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Derivation and Testing of Tenets of a Theory of Social Organizations as Adaptive Systems

Louette R. Johnson Lutjens, RN; PhD*

Management and organizational theories are commonly used to design nursing administration studies. This article proposes a nursing theory as a viable alternative and demonstrates its utility in the conduct of nursing administration research. The purpose of the research was to determine the explanatory power of the environmental stimuli of medical condition, nursing condition, nursing intensity, and medical severity on length-of-stay (LOS). Twenty-three percent of the variance in LOS was accounted for by the environmental stimuli with nursing acuity contributing 14%. The focal stimulus, medical condition (diagnosis-related groups), uniquely explained only one percent of the variance. The theory of social organizations as adaptive systems, derived from the Roy adaptation model, provides an attractive nursing framework to guide and design studies that will contribute to nursing administration science and address practical problems confronting nurse administrators.

Nurse administrators rely heavily on management and organizational theories, as well as on other non-nursing theories, for their practice and inquiry. This is not surprising because the use of non-nursing theories to teach nursing administration students and to conduct nursing administration research seems to be commonplace among educators. Henry (1989) noted that nursing theory, as it currently exists, is of little use in either nursing administration practice or research. The abstract nature and nascent stage of development of nursing theory make its application difficult. Meleis and Jennings (1989) have charged that

“the use of management [theory] by nurse administrators is analogous to the way nurses have used the medical model to shape clinical practice” (p. 8). Just as nursing practice historically has been defined and shaped by medical science rather than nursing science, nursing administrative practice historically has been defined and shaped by management science rather than nursing administration. The challenge then is to specify the use of extant nursing theories for the practice of nursing administration. The purpose of this article is to demonstrate the use of nursing theory for the conduct of nursing administration research.

A contemporary issue confronting nurse administrators is the current prospective payment system. Payment to hospitals is based on a diagnosis-related-group (DRG) system that fails to account for nursing care needs and severity of illness. Hence, DRGs incompletely and inaccurately reflect consumption of hospital resources. Refinement of the system has the potential to ensure equitable payment to hospitals, recognition of nursing's unique contribution in the care of the sick, and appreciation and valuing of individual nurse practitioners. The DRG

system was implemented to decrease national health care costs by controlling length of hospital stay. Since the inception of the system, nurses have argued that the system assumes set nursing treatments for all patients (“room and board”). To date, research has not been sufficient to convince policymakers otherwise. A notable exception is the work of Halloran and Kiley (1987) who found DRGs explained only 5.8% of the variation in LOS; nursing diagnoses explained 45% ($N = 1,288$). Nursing diagnosis was measured by presence or absence of the diagnosis.

A study by Medicus Systems (“What's the Cost,” 1986) spanning 22 hospitals and 500,000 patient days revealed that costs per case due to nursing intensity seemed closely linked with average LOS for most acute medical-surgical patients. Positive correlations between nursing hours and LOS have been reported by other researchers (Green, McClure, Wintfeld, Birdsall, & Rieder, 1988; McKibbin, Brimmer, Clinton, Galliher, & Hartley, 1985). Trofino (1989) found mixed results among 48 DRGs when studying differences between nursing care hours and LOS ($N = 10,729$). In summary,

Key words: Roy Adaptation Model, Nursing Administration Research, Theory Development

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despite the fact that DRGs determine LOS, the literature suggested that LOS is distinctly influenced by measures of nursing care. Specifically, this study sought to determine the explanatory power of medical condition, nursing condition, nursing intensity, and medical severity on LOS.

Theoretical Framework

A theory of social organizations as adaptive systems derived from the Roy adaptation model (RAM) was used as the theoretical framework (Roy & Anway, 1989). This theory derivation effort is a modification of one of Walker and Avant's (1988) theory development strategies. Medical condition, nursing condition, nursing intensity, and medical severity were viewed as environmental stimuli influencing hospital costs and payment to hospitals.

In the Roy adaptation model (Roy, 1984b) the person is conceptualized as an open adaptive system engaging in interchange with the environment for the purpose of adaptation. Similarly, Katz and Kahn (1966) advocated an open system approach for understanding adaptation in social organizations. Adaptation has been defined by Roy and McLeod (1981) as "the person's response to the environment which promotes the general goals of the person including survival, growth, reproduction, and mastery" (p. 53). Likewise, the organization adapts to its environment by responding in a manner which promotes the general goals of the organization including survival, growth, continuity, and reduction of uncertainty. The scientific assumptions underlying the RAM were examined and parallel assumptions developed for the theory of social organizations as adaptive systems (SOAS)(see Table 1).

