weight in DRG 104, but acuity ranked higher than relative weight in DRG 105. Clinically, nursing care standards and practices for cases in both groups are basically the same regardless of whether a cardiac catheterization procedure is done or not. Similarly, acuity is ranked lower than DRG relative weight in DRG 106 but higher than DRG relative weight in group 107 where, again, nursing standards and practices for both patient groups are basically the same. This also may suggest that nursing resource consumption is not adequately considered into the weighting scheme for these DRGs.

Despite the individual discrepancies in relative nursing acuity and relative resource values, the overall rank order correlation was significant, as demonstrated by a Spearman's Rank Coefficient value of r = .7151 (p = .01, df = 10). Spearman's Coefficient showing the relationship between geometric mean length of stay and total length of stay (r = 0.93, p = .01, df = 10) suggests that there is a stronger relationship between the length of stay variables than between the relative resource use measures.

Conclusions

It is possible that the lack of correspondence between the two patient classification systems is related to the problems addressed by classification theory specifically, and the disparity between medical model and nursing model concepts, in general. Certainly, the viewpoints of the developers of the individual systems--DRGs and acuity--are different because the practice of nursing and the practice of medicine are based on differing concepts of health care. If one is interested only in the overall correspondence of the two systems, especially the relationships between patient classes, statistically significant findings on the ranking level of comparison suggests a relatively high correspondence. However, the overall statistically significant results may be misleading if the focus of one's interest for determining resource use and length of stay is on specific or small clusters of DRGs. Correspondence between resource need and use measures is much less within patient classes.

Further, it is asserted that current nursing patient classification schemes in general, as well as the classification system used by University Hospital have not been refined to the degree necessary to reflect a composite measure of actual nursing resources consumed. Classification systems that group patients into classes based on levels of care required (minimal, moderate, maximum) do not appear to possess the sensitivity necessary to accurately reflect the cost of nursing in the cost-determination, cost-containment environment of the health care system of the 1980's.

DRGs and acuity classification schemes are both polythetic in nature which may provide further explanation of why no consistent patterns of corresponding patient grouping was identified. In both classification systems, a number of concepts or determinants for assigning cases to a particular group are employed; this offers a greater opportunity for variation within the groups and decreases the likelihood for identifying a highly positive relationship between the two classification systems.

Implications

It is concluded that for this population, the two patient classification systems--Diagnosis Related Groups and acuity--does not have a high degree of correspondence in grouping patients according to patterns of resource intensity. The study however, raises two primary issues deserving of immediate attention of nurse managers. One issue concerns the utilization of intensive care unit facilities and utilization of intensive care unit nursing resources. The study reveals a statistically significant relationship between unit length of stay and initial acuity in only three DRGs and negative, although statistically insignificant relationships, in three other DRGs. This suggests that it may be beneficial for the Nursing Department and perhaps the Department of Medicine, to assess whether intensive care unit beds are being appropriately utilized by all health care providers. At issue here are the medical and nursing standards of practice and the medical criteria for admission to and retention of cases in the two study intensive care units. It may be possible that costs for selected cases could be decreased by using alternative modes of care such as less expensive observation units and/or intermediate care units requiring less intensive resource use.

A second issue concerns nursing classification of patient acuity in a DRG reimbursement climate. A major finding of this study suggests that the DRGs may not have a high degree of predictive validity for assessing nursing resources needed. This factor, however, may be a function of the acuity tool which was used in the comparison. Considering the degree of identified within and across DRG variation in acuity in the study population, nurse managers may find it beneficial to isolate the kind and extent of nursing activities which the DRGs call into action so they can more accurately describe and quantify nursing's contribution to patient care. Maintenance of the Nursing Department budget is seriously threatened under DRG reimbursement if nurse administrators do not have objective data upon which to argue nursing's influence on costs and to assert nursing's proper claims upon the reimbursement revenue.

Limitations

Interpretation of the findings of this study are offered with caution because of several serious limitations associated with the research. First, no generalizations to the greater health care system can be made because findings are based on a limited number of cases from two units (CCU and CRR) in one hospital.

Contrary to the initial expectation of the investigator, the case-mix of patients in the two cardiac units was more heterogeneous than homogeneous with respect to DRG groups; this limited the total number of cases in the final data set as well as limiting the number of cases in each DRG category. A greater degree of correspondence between the two classification schemes may have been evidenced if the sample size of each DRG group had been larger.

At the time of data collection, the Discharge Abstract Computer system was not well developed in relation to its development nine months later--information was being manually retrieved from patients' records and entered into a computerized system. However, a medical records quality assurance program was in place with a documented accurary rate of 90 to 93 percent. This accuracy rate is higher than the accuracy rate for discharge abstract data reported in the literature and therefore adds strength to the findings of this study.

At the time of data collection, the Concentrated Nursing Charge system had also just been implemented in the Nursing Department. Data for the study was collected from month two through month seven after the introduction of the new system. No formal quality assurance information was available relevant to the accuracy of the information on the CNCs. Since this was an exploratory study, the decision was made to use these data sets, selecting out only those cases for which both hospital discharge abstracts and Concentrated Nursing Charge slips were available. Future investigators might obtain different results based on increased accuracy of the hospital discharge abstract system and on increased nursing familiarity with the Concentrated Nursing Charge slip system.

Perhaps the major limitation of the study is that the focus was on average acuity rather than on case-specific acuity. With the high degree of variation in acuity found in this study of patients classified into specific groups by the DRGs, a case-specific analysis of acuity is suggested to more accurately determine nursing resource consumption per DRG.

