

# The measurement of nursing intensity

by John D. Thompson

*At this stage in the development of diagnosis-related groups (DRG's), there is an imperfect record of the value and amount of nursing resources used by individual patients during a single hospital stay. Previous attempts to isolate the costs of nursing care in relationship to DRG's are reviewed. A research*

*strategy to attain such relative measurements is proposed. Such inquiries are necessary if precise measurements of the relative contribution of nursing to each DRG are to be isolated, if new managerial models are to be developed, and if objective measurements of severity within DRG's are to be devised.*

## Introduction

The effective management of nursing resources requires a linkage between the costs of services and the patients who receive them. When measured by its value and volume, there is wide variability in the intensity of nursing care received by patients. This variability can be observed in the nursing services given to patients with different medical problems or to the same patient at various times during a single hospital admission. This variability must be measured if effective nurse staffing patterns are to be projected and the relationships between nursing costs and diagnosis related groups (DRG's) payments are to be established. Presented here are issues involved in such measurement, reviews of past approaches to estimating the utilization of nursing services, and proposals for the development of more precise cost measurements related to DRG's.

The DRG approach to the management of and payment for hospital care is based on the assumption that the basic unit of service in an acute care general hospital is the episode of care given a patient during a single inpatient admission. The basic unit of service can be represented by a unified record merging clinical data (the uniform hospital discharge data set) with the patient's bill, thereby deriving the value and types of resources used by that patient during the course of care. These merged treatment records are then grouped according to similar clinical problems which patients present and like patterns of resource use. In this way a tool of considerable power is created for the payment, management, and evaluation of hospital care.

At this stage in the development of DRG's, there is an imperfect record of the value and amount of nursing resources used by the individual patient during a single hospital stay. This occurs because the utilization of routine nursing services, unlike those of ancillary services, cannot be derived from the patient's bill. It is only when patients are treated in a special care unit, such as intensive care or coronary care, that they are individually charged for the level of nursing resources they utilize. Routine nursing care is billed by an average per diem charge for nursing and hotel services to

all patients cared for on the nursing floors. Rates may vary depending on the number of beds in the patient's room. This billing system is due to the conventions of the costing model imposed during the historical evolution of the hospital cost accounting process.

Any investigation of the relative amount and cost of nursing resources used in treating hospitalized patients must consider both types of nursing care—that given in special care units and that rendered on the regular inpatient floors. Further research in this area would be an important undertaking for three reasons: Such an examination can include a more precise measure of the contribution of nursing expenses to the relative costliness of care by DRG. It can contribute to the development of a management and budgeting model for nursing services. It would directly relate to the concerns of some about the objective measurement of severity within DRG's (Smits, Fetter, and McMahon, 1984).

## Nursing care and special care units

Special care units, such as intensive care or coronary care units, are an extension of post-operative recovery rooms instituted in hospitals during the nursing shortage of World War II (Thompson, 1958) and were later included as one zone of a system of organizing hospital care named progressive patient care (Fetter and Thompson, 1969). The almost immediate acceptance of these units, both in the number of beds they contained and in the variety of patients admitted to the units, was dramatic (Rockwell, 1969).

There are three characteristics of these units that are relevant to this article: 1) a differential price is levied for care in the units; 2) they are staffed with two or three times the number of nurses as the regular nursing floors; and 3) nursing staff in most intensive care units are usually registered nurses with special training. The term intensive care unit is, indeed, an apt one as far as the provision of nursing care is concerned.

The number of beds in special care units is still increasing. Recent data from Connecticut (Table 1) reveals that for all acute care hospitals, beds and patient days in special care units are increasing at more than 10 times the rate of total beds and patient days.