Key Concepts

Key concepts in the Roy model are person, goal, environment, nursing activities, and health. These key concepts were examined to develop

Table 1
Theory of Social Organizations as Adaptive Systems (SOAS):
Parallel Assumptions

ROY ADAPTATION MODEL*	SOAS
<p>The person is a bio-psycho-social being. The person is in constant interaction with a changing environment. To cope with a changing world, the person uses both innate and acquired mechanisms, which are biologic, psychologic, and social in origin.</p>	<p>Social organizations are social-psycho-bio entities. Social organizations are in constant interaction with a changing environment. To cope with a changing world, social organizations use both maintenance and change mechanisms which are social, psychologic, and biologic in origin.</p>
<p>Health and illness are inevitable dimensions of life. To respond positively to environmental changes, the person must adapt.</p>	<p>Well-being and disruption are inevitable dimensions of organizational life. To respond positively to environmental changes, social organizations must adapt.</p>
<p>The person's adaptation is a function of the stimuli he/she is exposed to and his/her adaptation level.</p>	<p>The social organization's adaptation is a function of stimuli it is exposed to and its adaptation level.</p>
<p>The person's adaptation level comprises a zone indicating the range of stimulation that will lead to a positive response.</p>	<p>The social organization's adaptation level comprises a zone indicating the range of stimulation that will lead to a positive response.</p>
<p>The person is conceptualized as having four modes of adaptation: physiologic, self-concept, role function, and interdependence.</p>	<p>Social organizations are conceptualized as having four modes of adaptation: physical system, inter-personal system, role system, and interdependence system.</p>
<p>*(Roy, 1980, pp. 180-182)</p>	

analogies for the theory of social organizations. The foundational concept of person was extended for groups and interactional units found in social organizations to allow a focus on pluralities of interacting individuals (Schultz, 1987). Divisions of nursing services are social organizations viewed as adaptive systems. Adaptive systems not only respond to the environment but also can exhibit behaviors aimed at shaping or re-creating the environment.

The goal of nursing administration is to ensure the most efficient and effective delivery of nursing care services by promoting adaptation of the organization to its environment. The open systems view of organizations places emphasis on the environment. Environment for organizations includes "all the conditions, circumstances, and influences surrounding and affecting the development and behavior" of social organizations (Roy, 1984b, p. 39). The meaning of these conditions, circumstances, and influences for organizations is determined through the enactment process. Enactment is a concept used only in the theory of social organizations. It is conceptualized as an analog to Roy's concept of perception in the theory of person as an adaptive system. Organizations select elements from the environment that are viewed as important to the organization. These elements are then redefined and shaped to be relevant and meaningful to the organization and its goals. Hence, enactment consists of a socially constructed reality, that is, organizations reinterpret the actual environment and, in so doing, create a new reality.

Nursing administrative activities, in this theory, consist of assessing the nursing organization, diagnosing organizational problems, setting goals for the organization, and devising strategies (proactive as well as reactive) to manage stimuli confronting the organization. In this situation intuitive nurse administrators formulate creative strategies to reshape, re-create, or redefine the existing environment to be

more acceptable to the organization. This broad view of a proactive, creative, and intuitive nursing administration style supports Roy's notion of creative power within organizations (Roy & Anway, 1989) and is congruent with the philosophical assumptions of the RAM (Roy, 1988). Strategies that are successful in terms of organizational goal attainment are adaptive responses. Adaptive organizational responses allow energy to be freed so organizations can move on to other activities that promote their development and refinement as social organizations, that is, to a higher level of organizational wellness.

Similar to health at the individual level, health at the organizational level is the state and process of being and becoming integrated and whole. Organizations with high levels of health are integrated with and embrace the environment in which they are embedded.

Coping mechanisms for organizations are traditional and creative ways of responding to the changing environment. Roy and Anway (1989) have identified stabilizer and innovator as coping subsystems within organizations. They function as internal processors to promote the goal of adaptation. The stabilizer subsystem refers to the "structures and processes aimed at system maintenance" (p. 79). Just as the regulator subsystem in persons acts to maintain homeostasis and equilibrium, the stabilizer subsystem in organizations includes structures and processes that act to maintain the organization. One such stabilizer structure is conceptualized as a management information system. This structure maintains the hospital system by providing and maintaining information relative to the organization's mission.

The innovator mechanism involves "structures and processes for change and growth in organizations" (Roy & Anway, 1989, p. 80) such as administrative meetings where information is processed prior to decision-making. The stabilizer and the innovator subsystems are linked in the interpretive process of enactment.

The Roy adaptation model describes the environment as comprising external and internal stimuli. These influencing stimuli are categorized as focal, contextual, and residual. The stimuli arise both from within organizations and outside them. A "focal stimulus is the primary input, which precipitates a management focus, and is either positive or negative" (Roy & Anway, 1989, p. 83). Contextual stimuli are factors that contribute to the effect of the focal stimulus, that is, the stressor. Contextual stimuli vary in intensity and can be positive or negative. Residual stimuli also contribute to the effect of the focal stimulus; they have an "indeterminate yet potentially significant effect" (p. 83) on organizations. They refer to the nurse administrator's hunches about factors that are influencing the management situation. Therefore, the nurse administrator's beliefs or experiences may be considered residual stimuli.