Recommendations for Future Research

Two recommendations for future research are advanced. First, this study should be replicated when the implementation of DRGs has been completed. This study was conducted during the first phase-in year of the DRG reimbursement system at OHSU Hospital; the effects of the DRG reimbursement mechanism will need to be determined when the system is fully implemented (1986). Further, hypotheses regarding the anticipated relationships between the DRGs and levels of acuity and length of stay within the study units should be formed prior to a replication of the study.

A major conclusion of this study is that the current acuity tool for classifying all patients, regardless of diagnosis, may be limited in its ability to identify nursing care costs. Professional nursing is the diagnosis and treatment of human responses to potential or actual health problems, and as such, the practice of nursing includes a number of subtle, yet resource intensive, activities such as assisting persons in the grieving process or assisting a patient to cope with a terminal disease; the current acuity classification tools may not account for all of the nursing activities which contribute to a patient's progress and the cost of care.

Cases in a majority of the DRGs studied revealed a moderate to high degree of variation on one or more of the nursing model dependent variables. This suggests a more refined nursing-determined patient classification scheme may be needed to provide appropriate and equitable measurement of the variations in acuity and length of stay. With such a measure, nurse managers will be able to obtain statistically sound data on which to base budgetary and staffing decisions. To this end, it is suggested that a DRG-related nursing acuity system, perhaps Nursing Care

Related Groups (NCRGs) be developed.

To develop a refined classification system for nursing, a descriptive, correlational design is proposed as a first step. Data on the objective clinical characteristics of patients hypothesized to relate to nursing needs must be linked to data on the various nursing procedures performed on each patient. The analysis would seek to define clinically meaningful classes based on similar patterns of use of nursing resources. The study would be enhanced if multiple settings were utilized--perhaps an urban teaching hospital, a suburban Community Hospital and a Health Maintenance Organization (HMO).

The means of categorizing patients by DRG while they are still in the hospital (DRG classification is usually assigned at discharge) must be developed. Given this procedure, comparable high incidence DRGs at each institution could be selected and cases which most probably would fall into those categories could be studied. For example, it is possible that all facilities would have a high incidence of cases admitted to rule out myocardial infarction; with this admitting diagnosis, cases could fall into several DRGs, e.g., DRG 121, circulatory disorder with acute myocardial infarction with cardiovascular complications, discharged alive, DRG 140, angina pectoris, or DRG 143, chest pain, simply because it is often difficult to discern on admission whether a patient has truly infarcted. Study of a category such as this would provide a manageable number of cases to be followed from the emergency department, to intensive care, and onto the medical unit. The study should identify all nursing activities provided for the patient during his or her hospitalization. Additional high incidence DRGs could be included to add breadth to the study.

An instrument could be developed for recording all nursing activities performed for the patients' benefit. This instrument would follow cases from admission through discharge and would provide a case-specific record of nursing activities which would reflect a cross section of nursing units and specific care level activities. The recording instrument could be divided into major sets of functions such as those identified by Piper--(1) "daily essential functions", (2) "physical dependent functions", and (3) "nursing independent functions", (Piper, 1983)--or original sets of functions determined by the investigators, e.g., "nursing diagnosis intervention functions", "indirect care functions", "medical regimen implementation functions", and so forth. Each activity could be assigned a weight to reflect nursing resources consumed. Alternately, the actual time it takes to do each nursing activity could be recorded and an aggregate time score for each activity could be computed and weighted to reflect actual nursing costs.

The variations in acuity within and between DRGs found in the present study supports the need to identify case-specific acuity patterns of nursing resource use which first and foremost reflect actual care given to patients. While the patterns identified may parallel the DRG scheme, it is possible that they would be independent of the DRGs. The goal should be to isolate actual nursing resources consumed--nursing costs. Once this goal is accomplished, cases with similar nursing-cost could be classed into Nursing Care Related Groups. Since it appears that the Medicare reimbursement system will remain in place for a number of years, the next step would be to determine the actual relationship with respect to resource consumption between Nursing Care Related Groups and Diagnosis Related Groups.

If nurse managers are to communicate succinctly their Department's budgetary needs under the Medicare prospective payment system, thought needs to be given to the quantification of nursing activities which contribute to the patient's return to an optimal health state and to his or her return to the community. At this time nurse managers have the responsibility for determining nursing costs per DRG. Feldman and Goldhaber (1984) suggest the following strategies for coping with the DRG system: "(1) increase quality and quantity of documentation of the care given by nurses; (2) analyze patient care activities, utilization of personnel, the skill mix on the units, and patient acuity levels; (3) conduct staffing studies and implement or modify in-place patient classification systems; (4) reward staff for merit and productivity." These activities should result in an accurate assessment of the costs of nursing care and have the potential for controlling or decreasing costs. Once costs have been quantified by DRG, nurse administrators will be able to more appropriately support their budget requests and will be able to compare their Department's performance against the performance of other hospital departments of nursing.

References

American Hospital Association and National League for Nursing Education. (1950). <u>Hospital Nursing Service Manual.</u> New York: National League of Nursing Education.

American Nurses' Association. (1980). <u>Nursing: A social policy statement.</u> Kansas City, Mo., American Nurses' Association.

Auger, J.A., & Dee, V. (1983). A patient classification system based on the Behavioral System Model of Nursing: Part I. <u>Journal of Nursing Administration,</u> <u>13</u> (4), 38-43.

Aydelotte, M.K. (1973). <u>Nursing Staffing Methodology.</u> Washington, D.C.: U.S. Department of Health Education and Welfare. p. 60.

Barham, V.Z., & Schneider, W.R. (1980). Matrix: A unique patient classification system. <u>Journal of Nursing Administration,</u> <u>10</u> (12), 25-31.

Barr, A., Moores, B., & Rhys-Hearn, C. (1973). A review of the various methods of measuring the dependency of patients on nursing staff. <u>International Journal of Nursing Studies,</u> <u>10,</u> 195-208.