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**Table 1**

**Total number of patient days and beds and number of patient days and beds in intensive care units in all Connecticut hospitals, with percent increase from 1973: Selected years, 1973-1982**

Year	Total		Percent increase from 1973		Intensive care		Percent increase from 1973	
	Patient days	Beds	Days	Beds	Patient days	Beds	Days	Beds
1973	3,022,626	10,382	—	—	124,852	469	—	—
1974	3,060,511	10,459	1.2	0.7	128,679	491	3.1	4.7
1975	3,063,151	10,483	1.3	0.9	136,280	507	9.2	8.1
1976	3,108,816	10,658	2.9	2.6	157,877	578	26.5	23.2
1977	3,092,959	10,595	2.3	2.1	157,492	600	26.1	27.9
1978	3,053,707	10,656	1.0	2.6	160,314	614	28.4	30.9
1979	3,063,657	10,487	1.4	1.0	163,356	607	30.8	29.4
1980	3,131,789	10,407	3.6	0.2	165,911	602	32.8	28.4
1981	3,126,254	10,516	3.4	1.3	170,724	636	36.7	35.6
1982	3,177,796	10,608	5.1	2.1	189,663	691	51.9	47.3

NOTE: Date excludes newborn infants and neonatal intensive care units.

SOURCE: The Connecticut Hospital Association.

More recent data covering the first 6 months experience of these hospitals after the DRG payment system went into effect<sup>1</sup> reveals a decrease of 5.9 percent in the number of adult medical-surgical days when compared with the same period of the previous year. Further, this decrease is accompanied by an increase in admissions. As a consequence, the average length of stay dropped for these patients by one-half day. The data also reveals that while routine adult medical-surgical unit days are decreasing by 6.5 percent, special care unit days (excluding neonatal intensive care) continue to increase by 1.9 percent. Further, special care days average 9.18 percent of the total adult medical-surgical days in major teaching hospitals compared with 6.63 percent of days in nonteaching hospitals.

This pattern of relatively higher use of special care days among teaching hospitals is not surprising. The teaching hospitals in Connecticut demonstrate higher DRG-based case-mix indexes. An additional factor has been the steady growth of ambulatory surgery in the State. Fewer patients with less complex diagnoses are being admitted, thus increasing the case complexity of all patients hospitalized.

The value of time in intensive care units as an overall measure of nursing intensity is, however, limited to relatively few of the DRG's. A recent exploration of the special care units at Yale-New Haven identifies those DRG's in which patients are almost all admitted to special care units sometime during their stay.

<sup>1</sup>All 35 Connecticut general hospitals went on the DRG prepayment system on October 1, 1983.

Among them are the three DRG's that classify acute myocardial infarction along with DRG's involving cardiac surgery, major neuro, abdominal, and chest procedures. Although this is predictable and usually included in any DRG cost model, an interesting observation is the identification of those DRG's in which relatively few of the patients are treated in special care units. Further exploration of this parameter among hospitals will offer some insight into one aspect of intra-DRG variability in nursing service intensity.

The wide variation in the relative cost of intensive care between the DRG's is demonstrated in the 1979 data from New Jersey (Table 2). Although there are some differences within a single DRG across the three types of hospitals, the relative amount of care in intensive care units between the DRG's is remarkably similar, varying from almost none in DRG 6 to a major provision in DRG 2. All of these DRG's are within the same major diagnostic category. Care must be taken in comparing the routine costs in the acute care units (ACU's) with those in the intensive care units (ICU's) again because of the allocation of the former costs to patients based on undifferentiated hospital average ACU costs per day. The New Jersey data has removed hospital hotel costs, such as dietary, housekeeping, and linen from the ACU costs.

The cost of intensive care units of various types is included in Part II of HCFA-2552-83, D-1 (work sheet), and it is presented as average cost per diem. Using time in the unit as a basis for assigning such costs to the individual patient is not quite as accurate as the allocation of ancillary services where it is

**Table 2**  
**Standard costs for nursing services in acute care units and all special care units**  
**in New Jersey hospitals, by type of hospital and DRG<sup>1</sup> number: 1979**

DRG <sup>1</sup>	Nonteaching hospitals		Minor teaching hospitals		Major teaching hospitals	
	ACU <sup>2</sup>	ICU <sup>3</sup>	ACU <sup>2</sup>	ICU <sup>3</sup>	ACU <sup>2</sup>	ICU <sup>3</sup>
1	\$861.54	\$764.48	\$1,006.30	\$481.76	\$1,070.20	\$623.42
2	889.03	910.90	843.72	880.01	1,003.20	634.89
3	409.63	335.99	511.68	460.70	587.12	761.33
4	823.28	216.12	1,117.30	136.05	1,329.00	283.46
5	692.54	538.66	728.62	220.29	754.62	199.92
6	161.51	0.00	151.53	0.00	164.95	1.81
7	311.72	72.80	502.78	128.11	532.79	104.38
8	178.89	11.82	168.03	8.38	197.25	6.91
9	399.66	75.31	433.08	41.47	437.16	23.78
10	762.21	13.73	672.16	20.09	776.57	23.13

<sup>1</sup> Diagnosis-related group.