In addition to the influence of individual stimuli, organizations have adaptive levels that act as input into the coping mechanisms. Adaptation level is composed of the pooled effect of focal, contextual, and residual stimuli; it is a condition of the organization relative to adaptation. Adaptation level is a constantly changing point that represents the organization's ability to cope with the changing environment in a positive manner. The organization's adaptation level sets up a zone or range within which stimulation will lead to adaptive responses. Stimuli falling outside this adaptive zone or range lead to ineffective organizational responses.

Stimuli from the environment both external and internal to nursing organizations act as inputs to the stabilizer. Output from a stabilizer structure, such as a management information system, serves as input to the innovator. Innovator processes bring about a re-creation or representation of the environment through an interpretation of information (Morgan, 1989). This interpretation of the actual environment creates a new organizational reality. Weick (1969)

termed this process enactment. Morgan (1989) identified this process as the interpretive view. Interpreting events after they have occurred is an inherent aspect of information processing, a role of the innovator in nursing organizations. Through the process of enactment the environment becomes known to the organization. Enactments are, in part, determined by information from systems (Pfeffer & Salancik, 1978). Thus, information for decision-making to promote change and growth in organizations is always an enacted (reinterpreted) environment of the past.

The activities of the primary or functional mechanisms of the stabilizer and innovator are manifested in adaptive modes which are the effectors or secondary subsystems (Roy, 1984b). The manifestations of coping mechanisms in the adaptive modes permit observation and measurement. Empirical indicators, therefore, are rooted in the adaptive modes, not the coping mechanisms themselves.

The activity of the stabilizer and innovator mechanisms is observed and measured in the adaptive system modes. One such adaptive system for organizations is labeled by Roy and Anway (1989) as a physical system. Physical system has been "defined as basic operating resources and conditions" (Roy & Anway, 1989, p. 80). In today's information age, information systems are basic and necessary resources for administrators. The theoretical structure of social organizations (see Figure 1) is conceptualized as an analog to the theoretical structure of the theory of person as an adaptive system (see Figure 2). The schematic model (see Figure 1) for the theory of social organizations as adaptive systems differs from the theory of person as an adaptive system (see Figure 2) in the following ways. As discussed earlier, the organizational coping mechanisms of stabilizer and innovator are analogs for the individual coping mechanisms of regulator and cognator. The adaptive system modes were placed below the coping mecha-

nisms rather than on the same horizontal plane. This modification more clearly illustrates the notion of the adaptive modes as an outcome of stabilizer and innovator subsystem activity. For the study the outcome provided information on the dependent variable. Also, broken lines (see Figure 1) vivify the dynamic interplay between the stabilizer and innovator and the critical mediating role of the enactment process. A two-way arrow has been tentatively placed between the modes and coping mechanisms. This modification elucidates the dynamic interrelationship between the coping mechanisms and the adaptive modes. The direct link between the effector modes and the adaptive responses is maintained while depicting the notion

of a research outcome manifested in a mode. Additionally, the concept of enactment which is the organizational analog for Roy's concept of perception was placed in the schematic model for the theory of social organizations because it is critical to organizations.

Assumptions and Relational Statements

Major theoretical statements posited for the theory of social organizations as adaptive systems include existence and relational statements. Assumptions are existence statements; they merely "assert that something is so" (Walker & Avant, 1988, p. 80). Eight assumptions have been identified for the theory of social organizations as adaptive systems:

Figure 1. Theory of Social Organizations as Adaptive Systems (SOAS)

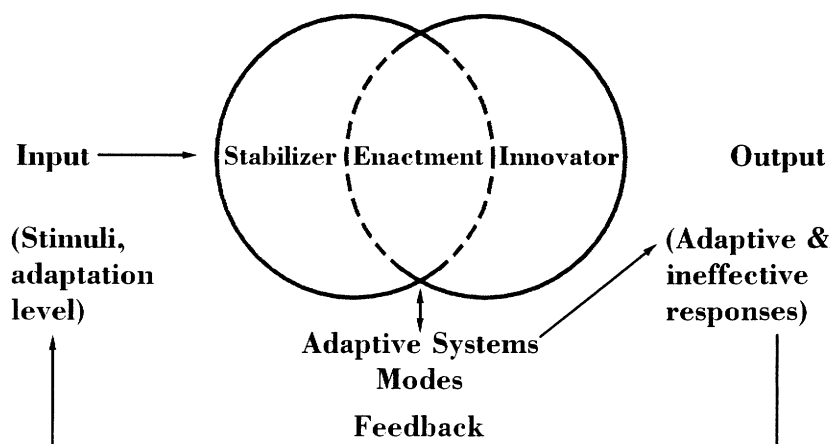
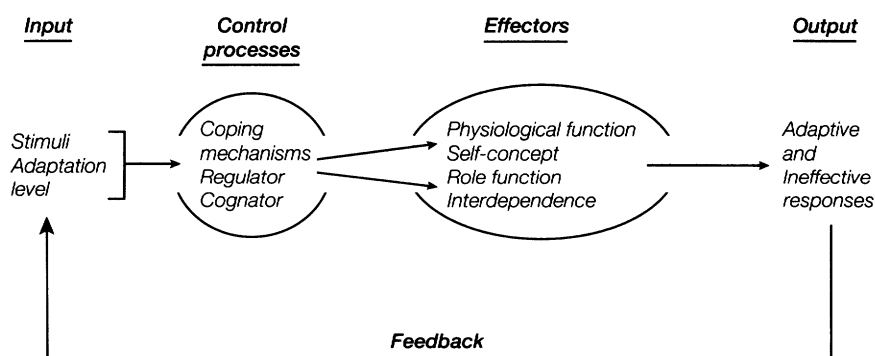