Caterinicchio, R.P., & Davis, R.H. (1983). Developing a client-focused allocation statistic of inpatient nursing resource use: An alternative to the patient day. <u>Social Science in Medicine,</u> <u>17</u> (5), 259-272.

Caterinicchio, R.P. (1983). A debate: RIMs & the cost of nursing care. <u>Nursing Management,</u> <u>14,</u> (5), 36-39.

Clark, E.L., & Deggs, W.W. (1971). Quantifying patient care needs. Hospitals. 9, 96-100.

Claussen, E. (1955). Categorization of patients according to nursing care needs. Military Medicine, 116, 209-214.

Connell, F.A., Blide, L.A., & Hanken, M.A. (1984). Ambiguities in the selection of the principle diagnosis: impact on data quality, hospital statistics and DRGs. Journal of the American Medical Records Association, February, 18-23.

Connor, R.J., Flagle, C.D., Hsieh, K.C., Preston, R.A., & Singer, S. (1961). Effective use of nursing resources: A research report. Hospitals, J.A.H.A., 31, 30-39.

Connor, R.J. (1961). A work sampling study of variation in nursing work load. Hospitals, J.A.H.A., 35, 40-41, 111-113.

Corn, R.F. (1980). Quality control of hospital discharge data. Medical Care, 18, (April), 416-926.

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

Davis, C.K. (1983). The federal role in changing health care financing. Nursing Economics, 1, July-August, 10-17.

Demlo, L.K., Campbell, P.M., & Brown, S.S. (1978). Reliability of information abstracted from patients' medical records. Medical Care, 16, (December), 995-1005.

Dowling, W. (1974). Prospective Reimbursement of Hospitals. Inquiry, 11, 163-180.

Feldman, J. & Goldhaber, F.I. (1984). Living with DRGs. Journal of Nursing Administration, 14, (5), 19-22.

Fetter, R.B., Shin, Y., Freeman, J.L., Averill, R.F., & Thompson, J.D. (1983). Case-mix definition by Diagnosis Related Groups. Medical Care, 18, 1-39.

Flagle, C.D. (1960). The problem of organization for hospital care. In C.W. Churchman & M. Verhuist (Eds.) Management Science: Models and Techniques (pp. 275-287) New York: Pergamon Press.

Fray, C.P. (1984). An accountability-classification instrument for orthopeadic patients. Journal of Nursing Administration, 14, (708), 31-39.

Glass, G. & Hopkins, K.D. (1984). Statistical methods in education and psychology. 2nd ed., Prentice-Hall: Englewood Cliffs, New Jersey.

George, F.L., Kuhen, R.P. (1955). Patterns of patient care. New York: MacMillian, Co.

Giovannetti, P. (1978). Patient classification systems in nursing: A description and analysis. U.S. Department of Health, Education and Welfare. Hyattsville, Md. (DHEW Publication No. CHRA) 78-22.

Giovannetti, P. (1979). Understanding patient classification systems. Journal of Nursing Administration, 9, (2), 43-47.

Grimaldi, P.L., & Micheletti, J.A. (1983). A defense of the RIMs critique - RIMs reliability and value? Nursing Management, 14, (5) 40-41.

Grimaldi, P.L., & Micheletti, J.A. (1983). RIMs and the cost of nursing care. Nursing Management, 13, (12), 12-22.

Hays, W.L. (1973). Statistics for the social sciences. 2nd ed., Holt, Rinehart and Winston, New York.

Horn, S.D., Sharkey, P.D., & Bertran, D. (1983). Measuring severity of illness: Homogeneous case-mix groups. Medical Care, 21, (January), 14-30.

Hornbrook, M.C. (1982). Hospital case-mix: Its definition, measurement and use: Part I. The conceptual framework. Medical Care Review, 39 (1).

Institute of Medicine (1977). Reliability of hospital discharge abstracts. Washington, D.C.: National Academy of Sciences.

Institute of Medicine (1977). Reliability of Medicare hospital discharge records. Washington, D.C.: National Academy of Sciences.

Institute of Medicine (1980). Reliability of national hospital discharge survey data. Washington, D.C.: National Academy of Sciences.

Jackson, B., & Resnick, J. (1982). Comparing classification systems. Nursing Management, 13, (11), 13-19.

Joel, L.A. (1983). RIMs: When dreams finally become reality. New Jersey Nurse, 13, (4), 2-3.

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

Kerlinger, F.N. (1964). Foundation of Behavioral Research. New York; Holt, Rinehart & Winston, p.447.

Knowlton, H.C., & Dunn, M.D. (1971). Stratification of nursing services and costs. Hospital Progress, January, 34-36, 46.

Leatt, P., Bay, K.S., & Stimson, S.M. (1981). An instrument for assessing and classifying patients by types of care. Nursing Research, 30, (3), 145-150.

Mullane,M.K. (1975). Nursing care in the political arena. Nursing Outlook, 23, (11), 699-701.

Norby, R.B., Freund, L.E., & Wagner, B. (1977). A nurse staffing system based upon assignment difficulty. Journal of Nursing Administration, 7, (11), 2-24.

Pardee, G. (1968). Classifying patients to predict staff requirements. American Journal of Nursing, 68, (3), 517-520.

Piper, L.R. (1983). Accounting for nursing functions in DRGs. Nursing Management, 14, (11), 46-48.

Plomann, M.P., & Shaffer, F.A. (1983). DRGs as one of nine approaches to case mix in transition. Research in Nursing and Health Care, (October), 438-443.

Poland, M., English, N., Thornton, N., & Owens, D. (1970). A system for assessing and meeting patient care needs. American Journal of Nursing, 70, (7), 1479-1482.