<sup>2</sup> Acute care unit (routine care).

<sup>3</sup> All special care units.

NOTES: Data are expressed in 1982 dollars.

SOURCE: New Jersey State Department of Health.

known that a specific patient received a specific service. All that is known in the intensive care unit is that the patient was there because the availability of these services was therapeutically indicated. It is only after examining the use of special care service by DRG's across hospitals and among physician practice patterns and nurse staffing methodologies that any normative judgements on the use of this expensive resource can be projected. (Relman, 1973).

### Routine nursing care

The major problem addressed here lies then with the measurement of the intensity of routine nursing services. Once this is accomplished, consideration can be given to combining the costs of routine nursing care with those of intensive care or leaving the two as separate measurements of different kinds of care given to the same patient. The assignment of the value of routine nursing care given to a specific patient is not likely to be developed for two reasons. In almost all hospitals, no record is kept of the kinds of nursing services each patient receives on the floors, which means that the variations in nursing intensity cannot be derived. The second reason is that cost accounting conventions have historically combined the costs of routine nursing care with hospital hotel costs, such as dietary, housekeeping, linen, and expressed as "routine costs" (sometimes called room and board costs). Therefore, any nursing intensity measurement for the foreseeable future must be assigned to DRG's as an allocation statistic or relative weight representing the intensity of routine nursing services received by individual patients within that DRG.

### Examining the intensity of nursing care

Previous attempts to examine the intensity of nursing services are examined in light of two criteria to determine the objectives of such studies: 1) do they assign the expenditure of routine nursing resources to individual patients in some equitable and meaningful manner? and 2) could these assigned resources be used to estimate the differences in the intensity of routine nursing services among patients *in each DRG*. If these two criteria are met, then research devoted to separating nursing costs from the rest of the "routine package" can proceed so that nursing expenditures can be assigned to DRG's in a manner closely resembling the assignment of ancillary service costs, such as radiology, pathology, and operating room.

In reviewing the work that has been done in this area, four possible approaches have emerged to meet the above criteria. They are 1) carrying out special studies examining the specific amount of nursing resources individual patients receive; 2) adapting nurse staffing algorithms to estimates of nursing care received during a hospital stay; 3) directly assigning nursing activities to patients on a regular basis; and 4) using nursing diagnoses in an attempt to estimate the amount of nursing care given to patients on the regular nursing floors.

### Special studies of nursing resources used by various categories of patients

Early in the history of the Medicare program, the American Hospital Association, stirred by members' concerns and a pilot study by the Commission for

Administrative Services in Hospitals, requested a nursing differential in the cost per diem reimbursement formula for Medicare patients. A sizeable study was conducted by the association, with some funding from the U.S. Public Health Service, to examine whether "there is a significant difference in the amount of basic nursing care received by patients 65 years of age or older" (Thompson *et al.*, 1968). The methodology employed was a comparative work sampling design in 55 acute care general hospitals in the United States. The difference in care received by older patients was estimated at "about 30 minutes of nursing care per patient day" (Thompson *et al.*, 1968). A differential of 8.5 percent of routine nursing costs was paid to hospitals as a consequence of the study.

Little attention was given to the incidental study finding that hospitals varied greatly in their provision of nursing care altogether. (There were relatively few special care units in those days and they were not included in the sampled nursing units.) For example, nursing hours per patient day varied from "3.06 hours to 6.30 hours per patient day, a difference of over 100 percent among the hospitals studied" (Thompson *et al.*, 1968), which far outweighed the differential factor due to the age of the patient treated.