Figure 2. Theory of Person as an Adaptive System
From *Introduction to Nursing: An Adaptation Model* (2nd ed.) (p. 30) by C. Roy, 1984, Englewood Cliffs, NJ: Prentice-Hall. Copyright by Prentice-Hall. Reprinted by permission.



1. Social organizations are adaptive systems.

2. Stabilizer and innovator are organizational coping subsystems.

3. Stabilizer and innovator are linked in the process of enactment.

4. Through the enactment process organizations redefine their environment.

5. Stabilizer, innovator, and organizational adaptive system modes are interrelated.

6. Organizational decisions and actions are determined by enacted environments.

7. Nursing administrative activities facilitate adaptation of the organization to its enacted environment.

8. The feedback process provides organizations with opportunities to assess effects of organizational responses to the environment.

Relational statements are types of theoretical statements that specify a relationship between concepts. Four relational statements serving as propositions have been identified for the theory of social organizations as adaptive systems:

1. Environmental stimuli, external and internal to organizations, act as inputs into organizational coping subsystems.

2. Activity of the stabilizer and innovator is manifested in organizational adaptive system modes.

3. Organizational adaptive responses are those contributing to overarching organizational goals of survival, growth, continuity, and reduction of uncertainty.

4. Adaptive organizational responses promote the health and well-being of organizations.

The Physical Adaptive System Mode

Nursing condition, nursing intensity, and medical severity were conceptualized as contextual stimuli contributing to the effect of the focal stimulus, the prospective payment system-based medical condition (see Figure 3). These stimuli acted as inputs into the management information system of the hospital, a stabilizer structure within the physical system mode. The contributions of medi-

cal condition, nursing condition, nursing intensity, and medical severity (both individually and in combination) are outputs of the stabilizer, which serve as inputs to the innovator, which processes information (see Figure 3). Interpretive processing of this information takes place in administrative meetings. Such meetings are innovator structures observed as basic operating activities within the physical system adaptive mode. Through these innovator activities, input from the stabilizer is analyzed. Output of the activity of the stabilizer and innovator in the study was organizational information on length-of-stay.

The theorem tested in this study was derived as follows:

Premise 1: Environmental stimuli act as inputs into organizational coping subsystems.

Premise 2: Medical condition, nursing condition, nursing intensity, and medical severity are environmental stimuli.

Theorem: Medical condition, nursing condition, nursing intensity, and medical severity act as inputs into interrelated organizational coping subsystems where information is processed and interpreted.

Research Questions and Hypotheses

Hypotheses and questions were developed from the theory of social

organizations as adaptive systems and from the literature to identify determinants of consumption of hospital services that explained length-of-stay.

Research Questions

1. How much variance in length-of-stay is explained by medical condition, nursing condition, nursing intensity, and medical severity?

2. Are there differences in the characteristics of the patient group which exceeded the targeted length-of-stay established by the Health Care Financing Administration and the characteristics of the patient group that did not exceed the targeted length-of-stay?

Hypotheses

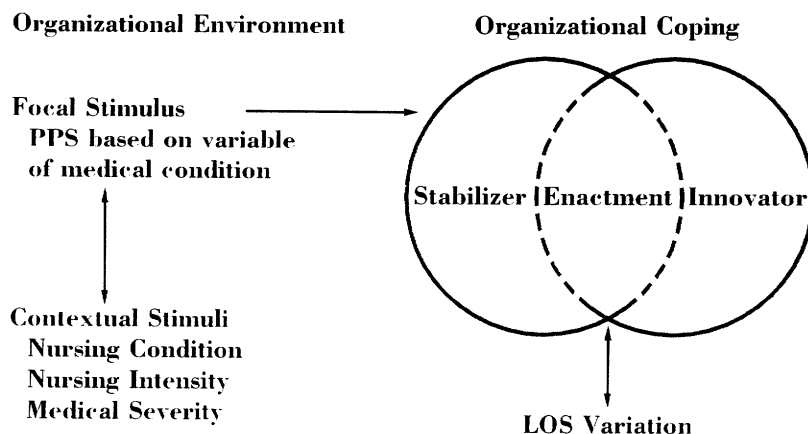
1. The combination of the variables (medical condition, nursing condition, nursing intensity, and medical severity) will explain more variance in length-of-stay than any one predictor variable taken singularly.