Polit, D., & Hungler, B. (1983). Nursing Research-Principles and Methods (pp. 213-214) (2nd edition). Philadelphia: J.B. Lippincott.

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

Ryan, T., Barker, B.L., & Marciante, F.A. (1975). A system for determining appropriate nurse staffing. Journal of Nursing Administration, 5, (6), 30-38.

Sokal, R.R. (1974). Classification: Purpose, principles, progress prospects. Science, 185, (September 27), 115-123.

Stimson, R.H., & Stimson, D.H. (1972). Operations research and the nursing staffing problem. Hospital Administration, 17, (Winter), 61-69.

Swansburg, R.C. (1978). The nursing budget. Supervisor Nurse, 9, (4), 11.

Tomsky, C.L. (1983). Acuity based staffing controls cost. Nursing Management, 14, (10), 36-37.

Wright, M. (1954). The importance of patient care. New York: G.P. Putnam Sons.

APPENDIX A

CRR and CCU Patient Acuity Parameter Form

CRR - ADULT

NOURISHMENT	0	Minimal Assistance With Preparation And Eating	2	Tube Feedings Force Fluids	3	Fluid Limit		
HYGIENE / ACTIVITY	0	Minimal Assistance Required	2	Complete Bath Pt. Can Assist With Turning and Amb.	4	Pt. Cannot Assist With Turning	6	Requires 2 Nurses For Turning and Complex Cares
ELIMINATION	0	Minimal Assistance	1	Bedpan Urinal	3	Urine Output Q 1^{o}	4	Incontinent
VS / MONITORING	0	VS Q 4^{o}	4	VS Q 2^{o} 1 Monitoring Modality	7	VS Q 1^{o} 2 Monitor Modality	10	VS Q 15-30 Min 3 or > Monitoring Modality
MEDS / IV's	0	PO Meds Q 4^{o} Heparin Lock	1	1-2 Infusing IV's IV Med Q 4^{o}	2	3 Infusing IV's HA IV Push Q 2^{o} IV Meds Q 2^{o} Fluid Challenge	4	4 or > IV Infusions IV Push Meds Q 1^{o} or > IV Meds Q 1^{o}
TEACHING / EMOTIONAL SUPPORT	0	Routine Explanations Pt. is Capable of Understanding	1	Routine Explanations Involving Family Teaching	2	Special Teaching And Emotional Support For Complications	5	Extraordinary Factors: Life Threatening Complications Sensory Deficit Language Barrier (ET/Trach) ~~Open Chest~~
TREATMENTS	0	Minor Only	2	1 Major Plus 2 Minor	3	2 Major Plus 2 Minor	4	3 or > Major Plus Minors

NAME: ______________________ DX: ______________________

CLASSIFICATION: ______________________

7-3: __________ 3-11: __________ 11-7: __________

PLEASE MARK: 7-3 in BLACK / 3-11 in GREEN / 11-7 in RED

Cat.

I	7 - 15
II	16 - 25
III	26 - 32

TREATMENTS

Major: ET and Trach Suctioning
Weaning Process
Major Dressing Changes
Cardio Version

Minor: Chest Tube Stripping
Chest P.T.
Decubitus Care

MONITORING MODALITIES

Major: Arterial Line
Swan Ganz
LAP
Cardiac Outputs
CVP

DIET	0	Needs Little Assistance With Feeding	3	Feed, Tube Feed Force or Restrict Fluids		
HYGIENEL/ACTIVITY	0	Requires Supervision and/or Assistanct With Hygiene and Ambulation	4	Can Assist Minimally With Hygiene and Needs Assistance for Turning	6	Completely Dependent - Requires 2 People to Turn and Position
ELIMINATION	0	Commode/Urinal	1	Bedpan / Foley	3	Incontinent / Diaphoretic
MEDICATIONS / IV's	0	Oral or NG Meds 1 Infusing IV's	4	2-4 IV Pushes / Shift 2 Infusing IV's Fluid Challenge	8	5 or More IV Pushes / Shift 3 or More Infusing IV's
TEACHING / EMOTIONAL SUPPORT	0	Routine Explanations With Normal Care Activities	2	Routine Teaching With Emotional Support For Patient With Diagnosed MI Teaching for Identified Needs of Patient/Family	4	Extraordinary Factors: Re-infarct Life-threatening Complications Language Barrier (ET & Trach) Patient Restrained Denial Isolation
VS / MONITORING	0	BP Q 4^{o}	6	BP Q 1^{o} 1 Major Plus 2 Minor Monitoring Modalities	10	BP Q 15-30 min 1 or > Major Plus 3 or > Minor Monitoring Modalities
TREATMENTS	0	2 Minor	2	1 Major plus 2 Minor	3	2 or > Major Plus 3 or > Minor

NAME: ______________________ DX: ______________________

CLASSIFICATION: ______________________

7-3: __________ 3-11: __________ 11-7: __________

Cat. I 0 - 7
II 8 - 20
III 21 - 34

USE ONE SHEET PER DAY / MARK ONE SECTION EACH SHIFT

10/20/80

TREATMENTS

Major:
- Cardioversion
- Suction
- Weaning
- Ventilator

Minor:
- Chest PT
- Pacemaker Checks
- Inspirometer
- ROM

MONITORING MODALITIES

Major:
- 12 Lead EKG
- Swan Ganz
- Cardiac Output
- Arterial Line
- IABP

Minor:
- Assess Heart and Lung Sounds
- S/A
- Guiac
- Draw Lab Work
- Orthostatic BP

