Donna D. Bost. UTILITY OF THE NURSING INTENSITY INDEX IN A COMMUNITY HOSPITAL IN SOUTHEASTERN NORTH CAROLINA. (Under the direction of Therese G. Lawler, R.N., Ed. D.) School of Nursing, November, 1986.

The purpose of this study was to replicate portions of research performed by Dr. Judy Reitz at Johns Hopkins Medical Center, using the Nursing Intensity Index (NII) as a patient classification instrument. The ability to generalize findings in different health care settings was a primary goal of the work. The NII was compared to patient charges, length of stay and Diagnostic Related Groups. All were found to be heterogeneous in terms of NII, consistent with Reitz's findings. Additionally, the NII was compared to a standard patient classification system. Concurrent validity between the two tools was found. The NII appeared to be most efficient in terms of time consumption to determine the scores. The sound conceptual basis of the NII, its ability to be generalized across institutions and its efficiency indicated the tool's usefulness in classifying patients.

The NII used eleven functional Health Parameters in its measurement. Four parameters are behavioral in nature, a broad area omitted from most patient classification systems. This research found all eleven Parameters to be predictors of the final NII score with Emotional Response having the

highest correlation. This demonstrated a major weakness of most other systems.

Further research needs to be performed for further generalization of these findings. Time allocations need to be associated with the NII scores so that nursing services may be billed separately from room rates. The NII seemed a valid and reliable measurement instrument for variable billing.

UTILITY OF THE NURSING INTENSITY INDEX IN A COMMUNITY HOSPITAL IN SOUTHEASTERN NORTH CAROLINA

A Thesis

Presented to

the Faculty of the School of Nursing

East Carolina University

In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Nursing

by

Donna D. Bost

November 1986

UTILITY OF THE NURSING INTENSITY INDEX IN A COMMUNITY HOSPITAL IN SOUTHEASTERN NORTH CAROLINA

by

Donna D. Bost

APPROVED BY:

DIRECTOR OF THESIS _____
Therese G. Lawler, R.N., Ed. D.

COMMITTEE MEMBER _____
Mary Ann McCarthy Rose, MSN, Ed. D.

_____
Andrew E. Hayes, Ed. D.

_____
Martha K. Engelke, BSN, M.P.H., C.S.

ASSISTANT DEAN, GRADUATE PROGRAM _____
Emilie D. Henning, R.N., Ed. D.

DEAN OF GRADUATE SCHOOL _____
Joseph G. Boyette, Ph. D.

ACKNOWLEDGEMENTS

A report of such importance could not have been completed without the dedication of time and cooperation of Dr. Judy Reitz, Director of Nursing, Francis Scott Keys Medical Center and Staff of New Hanover Memorial Hospital.

A special appreciation is extended to members of the Thesis Committee and Thesis Director, Dr. Therese G. Lawler, R.N., Ed. D.

TABLE OF CONTENTS

TABLE OF TABLES AND FIGURES

CHAPTER I. BACKGROUND AND PURPOSE OF THE STUDY

Statement of the Problem

The past two decades are littered with attempts of policy makers to reduce the rapidly rising costs of health care. Health care expenses in the United States have multiplied faster than in any other nation. From 1965 to 1975 health care costs rose 50% higher than overall costs of living (Walker, 1983). The early 1980's brought health care cost increases exceeding 15% - the highest inflation rate in 15 years (Coleman, Dayani and Simms, 1984). Nursing service comprises 50-60% of the health care market so naturally nursing is often cited as a prime cause of the escalating health care costs.

The prospective payment system is one method of containing health care costs. Diagnostic Related Groups (DRGs) are classifications of patients, based on diagnosis, claimed to be homogeneous in terms of resources consumed. Hospitals are reimbursed according to the DRG payment rather than actual cost of care. One factor omitted from the DRG formula is resource consumption by nursing personnel. Since nursing care is the reason for hospitalization, one would expect some reference to it in the formula. J. Reitz contends DRGs are not homogeneous in terms of nursing care (Reitz, 1985). This study will further examine this issue.

Pinpointing the cost of nursing care is difficult as this cost is usually embedded in the 'room and board' fee (per diem). Per diem charging makes accounting easy, but makes nursing services synonymous with the daily room rates and services such as laundry, housekeeping and food (Kiley & Schaefus, 1983; Shaffer, 1986). The public, as well as some nurses believe room rate increases are the result of the 'expensive nurses'. In reality, nursing care only comprises about 18% of the total costs of a hospital stay (Walker, 1983; Higgerson & Van Slyck, 1982). The other 82% results from laboratory fees (16.1%), room rates (17.8%), physician's professional fees (12.5%), and drugs (5.8%), etc. (Walker, 1983).

Nursing consumes the largest portion of a hospital's personnel budget--about 40% (Curtin, 1984). As a hospital's largest department, nursing is particularly vulnerable to cost-containment strategies (Walker, 1983). Some authorities single out nursing as the major cost in hospitals' operating expenditures (Walker, 1983). Yet the true cost of providing nursing care is not really known, since nursing costs are typically hidden in room rates (per diem rates). As mentioned previously, Walker illustrates that nursing comprises only 18% of total patient charges--much lower than most perceive. In this age of cost consciousness, nursing leaders are examining the issues of breaking nursing costs free from room rates in order to price out the consumption of nursing

resources. Many nursing leaders recognize that "nursing has been and continues to be included in the typical hospital budget with hotel services. Nursing must put a separate price on its services" (Shaffer, 1984).

Before a monetary value for nursing services or variable billing can be determined, valid and reliable measures of nursing services must be established. Various patient classification systems have been used for over 30 years with staffing rather than costing as the goal (Alward, 1983). The profession has made no real progress in establishing a uniformly acceptable 'staffing' classification system even though hundreds of thousands of dollars are spent each year across the country in studying various classification systems (Vaughan & MacLeod, 1980). Patient classification systems more recently are taking a different focus--costing nursing services (Van Slyck, 1982). "A reliable and valid patient acuity system is the essential component of any accurate method for allocating nursing resources and costing nursing care . . ." (Curtin, 1984).

Focus of the Study

The focus of this study came from an economic impetus with the purpose of testing the utility of a patient acuity (classification) system. A long range goal of this work included recommendation of a system which would be used across institutions to cost nursing services. In this regard, Susan Horn, the noted health economist, developed a Severity

of Illness Index in the late 1970's. This index was tested and seemed sound in indicating a person's severity of illness and costs consumed by that illness (Horn, 1980). Furthermore, Judy A. Reitz, working with Susan Horn, developed and tested a Nursing Intensity Index (NII) in a large metropolitan teaching institution (Johns Hopkins). The intent of this research was to test the utility of Reitz's Nursing Intensity Index as a potential base for allocating nursing costs in a rural community hospital in southeastern North Carolina.

Specifically, the NII was compared to Total Charges, LOS and DRGs. Also, the elements comprising the NII were tested to determine their individual impact on the final NII score. Time consumed using the NII and a standard patient classification tool was compared to determine which was most efficient. Finally concurrent validity between the NII and a standard patient classification system was tested.

Research Questions

The NII was chosen because of two primary factors. The first involved the NII's retrospective nature, a radically different approach from most other nursing patient classification systems. "Retrospective review decreases complexity and increases reliability" (Reitz, 1985). The second primary factor for selecting the NII was its sound conceptual framework. The tool uses theorists such as Orem, Roy, & Rogers as well as the established nursing processes

as its framework. While investigating the NII's utility in a different setting, other questions were also asked. These include:

1. Is there a relationship between diagnostic related groups (DRG) and nursing intensity?

2. Is there a relationship between a tri-daily prototype task-oriented patient classification system and the NII?

3. What relationships exist between nursing intensity, length of stay (LOS) and total hospital charges?

Significance

This research brought together two fascinating and complex concepts - health care economics and patient classification systems. The replication of testing of the NII indicated its utility in other health care settings, and so its ability to be generalized. Work such as this allows nursing to establish an acceptable patient classification system and to employ a valid method of costing nursing services.