2. The combination of the variables (medical condition, nursing condition, nursing intensity, and medical severity) will explain significantly more variance in length-of-stay than the variable of medical condition.

Definition of Terms

Based on the theory of social organi-

Figure 3. Physical Adaptive System Mode in the Theory of SOAS



zations as adaptive systems, theoretical definitions of the environmental stimuli (predictor variables) and the criterion variable for the study are defined as:

Medical condition. The focal stimulus, medical condition, was defined as DRGs. DRGs comprise a classification system that identifies primary diagnoses and secondary diagnoses, principal surgical procedures, complications, and comorbidities. Because of the large number of DRGs (470), only 10 of the most frequently occurring medical-surgical DRGs were selected for study.

Nursing condition. The contextual stimulus of nursing condition was defined for the study as human response patterns. Nine human response patterns (exchanging, communicating, relating, valuing, choosing, moving, perceiving, knowing, and feeling) described by Roy (1984a) comprise a conceptual framework for the nursing diagnosis classification system. The 14-member theorist group which was chaired by Roy proposed "nursing diagnosis as a judgment about health that is based on data relevant to the nine pattern characteristics. In other words, the indices of the field pattern are the basis for diagnosis, and nursing diagnosis describes a health pattern at a point in time of an individual, family, or group" (Roy, 1984a, p. 31).

Nursing intensity. The contextual stimulus of nursing intensity was viewed as an estimate of the time it takes a nurse to give care to a patient based on his/her needs.

Medical severity. Medical severity, a contextual stimulus, was defined for the study as potential for organ failure. Severity groupings, devised by MediQual Systems, Inc., (1983) are based on objective key clinical findings, for example, laboratory test results and radiological reports which assess potential for organ failure.

Length-of-stay. The criterion (dependent) variable, length-of-stay, was defined as the episode of care during a single inpatient hospital admission.

Method

A correlational design was used to examine the relationships between LOS (the criterion variable) and the environmental stimuli of medical condition, nursing condition, nursing intensity, and medical severity (predictor variables). Records of hospitalized patients discharged from a 462-bed hospital in the Midwest were used to collect data. Through power analysis it was determined that 615 patients were needed for a small effect size of .02, power of .80, non-centrality parameter of 120, and an alpha of .05 (Cohen, 1988). Because of the lack of established reliability of measures, a conservative approach was taken wherein the initial sample size was increased to allow for a degree of non-fit among selected cases.

Sample

The computer-generated random sample consisted of the records of 1,000 patients over 17 years of age discharged under a medical-surgical DRG. The final sample of 973 patients was from 10 DRGs selected for their high rate of occurrence in the study hospital (see Table 2). The study was considered exempt by the institutional review board because the research involved examination of existing records and information that would be collected and recorded by

the investigator in such a manner that patients could not be identified directly or through identifiers linked to specific patients.

Fifty-two percent of the patients were male ($n = 510$) and 48 percent female ($n = 463$). Patients ranged in age from 19 to 96 years with an overall mean age of 60.91 years ($SD = 15.73$ years).

Measures

Medical Condition

The DRG-specific relative cost weight was used to measure the focal stimulus, medical condition. Relative cost weights are derived from calculations based on a hospital's cost for the number of days in a regular room, number of days in a special care unit, and the cost of ancillary services such as pharmacy, laboratory, and radiology (*Federal Register*, 1983). They are "intended to reflect the relative resource consumption associated with each DRG" (*Federal Register*, 1983, p. 39768). The larger the cost weight, the greater the relative costliness and medical complexity of the DRG.

Thomas and Ashcraft (1989) evaluated the DRG relative cost weight by comparing interrater reliability coefficients among several methodologies, for example, Cohen's kappa, interrater reliability coefficient

Table 2
The Medical-Surgical DRG Distribution for 973 Patients

DRG	Description	n
014	Specific Cerebrovascular Disorders	99
106	Coronary Bypass with Catheterization	99
107	Coronary Bypass without Catheterization	100
112	Vascular Procedures	99
125	Circulatory Disorders	96
127	Heart Failure and Shock	100
209	Major Joint and Limb Reattachments	99
215	Back and Neck Procedures	98
359	Uterine and Adnexa Procedures	96
410	Chemotherapy	87

(R_1), ($N=431$ discharge records). They estimated a Cohen's kappa of .88 and R_1 of .89 for DRG relative cost weights. Cost weights have also been used by other researchers to measure DRGs (Halloran & Kiley, 1987; McKibbin et al., 1985).