APPENDIX B

Selected Patient Classification Schemes

TABLE I SELECTED PATIENT CLASSIFICATION SCHEMES

Name of Scheme Assessing Patient Classification (Reference)	Aspects of Nursing Care Included			Patient Population	Criteria for Care Groups		Workload Assessment and/or Data Collection Instruments	Comments
	Technical Care	Professional Care	Indirect or Collective		Basis for Choice	Nature of Criteria		
Early Intuitive method (Barr, Moores, Rhys-Hearn, 1973)	Considered jointly in quantitative way		Not considered separately	All clinical areas	Intuitive only - no criteria identified		No quantitative basis for assessment--nursing intuition only	One of the earliest attempts to classify patients and workload. An intuitive comparison of workload with norm for individual wards wards only - not for comparing different wards or patient types.
Traditional Johns Hopkins University Hospital Connors, Flagle, Hsieh, Preston, Singer, 1961; Connor, 1961; Flagle, 1960	Technical care and professional care not separately considered			General medical surgical wards	Severity of Illness 3 categories - I Self-care patients II Partial-care patients III Total-care patients		Average nursing time per patient determined by work measurement study--resulting in average nursing time per patient for each classification/category (Direct care hours)	Findings -- uneven distribution of patient case workload over time of day - peak during morning care - light during evening activities - 12MN to 6AM not considered
University of Washington Hospital (Pardee, 1968)	Not considered separately		Indirect care not measured	All patient care areas	- vital signs - ambulation status - eating - dressings/turn frequently - other procedures		Category I - minimal care Category II - moderate care Category III - most care	criteria for classification were devised for each unit based on the conditions, treatments and/or procedures identified by activity studies. Criteria varied between the units.

PETO (Clark & Diggs, 1971; Poland, Enclish, Thornton Owens, 1970)	Considered jointly	One activity study showed 76 per cent of time was devoted to direct physical care (leaving 24 per cent of time to indirect care)	General medical/ surgical and pediatric inpatients	Measures physical care requirements only - diet - vital signs - respiratory aides - suction - cleanliness - toileting - turning and/or assisted activity	Quantifies patients' physical needs based on direct analysis of patients' needs rather than assumption that what nurses do for the patient is what the patient needs. Each element of care given is assigned a point value based on nursing care required--each point is equivalent to 7½ minutes of nursing time.	- system is an index, not exact measure of nursing needs - time value for each point may be different if used in another hospital - can be correlated with a nursing audit to determine quality of care actually given

St. Bernard's Classification (Knowlton & Dunn, 1971)	RN and nursing support staff considered jointly		All nursing areas except Nursery, Pediatrics, Intensive Care Unit, Coronary Care Unit	- Ambulation
				- Bathing
				- Continence
				- Feeding
				- Special care
				  - postop care
				  - oxygen
				  - isolation
				  - unusual care ordered by physician
					<u>Levels of Patient Care</u>
					- self-care
					- partial care
					- total care
					
					Patient Care Codes
					Type I - self care
					Type II - partial care
					Type III- normal care
					Type IV - extensive care
					Type V - total care
						An early system established to contain costs throughout the hospital, especially nursing service costs --variable billing structure for nursing services established in this system.

John C. Lincoln Hospital System (Ryan, Barker, Marciante, 1975)	Considered Separately	Considered Separately	Not identified	- Bath - Activity - Medications - Treatments - Dietary needs - Vital signs - Social needs - Special tests (x-ray instructions/prep; preop teaching, tests requiring presence of RN, etc.) - Respiratory needs - Special factors for evaluation - traction, incontinence, language barrier, confusion, anxiety, etc.	Five levels of care from least to greatest intensity	Agency nurses (on-call) used to supplement core hospital staffing to meet patient acuity needs.

Kaiser-Permanente Medical Care Programs MATRIX Patient Classification System (Barham & Schneider, 1980)	Considered separately	Considered separately		Adaptable to any care delivery system and any patient type	- Bed (linen change status) - Bath, skin care, range of motion - Nutrition - Intake/output; elimination - Vital and neurological signs - Movement and transportation - Medications - oral, subq, IM, IV - Treatments - Teaching - Psychosocial	Four levels of care from least to greatest intensity. Matrix instrument identifies number of minutes required to perform each task/criteria description and skill level needed to provide appropriate care (NA, LPN, RN)	Unique because, through a single procedure, it allows identification of all patient care needs, relates these needs to appropriate skill level, and allocates the necessary amount of time to provide needed care activities.
Montefiore Hospital and Medical Center Critical Care Patient Acuity (Jackson & Resnick, 1982)		Professional care only in critical care areas	Some aspects considered separately	Critical care areas	- Physical restrictions - Dependency - Nursing assessment and intervention--total system approach - Medications - Psychosocial; emotional - Planning and evaluating - Nursing assessment and interventions--constant observation of one or more body system functioning	Four levels of care from least to greatest care intensity and nursing time consumption	Unique because "Planning and Evaluation" area of care is clearly identified as a parameter of direct care rather than classified in ambiguously determined "indirect-care" needs and nursing time consumed.

Medicus/RPSL System (Norby, Freund, Wagner, 1977)	Considered Separately	Considered Separately	Indirect care (H.N., Supervisor) considered separately	All inpatient populations	Condition indicators weighed to compute assignment difficulty. Sample indicators include: - admit/transfer-in - discharge/transfer-out - confused, disoriented, retarded - sensory deficit - mobility assistance - frequency of mobility - bath - feed - isolation - monitor up to q1hr - intake/output - specimen collection - intravenous/irrigation - special teaching needs - special emotional needs - surgery/procedure - incontinent/diaphoresis	Four patient category types I minimal care II intermediate care III complete care IV intensive care	A computerized system based on "Assignment difficulty" to determine required daily coverage by personnel type System incorporates Quality Care Monitoring and Management Reporting into the data collection and output process. It recognizes the nature of the relationship between care quality and care quantity and provides documentation for decision making and system self-correction.