CHAPTER II: REVIEW OF THE LITERATURE

Conceptual Framework

General Systems Theory provides an organized structure to think about complex interrelationships (Hamilton, 1984). When considering the concepts of health care systems, cost containment, variable billing and patient classification systems, systems theory organizes these parts into a meaningful structure. A system is defined as any set of interrelated components that interact with each other within a boundary that filters inputs and outputs (Hamilton, 1984). Feedback is the method used to correct discrepancies between actual and intended outputs (Katz & Kahn, 1978). In systems theory, the whole is greater than the sum of its parts, and change in one area affects change in other areas of the system (Hamilton, 1984).

Health care in America can be examined as a system. Innumerable subsystems exist such as Medicare payment systems, home health agencies and nursing research. Subsystems which are relevant to this study are financial management systems (prospective payment and variable billing for nursing services), patient classification systems and acute care hospitals.

Changes in cost containment directly affect change in the other subsystems involved in this study. Acute care hospitals are forced to work more efficiently by the

Prospective Payment System, resulting in a greater need to justify the costs of nursing services. Patient classification systems are changing to provide evidence of nursing costs rather than just staffing needs (Van Slyck, 1983; Wood, 1982). Through the use of systems theory, the complex parts of this study take shape and meaning.

Health Care Financing

A brief history of health care financing in America helps to explain the perspective of this study. During the 1950's and 60's, the focus of health care was guaranteed access for all Americans. The Hill-Burton Act provided monies for expansion of community hospitals in return for care provided to the indigent. Increased utilization and length of stays made health care dollars increase. The national "health" care policy was really a national "sickness" policy with "money and attention focused primarily on acute care beds" (Spitzer, 1983). The establishment of Medicare in the 1960's as well as the rapidly expanding technology of the 1970's and 1980's added to health care expenditures.

Another reason for the increase in health care dollars was the emphasis on malpractice. To avoid risks of malpractice charges, physicians often over-diagnosed and over-treated, thus charging higher bills. Until 1983, third party payers such as Medicare and Blue Cross/Blue Shield paid about 80% of what was billed. Spitzer suggested that by 1976, 90%

of hospital charges were paid by third party payers (Spitzer, 1983). As the government shared more of the financial burden of health care, the shift began from guaranteed access to cost containment. Several strategies were suggested during the late 1970's, but not until Reaganomics took hold did major changes occur.

As Grimaldi explained, PL-98-21, signed in April, 1983, created a prospective payment system which has radically changed health care in America. Previously, Medicare paid a hospital for each day of care a patient received computed on a fee-for-service basis. Under PL-98-21, hospitals are paid a flat illness-specific amount that is set prospectively and "that is independent of a patient's length of stay and services rendered" (Grimaldi, 1984). The purpose was to encourage hospitals to function more efficiently. Diagnostic related groups (DRG) was the system decided upon to prospectively pay hospitals. There were 467 DRG's developed by researchers at Yale University, one of whom was John Thompson, a nursing authority on health care management. The variables most frequently used to assign patients to the DRG's are "operating room procedure, principle diagnosis, age of the patient, and the presence of a qualified complication or co-morbid condition" (Grimaldi, 1984).

Another important change of PL-98-21, as pointed out by Grimaldi, related directly to the consideration for nursing care. Through 1982, Medicare had allotted an extra 5% of nursing salaries to the routine care rendered to elderly

patients. This differential was eliminated with a projected savings of $330 million (Grimaldi, 1984).

The lack of consideration of nursing resources in the reimbursement structure does not evidence the fact that the primary reason for hospitalization is the patient's need for acute, skilled nursing care (Spitzer, 1983). Under the pressure of prospective payments, nursing services are being scrutinized more closely. Since nursing does comprise 30 to 50% of budgeted hospital salaries, a cut in nursing costs might seem the logical way to function more efficiently. "What nursing must reiterate and validate is that nurses also produce substantial revenue for the hospital" (Spitzer, 1983). The best way to do this is by placing a price tag on services provided. Patient classification systems which reflect consumption of nursing resources provide a useful method of doing so.

Variable Billing

Separating the nursing services from the per diem (room and board) portion of the hospital bill is known as variable billing. This is not a new concept, yet to date few institutions have put it to use. Higgerson and Van Slyck put a variable billing system to work in 1974 in Phoenix, Arizona. Consumers in Phoenix demanded a detailed breakdown of charges including nursing. A patient classification system was developed and is still being used for variable billing. Within the first year of using this

system, 75% of patients received a lower bill due to paying only for their required nursing services, though total revenues remained stable (LaViolette, 1980). The consumer advantages of such a system are evident. Other endorsers of variable billing include the National League for Nursing. A position statement published in 1981 stated:

> The National League for Nursing believes that reimbursement to health care institutions for nursing care as a separate, well-defined service will facilitate the monitoring of nursing costs and provide an incentive for greater efficiency (NLN, 1981).

Charles Wood also advocated variable billing in his 1982 article published in the Harvard Business Review. Wood stated, "A flat daily rate neglects the many differences among the requirements of patients in terms of both the care needed and the stage of recovery." Wood continues to state, "Such a cost accounting system would be totally unacceptable in private business," and he used the analogy of a rental car price being equal no matter what type of car one rented (a Cadillac or a truck) (Wood, 1982).

Patient Classification Systems

Why then, with such evidence and support, has variable billing only been instituted in 26 hospitals across the country? (Van Slyck, 1985) A primary reason has been the disorganized national development of nursing measurement systems based on patient groupings. Vaughan and MacLeod

estimated 15 million dollars is spent annually on nursing staffing studies (Vaughan & MacLeod, 1980). Patient classification systems are not new; tools have been around since the early 1900's, yet little advancement in the system is evident. An article published in 1961 regarding measuring nursing activities could easily have been written in 1986 (Connor & Preston, 1961). In the slow attempt to develop patient classification systems, several directions have been taken.

Jones relates that disease staging is a classification method with a medical focus. Groupings are based on the level of the physiological extent of the primary diagnosis. The major problems with this system stem from a disregard for possible heterogeneity, particularly the lack of consideration for interacting diseases, and an absence of attention to psychosocial problems (Jones, 1984). Knaus describes another method of classification with medical emphasis, the Acute Physiology and Chronic Health Evaluation (APACHE). This system employs a scoring mechanism using the degree of major physiological and therapeutic intensity as a point earning factor. Major problems with the APACHE method include the consumption of time required to individually review the medical record and its limited use (it only applies to ICU patients) (Knaus, Draper & Wagner, 1983).

More sophisticated systems have recently been developed. However, Jones (1984) asserts, it is important to remember

that the goal is to "create patient categories that are homogeneous" in the area of interest. DRG's provide a classification system that claims homogeneity, yet several researchers have found the groups to be heterogeneous in relation to costs consumed (Horn, 1983; Mitchell, Miller & Walker, 1984; Sovie, et. al., 1985).

As an adjunct to DRG's, Horn developed a Severity of Illness Index at Johns Hopkins in the early 1980's with cost homogeneity as a focus. The Severity of Illness Index uses seven variables; (a) staging of principal disease, (b) interacting other conditions that the patient has and that affect the hospitalization, (c) rate of response to therapy or rate of recovery, (d) residual impairment, (e) complications, (f) dependence on hospital staff, and (g) extent of nonoperating room procedures (Horn, 1983). The tool has been tested and found reliable with validity data collected. It has been used to test charges against length of stay and mortality across institutions (Kreitzer, Loebner & Rovetti, 1982; Horn, 1983; Horn, Chachich & Clopton, 1983; Horn & Schumacher, 1982). Horn contends that DRG's are heterogeneous because Severity of Illness is omitted in the DRG formula (Horn, 1983). A limitation of the Severity of Illness Index is the lack of sufficient attention to the amount of nursing resources consumed.