Nursing Condition

The cumulative frequency of nursing diagnoses over the hospital stay was used to measure nursing condition, a contextual stimulus. The diagnoses used were those accepted by the North American Nursing Diagnosis Association (NANDA). A retrospective interrater reliability study ($N = 100$) between clinical nurse specialists and actual caregivers revealed that the nurse specialists validated 75% of the diagnostic judgments made by the caregivers.

Nursing Intensity

Nursing intensity, a contextual stimulus, was measured (on a daily basis) as the number of hours of direct nursing care projected to be required by patients over the next 23 hours. Hours were established by a proprietary patient classification (acuity) system purchased by the study hospital. The patient classification system had been operational for about five years during which continuous evaluation of interrater reliability was monitored. Interrater reliability, on average, was satisfactory over the study year.

Medical Severity

The Medical Illness Severity Grouping System (MedisGrps) is a clinical management information system that classifies hospital inpatients into severity groups at admission. Severity groups are defined by potential for organ failure. MedisGrps uses a complex procedure that computes a severity score of 0 - 4 based on weighted scores assigned by the computer to abnormal key clinical findings, such as physical findings, and laboratory and radiological test results. Although the scale is at the ordinal level of measurement, it was

treated as interval data.

Thomas and Ashcraft (1989) reported interrater reliability coefficients ($N = 431$ discharges) for MedisGrps (MediQual Systems, 1983): Kappa = .63, $R_1 = .84$, Gamma = .92, and Tau B = .78. Content validity was estimated by implicit agreement by physicians involved in the initial selection and refinement of the key clinical findings over a period of two years. Moreover, in the study hospital 95% interrater reliability was maintained by medical record personnel who assigned severity scores.

Length-Of-Stay

Length-of-stay was calculated by subtracting the admission date from the discharge date. If a patient was admitted and discharged on the same day, LOS of one day was assigned.

Procedure

Assigned DRG, hours of direct nursing care, severity group, length-of-stay, and demographic and clinical characteristics of the patients were retrieved from computerized databases. Nursing diagnoses were manually abstracted from hospital records by medical records personnel. Data sources arise from information systems conceptualized as stabilizer structures.

Results

Preliminary Analysis

The cost weights for the DRGs employed in this study ranged from .4284 (DRG 410-Chemotherapy) to 5.3324 (DRG 106-Coronary Bypass with Catheterization). Nursing diagnoses ranged from three for Circulatory Disorders (DRG 125) to nine for Coronary Bypass without Catheterization (DRG 107). The mean number of hours ranged from 3.66 for Uterine and Adnexa Procedures (DRG 359) to 8.98 for Coronary Bypass without Catheterization (DRG 107). Twenty-two percent of the sample had a rank of one for medical severity indicating a low potential for organ failure. Forty-six

percent of the patients had a rank of zero indicating minimal potential for organ failure. This finding may be a function of the DRGs selected for the study. The mean LOS ranged from three days for patients receiving Chemotherapy (DRG 410) to 14 days for patients undergoing Coronary Bypass with Catheterization (DRG 106). Characteristics of the sample are presented in Table 3.

Pearson r correlation coefficients among all four predictor variables ranged from -.04 to .56; there was little evidence of multicollinearity. Correlations between individual predictor variables and the criterion variable attained significance and ranged from $r = .24$ for medical severity to $r = .37$ for nursing intensity.

Hypothesis Testing

Fourteen percent of the variance in LOS was uniquely explained by nursing intensity using forward stepwise multiple regression analysis (see Table 4). The R^2 change for medical condition, after nursing intensity, nursing condition, and medical severity were entered into the equation, was one percent. This finding suggests that the focal stimulus, DRGs, provided very little unique information about LOS that was not already explained by the contextual variables.

Length-of-stay was used to group the 973 patients according to whether LOS exceeded the targeted LOS (outlier) or was equal to or less than the targeted LOS (inlier). All four predictor variables and age were discriminators of a patient's LOS group status. The order and discriminating power of the five variables are presented in Table 5. Medical severity was the strongest discriminator $F(1, 971) = 95.94$, $p < .001$. The two variables correctly classified outlier versus inlier hospital stays in 71.02% of the cases. Of the 767 inliers, 71.70% were accurately classified, and of the 206 outliers, 68.40% were correctly identified.