Classification by Type of Care (Leatt, Bay, Stimson, 1981)	Interdiscipline factors considered -- not specifically for nursing care only			Chronically ill, long-term care patients	- Demographic characteristics
					- Physical status
					  - extent of impairment
					  - extent of diagnosed health problem
					- Psychosocial status
					  - level of mental functioning
					  - personal adaptability
					  - social adaptability
					  - quality of lifestyle
					- Self care practices
					  - activities of daily living
					  - therapeutic (to improve or maintain health dependency)
					- Social & Environmental Factors
					  - characteristics of family and friends
					  - program of care
					  - location - where care program should be administered
							By nursing definition, not a true patient classification system. Included here because of heavy emphasis on patients' need for nursing care as assessment criteria in the classification system.

Johnson Behavioral System Model of Nursing (Auger & Dee, 1983)	(Implied) considered separately	(Implied) considered separately	Indirect not considered separately	Operationalized for use in psychiatric settings -- potential for all nursing practice setting	The eight behavioral subsystems of the Johnson's Behavioral System Model - ingestive - eliminative - sexual - dependency - affiliative - achievement - aggressive-protector - restorative	Adapative Behavior - Level I - adaptive behavior (minimal nursing care time) - Level II - minimally maladapative or in learning process - Level III - maladaptive behavior (require intensive nursing care time) - Level IV - maladaptive behavior of an intensity or frequency requiring continuous one-to-one intensive nursing care time	Provides nursing and hospital administrators with the capability to 1) establish staffing based on defined patient need for service 2) identify level of staff (RN, LPN) needed to provide varying nursing care 3) bill patients for actual nursing care services 4) assist staff in identifying and providing critical patient services 5) identify nursing services that are absolutely necessary for patient care and those that can be modified if budgetary restraints require scaling down of services

The Orthopaedic Hospital of Charlotte Accountability-Classification System (Fray, 1984)	(Implied) considered jointly - "each nurse documented activities on each patient for whom he or she was responsible"		Indirect considered jointly in quantitative way - included clinical coordinators and ward secretaries	orthopedic	- Nutrition - Self-care deficit - hygiene - mobility - aids (traction, etc) - Alteration in health maintenance - treatments - medications - observation parameters, etc. - Coping behavior - Patient status - age < 7; > 64 - isolation - special teaching - psychologically unstable, etc. - Additional treatments	Score = Class 0-9 = 1 10-19 = 2 20-32 = 3 33 - = 4 Modified "Nursing Care Record" (Higgerson & Van Slyck)	Provides systematic measurement of nursing time spent in delivering patient care. --Does not measure patient care needs nor quality of care given currently --Provides mechanism for future quality assurance audits
<u>Transitional</u> Client focused allocation statistic of inpatient nursing resource use (Caterinicchio & Davis, 1983)	Considered separately from professional	Considered separately from professional	activities not requiring nursing skills and knowledge included as "other activities"	inpatient medical-surgical, obstetric-gynecology, psychiatric units, intensive care, coronary care	"Nursing Activities" included all interventions encompassing assessment & planning, teaching, emotional support, medications and treatments, and physical needs functioning - measured in actual number of minutes spent with each study client in the performance of nursing activities & other client-specific activities by each skill level on each shift for entire length of stay	- Case mix Nursing Performance Instrument - "Client 8-Hour Nursing Activity Record" - "24-Hour Unit Activity Record"	Transition phase from traditional quantitative classification to classification of patients for determining costs of care. An analysis which attempts to construct a patient-focused cost function whereby the <u>costing of nursing services</u> is based upon the relationship between the intensity of general nursing interventions and patients' illness attributes.

					Cost per case basis per DRG. Results of analysis suggested that length of stay is the most significant prediction of indexed nursing units of service regardless of age and the complexity of medical problem when case-mix is controlled through assignment of cases to 13 nursing service resource clusters

APPENDIX C

Differential Charge Slip

Patient Acuity / Differential Charging 009

University Hospital

Service Record

Date Bldg. Fl. Rm.

Unit No.

Name

Birthdate

Admit Date				Discharge Date				Location	Pay Code
Mo	Day	Yr	Time	Mo	Day	Yr	Time		

Date of Service		Mo Day Yr (Whole Numbers Only)			Mo Day Yr (Whole Numbers Only)			Mo Day Yr (Whole Numbers Only)			Mo Day Yr (Whole Numbers Only)		
Charge Category	Procedure Number	D	E	N	D	E	N	D	E	N	D	E	N
CNC I	0010												
CNC II	0020												
CNC III	0030												
CNC IV	0040												

Date of Service	Quantity	Item No.	Miscellaneous (Describe)	Unit Price
IO DA YR				$.
O DA YR				$.