Nursing Classification

Nursing-patient classification systems have typically

taken a different approach from Staging, APACHE, DRG's or Horn's Severity of Illness Index. There are hundreds of different nursing-patient classification systems across the country (Giovanetti, 1984). These generally can be divided into two types: prototype and factor. The difference between the two relates to the actual design of the tool (Reitz, 1985). Prototype evaluation instruments use broad descriptions and characteristics of the typical patient in a category. The categories are graded on an ordinal scale. Patients are classed in the grouping which most closely matches the prototype description. The instruments used in this study are a prototype design. In comparison, the factor evaluation design uses lists of specific elements which are rated independently. These ratings are then combined and compared to a set of criteria (Reitz, 1985).

Both prototype and factor classification instruments typically focus on "physiological dimensions of care, overlooking psychosocial factors, patient teaching and discharge planning requirements" (Reinert, 1981). This recognized weakness has not seemingly altered the focus of most systems. Rather than include the omitted key areas, investigators have only examined whether elements established in systems can predict a classification rating. Parker looked at 60 physiological items such as feeding, elimination, etc. and could find no trend in predictors (Parker, 1974).

Alward reported that over half (50%) of respondents to one survey indicated that institutions developed their own patient classification systems (Alward, 1983). This is amazing considering the complexity in developing a system, and it indicates the number of varied systems in existance. Few systems have been marketed and tested for validity and reliability (Giovanetti, 1984). Nevertheless, GRASP, Excelcare and Van Slyck's model are most widely published, marketed and used in community hospitals (Wenzler & Dale, 1984; Van Slyck, 1982).

The most commonly used classification system is GRASP, an acronym for Grace-Reynolds Application & Study of Maryland Poland, Nellie English, Nancy Thornton, and Donna Owens' Classification System. Developed at Grace Hospital in Morganton, North Carolina, GRASP is a factor type patient classification system used in over 500 hospitals throughout the United States and Canada. It is the most widely used method of nursing workload measurement in the United States. Using its broad data base, GRASP is marketed as an accurate measure of nursing hours of care and a good system for use with the prospective payment systems. GRASP is based on time and motion studies measuring nursing activities rather than patient care requirements.

Excelcare is another widely marketed classification system developed in 1985 by Dr. J. Daugherty and Dr. B. Mason in Pennsylvania. Excelcare is based on nursing

standards. Standards are written for each nursing activity and then activities timed. Excelcare, like GRASP, is based on nurse activities rather than patient needs.

Certainly general problems seem to exist in most presently used systems. Huckabay and Skonieczny surveyed 2,000 nursing administrators. Reliability of the currently used tool, motivation of staff, overpadding the ratings, and getting nurses to classify once per shift were demonstrated as problems (Huckabay & Skonieczny, 1981). The ideal system should have no ambiguity or overlap among categories and should have high interrater reliability. Most patient classification systems have neither (Alward, 1983).

These classification system weaknesses lead to the selection of Reitz's Nursing Intensity Index for use in this study. Strengths of Reitz's tool include the unit of analysis being the patient rather than the nursing interventions. As mentioned earlier, most patient classification systems measure tasks such as feeding, turning, use of oxygen, etc., rather than the patient needs or response to care. The NII relies upon patient need rather than nurse activities as the unit of measurement.

A second strength of the NII is the use of the nursing process as a fundamental framework. Most other patient classification systems give little or no reference to or dependence upon the nursing process (Giovanetti, 1984). Most demonstrate a strong industrial engineering influence.

Emphasis is on tasks to be performed, not intellectual functions. This approach is questionable since most patient care situations are not simple. Patients interact with the environment and require intellectual interactions by nurses rather than simply application of disconnected tasks as industrial engineers perceive (Reitz, 1985). "Such measurement does not reflect the sweep of nursing efforts nor does it properly convey a sense of the complexity of knowledge and skill necessary in the practice of nursing" (Reitz, 1985). The NII does allow the intellectual processes necessary to assess, plan, implement and evaluate sound nursing care.

The third advantage of the NII refers to its application in retrospectively utilizing information in the patient's record. This eliminates the time consuming tri-daily classification of patients required and seen as a problem by most other systems (Huckabay & Skonieczny, 1981). Reducing the times and numbers of persons classifying increases the opportunity for interrater reliability and reduces cost of the system (Reitz, 1985).

Results of Reitz's work indicated that DRG's are not homogeneous with respect to nursing intensity. A limiting factor of the original study was the small number of DRG's represented (only 239 of the 476 DRG's). Ten or more cases were found in only 13 of the 239 DRG's represented. Larger numbers of specific DRG's need to be analyzed, which was one goal of this study.

A further limiting factor of Reitz's work was the inability to produce general results. "Research reported here was performed at a single large inner city, metropolitan, teaching hospital. It is not known whether the index has the ability to produce similar, favorable results in other settings such as in the community hospital . . ." (Reitz, 1985). A goal of this study was to increase the ability to generalize results.

Testing for concurrent validity was seen by Reitz as a third limiting factor of the original study. The established patient classification system was "not comparable either in rating scale, instrument design or process of application" (Reitz, 1985). Establishing concurrent validity would seem to be very difficult as this is the only retrospective nursing patient classification system evident in the literature. Also its focus on patient rather than nurse activities separates it from most other systems. In this study, a comparison of the presently used patient classification systems and the Reitz model was made. Although the two are dissimilar in conceptual reference and application, a possible correlation might have strengthened the Reitz model's comparability to most systems presently in use.

Hypotheses

Several relationships were examined with Reitz's NII as the independent variable. Hypotheses assumed were:

1. The NII would produce a positive correlation to length of stay and total charges of hospitalization.

2. DRG's would not demonstrate homogeneity with reference to NII levels.

3. All variables of the NII would have a significant impact upon the NII score.

4. Time needed to review the medical record using the NII would be less than time needed to rate a patient with a conventional patient classification tool three times a day for the length of stay.

5. A null relationship would exist between the established industrial engineering model patient classification system and the NII.

CHAPTER III. METHODOLOGY

Design

This research examined the relationships between the NII and length of stay, charge, DRG and present patient classification system. The ex post facto or correlation design examined the relationships among variables.

Sample

The sample consisted of 107 medical records randomly selected from a community hospital in Southeastern North Carolina (New Hanover Memorial Hospital). The sample records were drawn from the ten most frequently used DRG's in that hospital. The patient admission had to have occurred in the past 18 months. The goal of ten charts per DRG was not achieved in two instances due to difficulty in locating portions of information for certain charts. Frequency distribution of patient charts is shown in Table 1.

Table 1

Frequency Distribution of Patient Charts by DRG Category

DRG #	DRG Description	# of Charts
468	Unrelated OR Procedure	11
336	Transurethral Prostatectomy Age 69 and/or C.C.*	10
182	Esophagitis, Gastroenteritis and Misc. Digestive Disorders Age 69 and/or C.C.	10
140	Angina Pectoris	11
138	Cardiac Arrhythmia and/or Conductive Disorder Age 69 and/or C.C.	11
127	Heart Failure and/or Shock	13
89	Simple Pneumonia and/or Pleurisy Age 69 and/or C.C.	9
82	Respiratory Neoplasms	9
15	Transient Ischemic Attacks	10
14	Specific Cerebrovascular Disorders	13
	TOTAL	107

*Co-morbid condition

Instrumentation

The Nursing Intensity Index is a prototype design instrument with a four-point ordinal scale developed and tested at Johns Hopkins Hospital. The original study population represented 8,200 patient days. Correlations were examined with (a) overall patient Severity of Illness Index score, (b) length of stay, (c) total hospital charges, (d) charges in cost centers such as pharmacy, laboratory, radiology and routine charges. Also analyzed were nursing intensity scores by DRG.