In summary, findings of this study indicate that the variation in the criterion variable, LOS, was better explained by

Table 3
Distribution of the Variable Scores Among 973 Patients

	<i>M</i>	<i>SD</i>	Median	Mode
Medical Condition (DRG relative cost wt.) ^a Range = .4284-5.3324	2.074	1.596	1.427	1.010
Nursing Condition (# of nursing dx.) Range = 2.93-9.36	5.93	2.86	6.00	5.00
Nursing Intensity (Hours of care) Range = 3.66-8.98	6.23	2.87	5.50	5.30
Medical Severity (severity group) Range = 0-4	.97	1.05	1.00	0.00
LOS (# of hospital days) Range = 2.59-14.39	7.80	8.13	6.00	4.00

^a DRG relative cost weights should not be rounded.

Table 4
Summary of Forward Entry Multiple Regression Analysis with LOS as the Criterion Variable for 973 Patients*

Variable	Multiple <i>R</i>	<i>R</i> ²	<i>R</i> ² chg.	<i>F</i> chg.
Nursing Intensity	.37	.14	.14	156.53
Nursing Condition	.43	.18	.05	53.92
Medical Severity	.47	.22	.04	46.01
Medical Condition	.48	.23	.01	11.87

**p*<.001 for all estimates

Table 5
Discriminant Function Analysis of Environmental Stimuli and Age by LOS Outlier and Inlier Groups (*N* = 973)

Variable	Standardized Discriminant Coefficient	Wilks Lambda	<i>F</i> *
Medical Severity	.52	.91	95.94
Age	.54	.89	60.76
Medical Condition	-.64	.87	48.37
Nursing Intensity	.33	.86	40.56
Nursing Condition	.26	.85	34.01

Note: Group centroids for inlier patient group (equal to or less than the targeted LOS) and outlier patient group (exceeded the targeted LOS) were .81 and -.21 respectively.

**p*<.001

patients' projected need for hours of nursing care than by cumulative frequency of nursing condition, severity group, and DRG cost weight. The combined environmental stimuli accounted for 23% of the variation in LOS. Also, medical severity was the best discriminator between the patient group whose hospital stay was within the DRG-specific targeted LOS and the patient group whose hospital stay exceeded the DRG-specific targeted LOS.

Discussion

Although medical condition, the focal stimulus, is the current basis for federal payment to hospitals, DRGs explained only one percent of the variation in LOS in this study. This low percentage, relative to nursing environmental stimuli (variables), supports the work of Halloran and Kiley (1987). It would seem important to include nursing care in any measure of hospital resource consumption. Nursing care, however, was factored into DRG cost weights only on a per diem basis and attached as a constant to the type of unit (critical care or general). Thus, no allowance was made for differing types and amounts of nursing care required by individual patients.

Although nursing intensity was the best predictor of LOS, it did not discriminate as well as expected between patients who exceeded the mean LOS and those who did not. This may be due to the fact that medical severity measured *potential* for organ failure. Appropriate and necessary hours of nursing care might contribute to shorter LOSs because such care *prevents* potential organ failure from becoming a reality. Those patients who develop some degree of organ failure, despite nursing's best attempts at prevention, would presumably fall into the patient group that exceeded the targeted LOS.

Adequacy of the Theory

Premises derived from the theory identified medical condition, nursing

condition, nursing intensity, and medical severity as environmental stimuli and proposed a relationship between the stimuli and interrelated coping subsystems, coping mechanisms, and adaptive system modes (see Figure 4). Hypotheses were developed from the theorem to test the ability of contextual stimuli, nursing condition, nursing intensity, and medical severity to contribute to the focal stimulus, medical condition, in explaining LOS. The support for the hypotheses, in turn, supported the theoretical relationship between environmental stimuli and organizational coping subsystems and the interrelationship between the coping mechanisms and the adaptive system modes as well.

The DRG system that underlies the current prospective pricing scheme was identified as the focal stimulus for the study. This appeared consistent with the observation that DRGs are a stimulus emanating from the external environment that, by virtue of their control over federal payment to hospitals, precipitate a management focus. The fact that the empirical indicator of the focal stimulus, DRG cost weights, explained little variation in LOS does not invalidate its position as a focal stimulus for this

study. The same variable could be a focal stimulus in one study and a contextual stimulus in another. This study does suggest, however, that DRGs may not be the most appropriate management focus with regard to length-of-stay. However, presumably DRGs will remain a focus of management attention for as long as they provide the basis for payment to hospitals.

Roy (1984b) stated that "fine-line distinctions about what a stimulus is called are less important than the understanding of the configuration of factors" (p. 55). The configuration of factors is probably best exemplified by the term adaptation level. In this study adaptation level was conceptualized as the combined effect of DRG cost weights (focal stimulus), frequency of nursing diagnoses, hours of direct patient care, severity group (contextual stimuli) and unmeasured or unknown residual stimuli.

Factors comprising the unexplained 77% variance in this study are conceptualized as residual stimuli. Residual stimuli have been proposed as a category in which to place unknown and/or unmeasured factors influencing the ability of a social organization to adapt to its environment.