APPENDIX D

Descriptive Statistics on Total Sample

Table D-1

Distribution of ALL Diagnosis Related Groups in Initial Sample

DRG	MDC	TITLE	FREQUENCY	PERCENT
1	1 SURG	Craniotomy Age >17 Except For Trauma	1	0
12	1 MED	Degenerative Nervous System Disorders	1	0
14	1 MED	Specific Cerebrovascular Disorders Except TIA	2	0
15	1 MED	Transient Ischemic Attacks	1	0
24	1 MED	Seizure + Headache age >69 and/or C.C.	1	0
75	4 SURG	Major Chest Procedures	7	2
78	4 MED	Pulmonary Embolism	1	0
79	4 MED	Respiratory Infections + Inflammations Age >69 and/or C.C.	1	0
85	4 MED	Pleural Effusion Age >69 and/or C.C.	1	0
87	4 MED	Pulmonary Edema + Respiratory Failure	2	0
88	4 MED	Chronic Destructive Pulmonary Disease	4	1
89	4 MED	Simple Pneumonia + Pleurisy age >69 and/or C.C.	2	0
96	4 MED	Bronchitis + Asthma age >69 and/or C.C.	1	0
97	4 MED	Bronchitis + Asthma age 18-69 w/o C.C.	1	0
99	4 MED	Respiratory Signs + Symptoms Age >69 and/or C.C.	4	1

Table D-1

Distribution of ALL Diagnosis Related Groups in Initial Sample (Continued)

DRG	MDC	TITLE	FREQUENCY	PERCENT
100	4 MED	Respiratory Signs + Symptoms Age <70 w/o C.C.	1	0
101	4 MED	Other Respiratory Diagnosis Age >69 and/or C.C.	1	0
104	5 SURG	Cardiac Valve Procedure with Pump + with Cardiac Cath	18	4
105	5 SURG	Cardiac Valve Procedure with Pump + w/o Cardiac Cath	12	3
106	5 SURG	Coronary Bypass with Cardiac Cath	41	10
107	5 SURG	Coronary Bypass w/o Cardiac Cath	24	6
108	5 SURG	Cardiothor Proc. except Valve + Coronary Bypass with Pump	12	3
109	5 SURG	Cardiothoracic Procedures w/o Pump	3	1
110	5 SURG	Major Reconstructive Vascular Procedures Age >69 and/or C.C.	4	1
112	5 SURG	Vascular Procedures except Major Reconstruction	7	2
116	5 SURG	Permanent Cardiac Pacemaker Implant w/o AMI or CHF	13	3
117	5 SURG	Cardiac Pacemaker Replace + Revis Exc Pulse Gen Repl Only	1	0
118	5 SURG	Cardiac Pacemaker Pulse Generator Replacement Only	4	1
121	5 MED	Circulatory Disorders with AMI + C.V. Comp. Disch. Alive	8	2

Table D-1

Distribution of ALL Diagnosis Related Groups in Initial Sample (Continued)

DRG	MDC	TITLE	FREQUENCY	PERCENT
122	5 MED	Circulatory Disorders with AMI w/o C.V. Comp Disch. Alive	5	1
123	5 MED	Circulatory Disorders with AMI, Expired	5	1
124	5 MED	Circulatory Disorders Exc AMI, with Card Cath + Complex Diagnosis	29	1
125	5 MED	Circulatory Disorders Exc AMI, with Card Cath w/o Complex Diagnosis	19	5
127	5 MED	Heart Failure + Shock	22	5
129	5 MED	Cardiac Arrest	1	0
134	5 MED	Hypertension	3	1
135	5 MED	Cardiac Congenital + Valvular Disorders Age >69 and/or C.C.	2	0
138	5 MED	Cardiac Arrhythmia + Conduction Disorders Age >69 and/or C.C.	19	5
139	5 MED	Cardiac Arrhythmia + Conduction Disorders Age <70 w/o C.C.	5	1
140	5 MED	Angina Pectoris	34	8
141	5 MED	Syncope + Collapse Age >69 and/or C.C.	2	0
142	5 MED	Syncope + Collapse Age <70 w/o C.C.	1	0

Table D-1

Distribution of ALL Diagnosis Related Groups in Initial Sample (Continued)

DRG	MDC	TITLE	FREQUENCY	PERCENT
143	5 MED	Chest Pain	19	5
144	5 MED	Other Circulatory Diagnoses with C.C.	6	2
148	6 SURG	Major Small + Large Bowel Procedures Age >69 and/or C.C.	1	0
168	6 SURG	Procedures on the Mouth Age >69 and/or C.C.	1	0
177	6 MED	Uncomplicated Peptic Ulcer >69 and/or C.C.	2	0
180	6 MED	G.I. Obstuction Age >69 and/or C.C.	2	0
182	6 MED	Esophagitis, Gastrcent. + Misc. Digest. Dis. Age >69 and/or C.C.	2	0
187	6 MED	Dental Extractions + Restorations	1	0
192	7 SURG	Minor Pancreas, Liver + Shunt Procedures	1	0
207	7 MED	Disorders of the Biliary Tract Age >69 and/or C.C.	1	0
240	8 MED	Connective Tissue Disorders Age >69 and/or C.C.	2	0
247	8 MED	Signs + Symptoms of Musculoskeletal System + Conn Tissue	1	0
256	8 MED	Other Diagnoses of Musculoskeletal System + Conn Tissue	1	0
294	10 MED	Diabetes Age =>36	1	0
296	10 MED	Nutritional + Misc. Metabolic Disorders Age >69 and/or C.C.	3	0

Table D-1

Distribution of ALL Diagnosis Related Groups in Initial Sample (Continued)

DRG	MDC	TITLE	FREQUENCY	PERCENT
302	11 SURG	Kidney Transplant	1	0
311	11 SURG	Transurethral Procedures Age <70 w/o C.C.	3	1
315	11 SURG	Other Kidney + Urinary Tract O.R. Procedures		
320	11 MED	Kidney + Urinary Tract Infections Age >69 and/or C.C.	1	0
325	11 MED	Kidney + Urinary Tract Signs + Symptoms Age >69 and/or C.C.	1	0
331	11 MED	Other Kidney + Urinary Tract Diagnoses Age >69 and/or C.C.	3	1
334	12 SURG	Major Male Pelvic Procedures with C.C.	1	0
365	13 SURG	Other Female Reproductive System O.R. Procedures	1	0
395	16 MED	Red Blood Cell Disorders Age >17	1	0
408	17 SURG	Myeloprolif Disorder or Poorly Diff Neoplasm with Minor O.R. Procedure	1	0
410	17 MED	Chemotherapy	1	0
418	18 MED	Postoperative + Post-traumatic Infections	1	0
423	18 MED	Other Infectious + Parasitic Diseases Diagnoses	1	2
425	19 MED	Acute Adjust React + Disturbances of Psychosocial Dysfunction	2	0