Reitz's NII used two groupings consisting of eleven health care parameters enumerated in Figure One. Biophysical health includes nutrition, elimination, sensory function, structural integrity, neurological/cerebral function, circulatory function and respiratory function. The second grouping, behavioral health, includes emotional response, social system, cognitive response and health management patterns. These categories were established after working with direct care nurses and managers over a 12-month period. Validity and reliability of the index were tested and supported at the $P = .05$ level (Reitz, 1985).

Reitz required attendance of a 2-day training session for all persons using the NII. Definitions of each of the functional health parameters and each level of intensity were reviewed in detail. Persons being trained actually rated charts to assure interrater reliability. The entire

Figure I

NURSING INTENSITY INDEX

Patient ID number _____ Rater's name _____ Date _____

Admission date _____ Discharge date _____

Functional Health Parameters	LEVELS			
	1	2	3	4
Nutrition	mild/no deficits	some deficit present	significant deficit	catastrophic deficits
Elimination	mild/no deficits	some deficit present	significant deficit	catastrophic deficits
Sensory Function	mild/no deficits	some deficit present	significant deficit	senses non-functional
Structural Integrity	physiological barriers intact	some alteration in barriers present	physiologic barriers significantly compromised	physiologic barriers non-functional
Neurologic/ Cerebral Function	mild/no deficits	some deficit present	significant deficit	catastrophic deficits
Circulatory Function	mild/no deficits	some deficit present	significant deficit	catastrophic deficits
Respiratory Function	mild/no deficits	some deficit present	significant deficit	catastrophic deficits
Emotional Response	independent adaptation	some maladaptive behaviors	significant maladaptive behaviors	dangerous to self, others
Social System	intact/ supportive	some disorganization present	significantly disorganized resources	absent/non-functional
Cognitive Response	mild/no deficits	some deficit present	significant deficit	absent/non-functional
Health Management Pattern	highly compliant health practices	some inconsistent practice present	significant noncompliant health practices	destructive health practices
INTENSITY RATING	1	2	3	4

Do not use without complete narrative prototype definitions

medical record was reviewed and then each of the functional health parameters were considered separately. The rater must determine the patient level in each parameter based on the need during "most of the admission".

Generally, a Level 1, Minor Intensity rating in a functional health parameter reflects a minor health care problem which requires routine application of the nursing process with resolution of the problem. A Level 2, Moderate Intensity rating, represents a patient with problems in that parameter which requires non-complex intervention, periodic evaluation and revision of plan. Response to therapy is evident. A Level 3, Major Intensity rating, reflects significant health deficits. Biophysical instability is present and complex interventions are required. Frequent reassessment and revision to plan of care is needed. The patient does not readily respond to the intervention. A Level 4, Extreme Intensity rating, reflects a life threatening, catastrophic illness. Constant observation and monitoring are required. Using these general guidelines as well as detailed definitions of each functional health parameter, the rater assigns a level in all eleven areas. Justification of each rating is required on the rating sheet. Final rating is assigned again based on a measure of "most of the time" nursing intensity required by a patient over the entire hospitalization. This final score is applied by "implicitly integrating" scores assigned each of the eleven health care parameters (Reitz, April, 1986).

Using Pearson's Correlation Coefficient, results of Reitz's original study showed a strong correlation with Horn's Severity of Illness Index (.61), moderate positive correlations with length of stay (.47), routine charges (.43), and minor positive correlations with total charges (.30), radiology charges (.27), laboratory charges (.23), and pharmacy charges (.22). Regression analysis of the tool itself showed each of the eleven health parameters to be significant. Emotional response demonstrated greatest explanatory power. This is most interesting when remembering most other nursing classification systems give little if any credit to emotional response.

The time needed to review a chart showed a mean of 17 minutes. This number seems small when considering the average patient classification tool requires tri-daily ratings of perhaps 1-2 minutes per patient or 6 minutes/day with the standard system (Giovanetti, 1984). Since 7 days is the present average length of stay, 42 minutes per hospitalization is required with the standard patient classification system to rate patients. The NII used 23 minutes less time per hospitalization.

Data Collection

In this study, data collected for each chart were record number, length of stay, total charges, DRG, age of patient, average patient classification (using the present tool as described below), sex of patient, and time consumed to review the record.

Record number, length of stay, DRG, patient age, sex, and hospital service were obtained directly from the patient record. Charges were supplied by the accounting department for the records chosen. Permission to obtain this information was granted by the Chief Financial Officer.

The average patient classification was obtained by using charted physician and nursing orders to rate each patient each shift using the established tool. This kind of tool is a prototype industrial engineering model. It uses factors such as assistance in eating, degree of ambulation, use of oxygen, use of restraints, mental status, complex I.V., and treatments to establish a level on a 4-point ordinal scale. The audit tool shown on the following page was used to rate the charts for each shift of the admission. This system was designed to be used each eight hours. However, the nurse's ratings were not made a part of the permanent record, so exact retrieval was impossible. Therefore, in this study the researcher simulated use of the tool, and from information evident in the chart, assigned a rating for each 8-hour period (7AM, 3PM, 11PM). A mode was obtained from the 8-hour measurements to allow comparison with the NII. This method was not ideal but allowed some comparison of the two different systems. This methodology was believed sound due to a greater than 90% agreement by validity raters presently working with the