Implications

The threat of including nursing care services in a measure of medical severity is escalating with the current trend for states to legislate collection of severity data. Currently two states, Iowa and Pennsylvania, require hospitals to collect severity data using MedisGrps (MediQual Systems, 1983). The tacit assumption underlying this strategy is that variation in nursing care can be attributed to medical severity. The findings from this study indicate a distinction between the contributions of medical severity to LOS and those of nursing care to LOS.

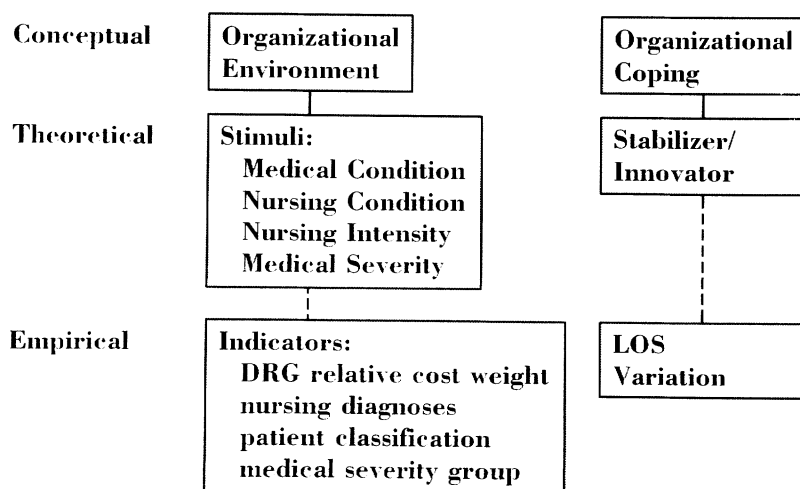
Currently, patient classification instruments are viewed as expensive to maintain and perceived as lacking credibility by many hospital administrators. It is a commonly held belief that patient classification instruments overproject the numbers of nurses needed to staff units. This generally negative opinion of patient classification instruments may be due to the type and sensitivity of the instrument rather than to the inherent worth of measuring nursing intensity. The findings from this study suggest that there is value in pursuing the measurement of nursing intensity.

Limitations of the Study

A major limitation in this study is the lack of established reliability and validity of the measures. No studies of validity on DRG cost weights were found in the literature. The high reliability coefficients found in the Thomas and Ashcraft (1989) study suggest that the cost weights may be a reliable measure, but their validity as a measure of medical condition has yet to be confirmed.

The time-based nature of patient classification systems makes the applicability of the study findings to other institutions very difficult. The lack of comparability or applicability of findings is a common problem with

Figure 4
Conceptual-Theoretical-Empirical Structure



these systems and reflects the current state of technology. The use of second generation patient classification instruments such as ARIC (Allocation, Resource Identification, and Costing) (Giovannetti & Johnson, 1990) that provide ongoing reliability and validity monitoring capabilities and cross-institutional comparability will strengthen future research.

Recommendation for Further Research

Studies are needed to replicate this research and to identify other determinants of LOS. Factors comprising the 77% unexplained variance need to be identified. Nursing practice patterns are possible residual stimuli that need to be identified and investigated. Residual stimuli become contextual stimuli after identification and measurement. Nurses must determine the things they do that significantly contribute to patient outcomes such as LOS. If nurses do not demonstrate their contribution to positive patient outcomes, the value of nursing in the care of the sick will continue to be masked by physician-generated activities.

The next theoretical challenge is to determine the usefulness of the theory for translating research findings into practice. The proposed two-way process between the modes and the coping mechanisms would provide, from a theoretical perspective, for the utilization of research findings by hospitals to change practice, thereby extending the scope of the theory. Studies using the theory of social organizations as adaptive systems are needed to further test the theory's utility in nursing administration research and in the practice settings of nurse administrators. The theory of social organizations as adaptive systems is a viable alternative to the use of management theories for studying problems specific to nursing administration and thus provides an attractive perspective upon which to build a program of research.

Conclusion

This study demonstrated that neither measures of medical condition nor measures of medical severity were a substitute for measures of nursing care. Therefore, nursing care, in addition to medical treatment, needs to be considered when devising a method such as DRGs to reflect patients' use of hospital resources and as a basis for payment.

The theory derived from Roy's adaptation model has utility for nurse administrators in that the concepts environmental stimuli and organizational coping are pragmatic and have been operationalized. The findings can be used to guide decision-making to facilitate adaptation of the nursing division to its environment.

A conceptual leap is required to view this theory as a derivation of the Roy model, which was developed with individuals in mind. Bridging this conceptual gulf between persons and social organizations offers the distinct advantage of broadening the scope of the Roy adaptation model by providing a nursing theoretical framework to use in designing programs of research within agencies and institutions. Such programs would make a dual contribution by providing data to solve practical problems and by contributing to nursing administration.

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