Table D-1

Distribution of ALL Diagnosis Related Groups in Initial Sample (Continued)

DRG	MDC	TITLE	FREQUENCY	PERCENT
426	19 MED	Depressive Neuroses	1	0
430	19 MED	Psychoses	1	0
449	21 MED	Toxic Effects of Drugs Age >69 and/or C.C.	1	0
450	21 MED	Toxic Effects of Drugs Age 18-69 w/o C.C.	1	0
467	23 MED	Other Factors Influencing Health Status	1	0
468		Unrelated or Procedure	5	1
		Total	400	100

Table D-2

Frequencies of Cases By Major Diagnostic Category (MDC)

Code	Title	N	Cumulative Percent
MDC 01	Diseases and disorders of the nervous system	6	1
MDC 02	Diseases and disorders of the eye	0	
MDC 03	Diseases and disorders of the ear, nose and throat	0	
MDC 04	Diseases and disorders of the respiratory system	26	8
MDC 05	Diseases and disorders of the circulatory system	319	88
MDC 06	Diseases and disorders of the digestive system	10	90
MDC 07	Diseases and disorders of the hepatobiliary system and pancreas	2	91
MDC 08	Diseases and disorders of the musculoskeletal system and connective tissue	4	92
MDC 09	Diseases and disorders of the skin, subcutaneous tissue and breast	0	
MDC 10	Endocrine, nutritional and metabolic diseases and disorders	4	93
MDC 11	Diseases and disorders of the kidney and urinary tract	9	95
MDC 12	Diseases and disorders of the male reproductive system	1	95

Table D-2

Frequencies of Cases By Major Diagnostic Category (MDC)

Code	Title	N	Cumulative Percent
MDC 13	Diseases and disorders of the female reproductive system	1	95
MDC 14	Pregnancy, childbirth and the puerperium	1	95
MDC 15	Newborns and other neonates with conditions originating in the perinatal period	0	
MDC 16	Diseases and disorders of the blood and blood-forming organs and immunity disorders	0	
MDC 17	Myeloproliferative disorders, diseases and poorly differentiated malignancy and other neoplasms not elsewhere classified	2	96
MDC 18	Infectious and parasitic diseases (systemic or unspecified sites)	2	97
MDC 19	Mental diseases and disorders	5	98
MDC 20	Substance use and substance-induced organic mental disorders	0	
MDC 21	Injury, poisoning, and toxic effects of drugs	2	98
MDC 22	Burns	1	99
MDC 23	Factors influencing health status and other contacts with health services	0	
MDC 24	Ungoupable records	5	100

AN ABSTRACT OF THE THESIS OF

ROBERTA MARIE PHILLIPS NEPPLE

For the MASTER OF NURSING

Date of Receiving this Degree: June 14, 1985

Title: PATTERNS OF ACUITY IN TWELVE CARDIAC DIAGNOSIS RELATED GROUPS

APPROVED: ______________________________
Mark C. Hornbrook, Ph.D., Thesis Advisor

The primary aim of this exploratory, correlational study was to compare two patient classification systems--Diagnosis Related Groups (DRGs) and Nursing Determined Acuity--with respect to their degree of correspondence in grouping patients according to patterns of resurce use. The comparison was conducted on three levels (1) homogeneity of patient groups, (2) ranking of patient groups, and (3) predictive validity of the DRGs for the outcomes of length of stay and patient acuity. The critical dimensions of hospital use were length of stay and acuity, where acuity was defined as need for nursing care.

Theories of classification and measurement provided a framework for comparison of the two schemes. To demonstrate the differences between a nursing model and a medical model for classifying patients, an original conceptual model was developed.

The setting was Oregon Health Sciences University (OHSU)

Hospital. The final sample consisted of 262 cases from twelve (12) cardiac DRGs; 72 cases were discharged from the Coronary Recovery Room, 178 were discharged from the Cardiac Care Unit.

The medical resource use measures were identified as (1) DRG relative resource weight, and (2) DRG geometric mean length of stay. Nursing resource use data were abstracted from concentrated Nursing Charge Slips on which acuity level for each case is recorded using the Nursing Patient Classification and Staffing System at OHSU Hospital. Four nursing model dependent variables were (1) unit length of stay, (2) total length of stay, (3) initial acuity, and (4) total acuity.

Coefficients of variation and one-way ANOVA were utilized to test for within and between group homogeneity. The findings suggest that, although it appears that some of the variance can be attributed to the DRG scheme, there is some evidence for within group homogeneity. The degree of homogeneity varies across the twelve groups with a lesser degree of variance demonstrated on the acuity measures than was demonstrated on the length of stay measures.

Spearman's Correlation Coefficients were computed to determine the concordance between the length of stay variables and between the relative resource use variables. Both coefficients are significant at the 1% level, however, the findings suggest there is a greater relationship between the length of stay

Using Pearson's Product Moment Correlations for the examination of the relationships between the four dependent variables, within the twelve DRGs, the only consistent relationships for predicting resource use found was initial acuity to total acuity.

Although the degree of correspondence between the two classification schemes is statistically significant on the across group ranking levels, no consistent patterns in dependent variable relationships was revealed overall. The findings suggest that there is insufficient evidence to support a high degree of correspondence within or between DRGs for classifying patients into nursing resource use groups more simiar than dissimilar.