NEW HANOVER MEMORIAL HOSPITAL

PATIENT CLASSIFICATION

AUDIT WORKSHEET

Initials: _____

_____

m Number _____

gory

ore Audit _____

er Audit _____

_____

_____

_____

_____

			A. DIET				B. ACTIVITY				C. BATH				D. TEMP. BLD. PR.			E. PAT. HAS			F. TRAVEL			G. MENTAL STATUS							H. OXYGEN				I. TRT MENT		J. IV
			1	2	3 - 4	2 - 3	3 - 4	2	2	1	3 - 4	2	1 - 2	2 - 3	1	2 - 3	4	2 - 3	3 - 4	3 - 4	2 - 3	3 - 4	2 - 3	1	3 - 4	4	4	3	3	3	2 - 3	2 - 3	1 - 2	3 - 4	2 - 3
		CATEGORIES / INDICATORS	Unmarked	Needs Help	Staff to Feed	Fam / Other Feed	Bedrest	Bathroom Priv.	Up with Help	Up at Lib	Comp Assist	Partial Help	Tub or Shower	Done by Fam/Other	Bid, Tid, Qs	qid, q4h	qlh, q2h, q30min	Ostomy	Levine Tube	Trach	Wheelchair	Stretcher	Peds (in arms)	Alert	Lethargic	Resp. to Stimulus	Unresponsive	Disoriented	Restraints	Nasal Cannula	Mask	Croupette	P. R. N.	Simple	Complex	Simple
DIET	1	Unmarked																																		
	2	Needs Help	X																																	
	3 - 4	Staff / Feed	X	X																																
	2 - 3	Fam / Oth Feed	X	X	X																															
ACTIVITY	3 - 4	Bedrest	3	3	3	3																														
	2	Bthrm. Priv.	2	2	2	2	X																													
	2	Up w/Help	2	2	2	2	X	X																												
	1	Up at Lib.	1	2	X	X	X	X	X																											
BATH	3 - 4	Comp Assist	3	3	3	3	3	3	X	X																										
	2	Part. Help	2	2	2	2	2	2	2	2	X																									
	1 - 2	Tub/Shower	1	2	2	2	2	2	2	1	X	X																								
	2 - 3	By Fam/Oth	3	2	3	3	3	3	3	2	X	X	X																							
TEMP. BLD. PR.	1	Bid, Tid, Qs	1	2	2	2	2	2	2	1	3	2	2	2																						
	2 - 3	qid, q4h	2	2	3	3	3	3	3	2	3	2	2	3	X																					
	4	qlh, q2h, q30m	4	4	4	4	4	4	4	4	4	4	4	4	X	X																				
PAT. HAS	2 - 3	Ostomy	2	2	3	3	3	2	2	2	3	2	2	3	2	3	4																			
	3 - 4	Levine Tube	3	3	3	3	3	2	3	2	3	3	2	3	3	3	4	4																		
	3 - 4	Trach	3	3	3	3	4	3	3	3	3	3	2	3	3	3	4	4	4																	
TRAVEL	2 - 3	Wheelchair	2	2	2	2	3	2	2	X	3	2	2	3	2	2	3	2	2	2																
	3 - 4	Stretcher	3	3	3	3	3	3	3	X	3	3	3	3	3	3	4	3	3	3	X															
	2 - 3	Peds (in arms)	X	2	3	2	3	X	3	2	3	2	X	2	2	3	3	3	3	3	X	X															
MENTAL STATUS	1	Alert	1	2	3	3	3	1	2	1	3	2	1	2	1	2	3	2	3	3	2	3	2													
	3 - 4	Lethargic	2	3	3	3	3	3	3	X	3	2	X	3	2	3	4	3	3	3	3	3	3	X													
	4	Rsp to Stim	4	4	4	4	4	X	X	X	4	X	X	4	4	4	4	4	4	4	X	4	4	X	X												
	4	Unresponsive	4	4	4	4	4	X	X	X	4	X	X	4	4	4	4	4	4	4	X	4	4	X	X	X											
	3	Disoriented	3	3	3	3	3	3	3	X	3	3	3	3	3	3	4	3	3	3	3	3	3	X	X	X	X										
	3	Restraints	3	3	3	3	3	3	3	X	3	3	3	3	3	3	4	3	3	3	3	3	3	X	X	X	X	X									
OXYGEN	3	Nasal Cann.	3	2	3	3	3	X	2	X	3	3	3	3	3	3	4	4	4	4	3	4	X	3	3	4	4	3	3							
	3	Mask	3	2	3	3	3	X	2	X	3	3	3	3	3	3	4	4	4	4	3	4	X	3	3	4	4	3	3	X						
	2 - 3	Croupette	2	2	3	3	3	X	2	X	3	3	3	3	3	3	4	4	4	4	3	4	2	3	3	4	4	3	3	X	X					
	2 - 3	P. R. N.	2	2	3	3	3	2	2	1	3	2	2	3	2	2	4	3	3	3	2	3	2	2	3	4	4	3	3	3	3	3				
TRT MENT	1 - 2	Simple	1	2	3	2	3	2	2	1	3	2	2	3	1	2	4	2	3	3	2	3	2	1	3	4	4	3	3	3	3	3	2			
	3 - 4	Complex	3	3	4	3	4	3	3	X	4	3	3	3	3	4	4	3	4	4	3	4	4	3	4	4	4	4	4	4	4	4	3	X		
IVS	2 - 3	Simplex	2	2	3	2	3	2	2	2	3	2	2	2	2	2	4	3	3	3	2	3	2	2	3	4	4	4	3	3	3	3	3	2	X	
	3 - 4	Complex	3	3	4	3	4	3	3	3	4	4	3	3	3	4	4	4	4	4	3	4	4	3	4	4	4	4	4	4	4	4	4	3	4	X

075 (10-82)

same tool. A positive correlation would indicate some favorable outcomes of the industrial engineering model, while a negative correlation would indicate its incomplete scope, if one believes the NII to be valid and reliable.

Time was measured using a stopwatch started by the researcher at each chart review and stopped after nursing severity rating was complete. Age, sex, service, record number, length of stay, DRG and charges were not included in the timing. Ten staff nurses were timed with a stopwatch as they classified patients using the established system. Critics of the NII have stated exceptionally long periods of time were needed to retrospectively review the chart to obtain a classification (Jones, 1984). One hypothesis in this study predicted less time was needed to rate retrospectively than to rate three times each day of hospitalization.

Consent Form

Consent was obtained from the financial director to use the medical records and accounting departments for the collection of data. The researcher spoke with Reitz and obtained permission to use the NII with two stipulations: one, that the researcher sign a guarantee stating that any data compiled will not be sold to a third party payer, and two, that the researcher attend a 16-hour training session with Reitz to ensure accurate use of the tool. This took place in the Spring of 1986.

No permission was obtained from patients whose records were reviewed. No names were associated with data collection and all information remained confidential. Direct patient care was not affected by this retrospective research.

Data Analysis

The 107 medical records were randomly selected. The full study population was divided into the number of cases per DRG. The mean, minimum and maximum scores of nursing intensity, length of stay and total charges were calculated. An analysis of frequency distribution was used to examine distribution of the NII among DRG. Correlations and regression analysis were used to test the hypothesis. All data were coded and entered into the computer for analysis by the SAS program.

CHAPTER IV: FINDINGS

This study replicated portions of work done by Dr. Judy Reitz (1985) with the additional comparison of a standard patient classification system with the NII. Of interest were the comparisons of the two studies as well as the testing of the five hypotheses suggested in this work.

Table 2 provides the mean and range of the NII scores, LOS and charges by DRG. Wide variations in the three variables were evident in all of the DRG's, speaking to their heterogeneous nature suggested by Reitz in the original study. This heterogeneity is statistically significant when considering the weighted average coefficient of variation (C.V.) for LOS and total charges by DRG. The C.V. is formed by taking the standard deviation within a subgroup and dividing by the mean. A smaller C.V. reflects more homogeneous data. Table 3 displays this data and further supports heterogeneity of DRG's in these two respects. Operating Room procedures (DRG 468), Gastrointestinal problem (DRG 182), Pneumonia (DRG 89), and CVA (DRG 14) appeared most heterogeneous in terms of LOS and Total Charges. The heterogeneous nature of DRG's in terms of NII scores is discussed later in this research.

Table 2

Mean and Range of NII Scores, LOS, and Charges by DRG

DRG	Variables	Number of Charts	Mean	Minimum	Maximum
468 - OR	NII scores	11	2.54	2.0	4.0
	LOS	11	15.09	2.0	36.0
	Charges	11	6752.01	3123.05	12052.17
336 - TUR	NII scores	10	1.9	1.0	3.0
	LOS	10	6.7	5.0	11.0
	Charges	10	2723.72	1327.65	4891.55
182 - GI	NII scores	10	1.0	1.0	3.0
	LOS	10	8.6	1.0	28.0
	Charges	8	2645.88	546.08	6601.25
140 - Angina	NII scores	11	1.90	1.0	3.0
	LOS	11	4.73	1.0	7.0
	Charges	8	3433.02	1705.08	9797.89
138 - Arrhythmia	NII scores	11	2.18	1.0	3.0
	LOS	11	7.27	1.0	19.0
	Charges	11	3455.76	654.66	9016.34
127 - CHF	NII scores	13	2.15	1.0	3.0
	LOS	13	7.23	1.0	11.0
	Charges	13	1305.45	1003.18	6430.39

Table 2 (cont.)

DRG	Variables	Number of Charts	Mean	Minimum	Maximum
89 - Pneumonia	NII scores	9	2.33	1.0	4.0
	LOS	9	9.55	1.0	32.0
	Charges	5	1913.43	1331.92	3020.19
82 - Respiratory Neoplasm	NII scores	9	2.44	1.0	4.0
	LOS	9	11.0	2.0	26.0
	Charges	9	3696.07	666.33	5376.00
15 - TIA	NII scores	10	2.0	1.0	3.0
	LOS	10	5.30	2.0	11.0
	Charges	10	2051.58	1057.76	3703.07
14 - CVA	NII scores	13	2.77	2.0	4.0
	LOS	13	18.15	1.0	54.0
	Charges	13	6643.93	697.25	18,954.16

Table 3

WEIGHTED AVERAGE COEFFICIENT OF VARIATION (C.V.) FOR LENGTH OF STAY (LOS) AND TOTAL CHARGES BY DRG

DRG	LOS	TOTAL CHARGES
468 - OR	73%	50%
336 - TUR	32%	47%
182 - GI	98%	107%
140 - Angina	44%	71%
138 - Arrhythmia	70%	72%
127 - CHF	44%	47%
89 - Pneumonia	97%	105%
82 - Respiratory neoplasm	75%	64%
15 - TIA	65%	46%
14 - CVA	97%	87%

TESTING THE HYPOTHESES

Relationship of NII Ratings to Length of Stay

The first hypothesis stated, "The NII will produce a positive correlation to length of stay (LOS) and total charges of hospitalization." Reitz's study demonstrated a moderately positive correlation between length of stay and the NII (.47 coefficient at .05 level of significance). This study found a .39 coefficient (significant at .001) (Table 4). Examination of Table 5 reveals the mean LOS by NII levels. The mean LOS did increase with intensity with the exception of Level 4, Extreme Intensity. Seven patients in the entire sample were rated as a Level 4. Four of the seven (57%) expired during hospitalization indicating their illnesses to be so catastrophic that death shortened the LOS. Reitz found the same decrease in LOS in the Level 4 patients. This evidence supported the first portion of this hypothesis.

Table 4

CORRELATIONS BETWEEN LOS AND NII

BOST'S	REITZ'S
.39	.47
P = .001	P = .05

Table 5

MEAN AND STANDARD DEVIATION OF LENGTH OF STAY
BY NURSING INTENSITY INDEX LEVELS

NII Level	Mean LOS	S.D. of LOS
Level I	5.00	2.48
Level II	6.91	5.02
Level III	15.93	11.44
Level IV	12.57	18.80

Relationship of NII Ratings to Patient Care Charges

Correlation between the NII and total charges of a hospital stay also produced a moderately positive result in both studies. This research showed a .42 correlation while the Reitz study showed a .30 correlation, indicating that a smaller community hospital more strongly reflected a relationship between total charges and NII. Table 6 demonstrates the correlation between total charges, charges by departments and NII in both this and Reitz's research. A moderately positive correlation existed within the departments with the strongest correlation being total charges. The positive correlations indicated a strong relationship between these two variables.

Using an Analysis of Covariance controlling for LOS a dramatic relationship between the NII and Total Charges became evident. The F value for the NII was 33.69 (significant at the .0001 level) (Table 7). A Multiple Comparison (Duncan's Multiple Range Test) indicated NII Level 3 and Level 4 to be alike in terms of total charges. Level 2 and Level 1 are unique in their total charges. Table 8 represents this data. The first hypothesis was supported in terms of LOS and Total Charges.

Table 6

Comparison of Bost's and Reitz's Correlation of NII with Total Charges & Departmental Charges

	Bost	Reitz
Total Charges	.42	.30
Radiology	.17*	.27
Laboratory	.20	.23
Pharmacy	.40	.22
Room	.46	not measured
Supplies	.28	not measured
Respiratory	.40	not measured

Significant at P = .001 for total charges

Significant at P = .05 for other charges in both studies

*This charge was not significantly related at .05 level

Table 7

RELATIONSHIP OF NII AND TOTAL CHARGES USING AN ANALYSIS OF COVARIANCE CONTROLLING FOR LOS

F value = 33.69 (P = .0001)

9, 97 df

Table 8

MULTIPLE COMPARISON (DUNCAN'S MULTIPLE RANGE TEST) OF TOTAL CHARGES AND NII CONTROLLING FOR LOS

Grouping*	Mean	N	NII
A	$5709.2	7	4
A	$5698.4	26	3
B	$3098.8	49	2
C	$1894.3	16	1

*Letters indicate homogeneous groups

NII and DRG's

The second hypothesis predicted that DRG's would not demonstrate homogeneity with Nursing Intensity levels. This hypothesis was also supported. Of the ten DRG's selected in this research, two (20%) had NII ratings in all four levels. The remaining eight (80%) DRG's had NII ratings in three of the possible four levels. This indicated extreme heterogeneity between DRG's and NII.

Reitz's work demonstrated the same findings, yet not as dramatically. Reitz found 64% of her DRG's to have only one NII level, 31% to have two levels, 5% to have three levels, and only 1% to have all four levels. Methodology for chart selection in Reitz's work was not based on DRG as it was in this research. Therefore, many of Reitz's DRG samples were very small, possibly resulting in the difference in heterogeneity demonstrated. Nevertheless, this work supported the second hypothesis and strongly suggested that DRG's are not homogeneous in respect to NII levels.

Table 9 demonstrates the raw data reflecting the relationship between NII and DRGs. NII rating 2 was the most common rating (50%) in nine of the ten DRGs. When considering heterogeneity of DRGs a review of sample patients within a DRG was beneficial. DRG 89 - Pneumonia, was considered. This DRG had one chart rated Level 1. This patient with pneumonia responded quickly to a simple protocol of respiratory therapy and antibiotics requiring very little nursing intervention.

Table 9

TABLE OF NII BY DRG

NII	DRG										
	14	15	82	89	127	138	140	182	336	468	Total
1	0	3	1	1	1	2	3	3	3	0	16 15%
2	3	6	4	5	9	5	6	5	5	6	54 50%
3	6	2	3	2	3	4	2	2	2	4	30 28%
4	4	0	1	1	0	0	0	0	0	1	7 6%
TOTAL	13	10	9	9	13	11	11	10	10	11	107

Five patients were rated as Level 2. Most of these patients received multiple therapies with variable responses. Some assistance physiologically and behaviorally were indicated. Two patients rated a Level 3. These patients required much assistance primarily due to psychological demands. One was combative, the other extremely "anxious" for most of the admission. One patient rated a Level 4. This patient had catastrophic deficits in ten of the eleven Health Parameters and eventually expired during this admission. The wide variations within one DRG demonstrated this DRG's heterogeneity in terms of nursing requirements.

The same scenario could be repeated for the other DRGs tested in this research. More research needs to be done with larger DRG samples before heterogeneity can be more firmly established.

Variables Within the NII and Final Score

The third hypothesis stated "All variables of the NII will have a significant impact upon the final NII score." Using Pearson's Correlation Coefficients all eleven Health Parameters demonstrated a strong positive correlation to the NII score. Table 10 displays these correlations.

Reitz used a Regression Analysis "to predict or explain the magnitude of the power of contribution of each of the eleven functional health parameters of the NII with respect to the overall score assigned to cases in the study." Reitz found each of the variables to be significant with

Table 10

PEARSON CORRELATION COEFFICIENTS OF THE ELEVEN FUNCTIONAL HEALTH PARAMETERS AND THE NII

Functional Health Parameters	NII
1 - Nutrition	.63
2 - Elimination	.47
3 - Sensory Function	.66
4 - Structural Integrety	.62
5 - Neurological/Cerebral Function	.66
6 - Circulatory Function	.46
7 - Respiratory Function	.61
8 - Emotional Response	.74
9 - Social System	.70
10 - Cognitive Response	.64
11 - Health Management Patterns	.42

P = .0001

emotional response demonstrating the greatest explanatory power (R square = .419).

This researcher used the Stepwise Regression Procedure and found R = .91 after nine parameters were entered. F = 53.89 with 9,97 df. This indicated a remarkable predictive power of all of the Functional Health Parameters. Nutrition and Cognitive Response were not entered after the nine steps due to the R being so high.

As in Reitz's work, the Behavioral Parameters had a great deal of predictability speaking to their importance in such an instrument. Hypothesis #3 was supported.

Table 11

STEPWISE REGRESSION PROCEDURE FOR

DEPENDENT VARIABLE NII

Intercept		F
Rating 2	Elimination	4.54
Rating 3	Sensory Function	11.30
Rating 4	Structural Integrity	5.10
Rating 5	Neurological/Cerebral Function	5.31
Rating 6	Circulatory Function	11.62
Rating 7	Respiratory Function	6.00
Rating 8	Emotional Response	7.19
Rating 9	Social System	11.12
Rating 10	Health Management Pattern	10.21

1,97 df
F = 53.89 (.0001)
R = .91

Time to Rate Charts

The fourth hypothesis stated, "Time needed to review the medical record using the NII is less than time needed to rate a patient using a standard patient classification tool three times a day for the length of stay." This hypothesis was also supported. The mean time to rate a chart was 10.79 minutes. Reitz's original work resulted in a mean time of 17 minutes (Table 12). Reitz used several raters compared to the one rater in this study. The speed at which individuals work may contribute to this difference.

Nevertheless, the ten nurses who were timed rating patients according to the established patient classification system averaged .6 minutes per patient. After multiplying .6 minutes by 3 (for the 3 ratings each day) and by 7 (average LOS for the units used), results are 12.6 minutes per patient. This gave 1.91 minutes more per patient using the established system. Given 1.91 more minutes per patient day and the projected number of patient days, two full-time employees' time could be saved using the NII.

Table 12

COMPARISON OF MEAN TIME NEEDED TO RATE CHARTS USING THE NII AND THE STANDARD PATIENT CLASSIFICATION SYSTEM

Reitz with NII	Bost with NII	Bost with Pt. Class.
17 min.	10.79 min.	12.6 min.

Comparison of the NII and the Patient Classification System

The fifth hypothesis stated, "A null relationship will exist between the established industrial engineering model patient classification system and the NII." The Pearson Correlation Coefficient between the NII and the Patient Classification System was .54 (P = .0001) indicating a relationship between the two variables.

Chi - square value is 58.66 (P = .001) which also indicated a relationship between the two. Examining the raw data, some variation between the two variables was evident (Table 13). For example, an NII rating of 3 had Patient Classification scores of 2, 3 and 4. Over half of the sample of NII Level 3 had scores other than Patient Classification score of 3.

When charts were reviewed, differences within the tool seemed to be related to the patient being used as the unit of analysis rather than the nurse, and to the emotional needs of the patient. These factors were two of the advantages of the NII and influenced this researcher to prefer the NII over conventional classification systems.

This hypothesis was rejected in terms of statistical data. There did seem to be a relationship between the two systems which is expected if both contend they measure nursing resource consumption. The area of concurrent validity needs further research.

Table 13

TABLE OF NII BY PATIENT CLASSIFICATION

	PT CLASS					
NII	1	2	3	4	6	Total
1	0	13	2	1	0	16 15%
2	1	28	24	1	0	54 50%
3	0	8	16	6	0	30 28%
4	0	0	2	3	2	7 7%
TOTAL	1 .93%	49 45%	44 41%	11 10%	2 2%	

CHAPTER V: CONCLUSIONS AND IMPLICATIONS

To summarize the results of this research, four of the five hypotheses were supported. A moderately positive correlation existed between NII, LOS and charges. It would seem that there was a relationship between NII, LOS and charges. No measure of intensity is currently used in the Prospective Payment System.

Secondly, DRG's did not demonstrate homogeneity with Nursing Intensity levels as had been suggested by many critics of the prospective payment system. While nursing comprises the largest hospital department and the largest portion of budgeted salary dollars, one would expect DRG's to be more homogeneous to this costly resource. It is hoped that research such as this will encourage alterations of the present system to include Nursing Intensity.

Just as in Reitz's work, all of the NII variables affected the final rating with emotional response being the highly correlated. Inclusion of such behavioral parameters is an obvious asset to this tool.

Use of the NII can save enough time to equal that of two full-time positions per year. This data could justify the positions necessary to rate records retrospectively. Reducing dramatically the number of persons rating would greatly increase interrater reliability. This was one definite advantage of this instrument.

Finally, the NII and Patient Classification System did seem to have some weak concurrent validity. Due to the NII's theoretical basis, its time savings and its greater interrater reliability, it seemed the patient classification system of choice.

Implications for Further Research

Although the total sample was over 100 patient charts, the number of charts per DRG was small. One limitation of this study involved the small size of the DRG grouping. More replications need to be performed, and the number of DRG's tested needs to be performed. Also, other types of institutions need to be tested. This study adds to the ability to generalize results; however, before further conclusions can be drawn, other hospitals should be tested.

This is the first comparison of the NII to another patient classification system. Further comparisons are needed to additionally test the two systems' concurrent validity.

Nursing allotments need to be included with the NII levels so resulting data can be used for budgeting. Dr. Reitz has begun some time studies at Johns Hopkins and will soon make that information available in the literature. One criticism of the NII involved its inability to be used for shift-to-shift staffing. This needs to be further studied; however, annecdotal evidence shows that dramatic staffing changes do not occur on an 8-hour basis. Rather,

trends in intensity should be followed and nursing personnel should be staffed accordingly.

Implications for Practice

Establishing valid and reliable patient classification systems is essential for nursing administration so quantification of resource consumption can be defended. Such a system should be acceptable to both practicing nurses as well as hospital administration. A good system is generic so cross-institutional comparison may be performed. No such system exists in the United States except the NII. Further research as well as cross-institutional implementation of the NII is needed.

As a frontiering effort, this research opens doors for much more investigation as well as adds support to research already performed. The advantages of the NII seem evident and include:

1. The patient is the unit of analysis rather than discernible tasks.

2. A retrospective review increases reliability of the tool and decreases time and expense.

3. Use of the nursing process as the fundamental framework in the conceptual development of the NII enhances the validity of the tool.

4. Use of such a nursing patient classification system will justify and explain nursing resource consumption and will ultimately improve health care delivery systems at a reasonable price.

BIBLIOGRAPHY

Alward, R.R. Patient classification systems: The ideal vs. reality. JONA, Feb. 1983, 14-19.

Ament, R. et. al. Three case-type classifications: Suitability for use in reimbursing hospitals. Medical Care, May 1982, 20 (5), 460-467.

Bay, K., Leatt, P. & Stinson, S. Cross-validation of a patient classification procedure: An application of the "U" method. Medical Care, Jan. 1983, 21 (1), 31-41.

Bell, A. & Storey, C. Assessing workload by a nursing study. Nursing Times, Aug. 22, 1984, 57-59.

Bentley, J. D. & Butler, P. W. Case mix reimbursements: Measures, applications, experiments. HFM, March 1980, 24-35.

Bermas, N. & Van Slyck, A. Patient classification systems and the nursing department. Hospitals, Nov. 16, 1984, 58, 30-31.

Burger, J. & Schmitt, P. Patient classification index documenting staffing needs. Critical Care Nurse, Sept/Oct, 1982, 33-35.

Caterinicchio, R. P. A debate: RIMs and the cost of nursing care. Nursing Management, May 1983, 14 (5), 36-39.

Chagnon, M. et. al. Validations of a patient classification through evaluation of the nursing staff degree of occupation. Medical Care, June 1978, 16 (6), 265-475.

Coburn, R. & Harper, D. An alternative to cost-based hospital reimbursement. Health Care Financial Management, May 1983, 37 (5), 36-44.

Coleman, J. R., Dayan, E. & Simms, E. Nursing careers in the emerging systems. Nursing Management, January 1984, 15 (1), 19-27.

Connor, R. Effective use of nursing resources: A research report. JAHA Hospitals, May 1, 1961, 35, 30-39.

Cullen, D. J., Keene, R., Waternaux, C., Peterson, H. Objective, quantitative measurement of severity of illness in critically ill patients. Critical Care Medicine. March 1984, 155-159.

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

Curtin, L. L. & Zuilage, C. DRG's: The reorganization of health. S-N Publications, Inc., Chicago, Illinois, 1st Ed., 1984.

Dale, R. L. & Mable, R. J. Nursing classification system: Foundation for personal planning and control. JONA, Feb. 1983, 10-13.

Dijkers, M. & Paradise, T. PCS: One system for both staffing and costing. Nursing Management, Jan. 1986, 17 (1), 25-34.

Ethridge, P. The case for billing by patient acuity. Nursing Management, Aug. 1985, 16 (8), 38-41.

Feyerherm, A. M. Nursing activity patterns: A guide to staffing. Nursing Research, Spring 1966, 15 (2), 124-133.

Garg, et. al. Evaluating inpatient costs: The staging mechanism. Medical Care, March 1978, 16 (3), 191-201.

Gaynor, J. M., Kant, D. A. & Mills, E. DRGs: Regulatory and budgetary adjustments. Nursing and Health Care, May 1984, 275-279.

Germain, D. & Meijers, A. Nursing workload measurement: An expanded future role. Dimensions, March 1984, 18-20.

Giovanetti, P. & Mayer, G. G. Building confidence in patient classification systems. Nursing Management, Aug. 1984, 15 (8), 31-34.

Grimaldi, P. L. & Micheletti, J. A. DRG reimbursement: RIMs and the cost of nursing care. Nursing Management, Dec. 1982, 13 (12), 12-22.

Halloran, E. & Kiley, M. Case mix management. Nursing Management, Feb. 1984, 15 (2), 39-45.

Hamilton, J. M. Nursing and DRGs: Proactive responses to prospective reimbursement. Nursing and Health Care, March 1984, 155-159.

Henney, C. R., McFarlane, J. & Crooks, J. A method of estimating nursing workload. Journal of Advanced Nursing, 1982, 7, 319-325.

Higgerson, N. & Van Slyck, A. Variable billing for services: New fiscal direction for nursing. JONA, June 1982, 20-27.

Horn, S. D. Does severity of illness make a difference in prospective payment. HFM, May 1983, 49-53.

Horn, S. D. Measuring severity of illness: Comparisons across institutions. AJPH, Jan. 1983, 73 (1), 25-31.

Horn, S. D. & Burkly, G., et. al. Interhospital differences in severity of illness. The New England Journal of Medicine, July 4, 1985, 313 (1), 20-24.

Horn, S. D., Chachich, B. & Clopton, C. Measuring severity of illness: A reliability study. Medical Care, July 1983, 21 (7), 705-714.

Horn, S. D. & Schumacher, D. N. Comparing classification methods: Measurement of variations in charges, LOS and mortality. Medical Care, May 1982, 20 (5), 419-506.

Huckabay, L. M. & Skonieczny, R. Patient classification systems - the problems faced. Nursing and Health Care, Feb. 1981, 89-102.

Joel, L. A. DRGs: The state of the art of reimbursement for nursing services. Nursing and Health Care, Dec. 1983, 560-563.

Johnson, K. A practical approach to patient classification. Nursing Management, June 1984, 15 (6), 39-41.

Jones, K. R. Severity of illness measures: Issues and options. Nursing Economics, Sept/Oct 1984, 2, 312-317.

Katz, D. & Kahn, R. L. The Social Psychology of Organizations, 2nd ed. New York: John Wiley and Sons, 1978, 17-34.

Knaus, W. A., Draper, E. A. & Wagner, D. P. Toward quality review in intensive care: The APACHE system. QRB, July 1983, 196-204.

Kreitzer, S., Loebner, E. & Roveti, G. Severity of illness: The DRG's missing link. Quality Review Bulletin, March 1982, 8 (5), 21-34.

Lagona, T. G. & Stritzel, M. M. Nursing care requirements as measured by DRG. The Journal of Nursing Administration, May 1984, 15-18.

de Mars Martin, P. & Boyer, F. Developing a consistant method for costing hospital services. Healthcare Financial Management, Feb. 1985, 30-37.

Mason, E. J. & Daugherty, J. K. Nursing standards should determine nursing's price. Nursing Management, Sept. 1984, 15 (9), 34-38.

McClain, J. R. & Selhat, M. S. Twenty cases: What nursing costs per DRG. Nursing Management, Oct. 1984, 15 (10), 26-34.

Meijers, A. MIS team evaluates patient classification systems. Dimensions, Dec. 1982, 25-26.

Meijers, A. Nursing: Using workload measurement systems. Dimensions, Sept. 1983, 49.

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

Muller, C. Paying hospitals: How does a severity measure help? AJPH, Jan. 1983, 73 (1), 14-15.

Olsen, S. The challenge of prospective pricing: Work smarter. JONA, April 1984, 22-26.

Parker, R. & Boyd, J. A comparison of a discriminant vs. a clustering analysis of a patient classification for chronic disease care. Medical Care, Nov. 1974, 12 (11), 318-325.

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

Position statement on reimbursement for nursing care. NLN, May 1981, 11-1862, 14-16.

Powell, P. J. Reimbursement for nursing service: Fee-for-service. Nursing Management, March 1983, 14 (3), 13-15.

Prescott, P. A. DRG prospective reimbursement: The nursing intensity factor. Nursing Management, Jan. 1986, 17 (1), 43-46.

Reinert, P. & Grant, D. R. A classification system to meet today's needs. JONA, Jan. 1981, 21-25.

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

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

Reitz, J. Reliability and validity testing of a nursing intensity index: A technical report. Unpublished document, April 1985.

Reitz, J. A. Development of a nursing intensity index: A technical report. Unpublished work with S. D. Horn, April 1985.

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

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

Rodriguez, R. C. A classification system for the orthopedic patient. ONA Journal, Oct. 1979, 6 (10) 398-405.

Shaffer, F. A. A nursing prospective of the DRG world, part I. Nursing and Health Care, Jan. 1984, 48-51.

Shaffer, F. A. Nursing: Gearing up for DRGs, part II: Management strategies. Nursing and Health Care, Feb. 1984, 93-99.

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

Stanley, M. & Luciano, K. Eight steps to costing nursing services. Nursing Management, Oct. 1984, 15 (10), 35-38.

Switzer, E. The failure of America's hospitals. Ladies Home Journal, June 1985, 45-48, 168-170.

Thompson, J. D., Jacobs, S. E., Patchin, N. R. & Anderson, G. L. Age, a factor in amount of nursing care given, AHA study shows. Hospitals, March 1, 1968, 41, 33-39.

Toth, R. M. DRGs: Imperative strategies for nursing service administration. Nursing and Health Care, April 1984, 197-203.

Trivedi, V. M. Nursing judgement in selection of patient classification variables. Research in Nursing and Health, May 3, 1979, 109-118.

Trofino, J. A reality based system for pricing nursing service. Nursing Management, Jan. 1986, 19-24.

Vanderzee, H. & Glusko, G. DRGs, variable pricing and budgeting for nursing services. JONA, May 1984, 11-14.

Vaughan, R. G. & MacLeod, V. Nurse staffing studies: No need to reinvent the wheel. JONA, March 1980, 9-15.

Vaughan, R. G. & MacLeod, V. Comparing acuity among hospitals - who has the sickest patients? JONA, May 1985, 25-28.

Van Slyck, A. Models of practice: Variable charges for nursing care. Professionalism and the Empowerment of Nursing, American Nurses Association, 1982, 47-57.

Wagner, D., Knaus, W. A. & Draper, E. A. Statistical validation of a severity of illness measure. AJPH, Aug. 1983, 73 (8), 878-887.

Waldholz, M. Most hospitals quickly learn to be profitable. The Wall Street Journal, Aug. 28, 1985, 6.

Walker, D. The cost of nursing care in hospitals. JONA, March 1983, 13-15.

Waters, S. What happens if your hospital bills separately for nursing? RN, July 1985, 18-21.

Wenzler, D. & Dale, O. Variable billing. Grasp Newsletter, Winter 1984, 1 (5), 1-2.

Wolf, H. & Young, J. P. Staffing the nursing unit. Nursing Research, Summer 1965, 14 (3) 236-243.

Wood, C. Relate hospital charges to use of services. Harvard Business Review, March/April 1982, 82211, 123-130.

Wood, C. Nursing should be a revenue producing center. Hospitals, Nov. 1983, 33-34.

Young, W. W., Swinkola, R. & Zoen, D. The measurement of hospital care mix. Medical Care, May 1982, 20 (5), 501-512.