The differential for the care of the elderly was not unexpected in light of today's knowledge. The problem with the study was that it could not separate the effect of age and the effect of case mix when explaining this difference because the DRG concept had not yet been developed. DRG payment and the formation of age groups of 70 and over in many of the new DRG's (though not tested for nursing care) allowed for differential payments for a total cost per case when the difference in resource expenditure was demonstrated. The reason for the nursing differential for age alone, then, no longer existed, and the differential was rescinded.

Since age is an important variable in the definition of DRG's, and nursing care an important element in costs per DRG, an examination of this relationship was undertaken. The Yale research team encountered problems in the nursing care-DRG relationship early in the development of the case-mix accounting and budgeting system. A patient-specific nursing intensity measure was developed through an adaptation of the Rush-Presbyterian-St. Luke's Hospital's classification system containing 19 task configurations, 5 patient characteristics, and an additional indicator of increased utilization of nursing resources. These factors were weighted by values obtained through time studies of the tasks and estimated time devoted to the care of patient with the listed characteristics.

The classification was applied for two shifts of each day for 1,400 patients during their entire stay in the hospital. The daily ratings were summed and a per case estimate was obtained by deriving an average value of nursing resources used during the stay. These nursing intensity values were then assigned to DRG's and expressed as a DRG weight from 1 to 8 (Table 3).

The study demonstrated clearly that "demands on the nursing department vary significantly depending upon the DRG of the patient treated" (Social Security Administration, July 1976 and Oct. 1976).

In light of the present status of the DRG system, there are four problems with this study. One, the nursing weights are derived from an earlier version of the DRG's containing some 327 groups. Though the weights were later expanded to the 383 *International Classification of Diseases, adapted for use in the United States, Eighth Revision (ICDA-8)* version of DRG's and subsequently mapped into 467 *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* groups, each change weakens the validity of the classification. Two, the relationship in the intensity rating between the special care and routine care nursing intensity is not explored. Three, the number of patients studied is not large enough to obtain values for each DRG. Four, since only one hospital was used, it would be desirable to include more institutions and examine interhospital variability in the nursing intensity measures.

Problem three was dealt with for 80 of the DRG's not represented in the sample of 1,400 patients by a committee of staff nurses that determined the value of the weights for each of the empty DRG's normatively by using the groups with empirically determined weights as reference points.

Another attempt to link the intensity of nursing services to DRG's (New Jersey State Department of Health, Aug. 1983) for the New Jersey reimbursement experiment encountered some of the problems outlined the Yale experience. The New Jersey reimbursement scheme is based on the desirability of assigning nursing relative intensity measures (RIMS) and costs as an allocation statistic derived from a study of patients in New Jersey hospitals. This research advocated RIMS for such an allocation exercise (Catternichio, 1983). The problem with the RIMS studies is, again, that the small sample size of patients precluded the assignment of an allocation statistic to each DRG. Regression equations were derived primarily at the major diagnostic categories (MDC) level instead of the DRG level. Another problem with the linear approach is that any regression equation accepts the underlying assumption that each day of care is assigned the same incremental value of nursing resources. This is clinically counter-intuitive for some nurses and dampens its application as input into a staffing model.

Rather than iterating the various claims and counter claims surrounding RIMS as a measure of nursing intensity, (Grimaldi, 1982) it seems more productive to return to those criteria for nursing intensity measures set up in the beginning of this paper. There it is held that an allocation statistic for the DRG payment and management system must be derived at the DRG level. Because the RIMS system does not meet this second criterion and the large variability of nursing costs within one MDC is demonstrated in Table 2, it is felt that the application of RIMS to a DRG payment system is questionable indeed.

**Table 3**  
**Nursing intensity weights for diagnosis related groups<sup>1</sup>**

DRG Number	Nursing weight	DRG title
1	5	Craniotomy except for trauma, 18 years or over
2	6	Craniotomy for trauma, 18 years or over
3	5	Craniotomy, under 18 years
4	5	Spinal procedures
5	7	Extracranial vascular procedures
6	2	Carpal tunnel release
7	5	Peripheral and cranial nerve and other nervous system procedures, and/or comorbidities and complications, 70 years or over
8	4	Peripheral cranial nerve and other nervous system procedure, without comorbidities and complications, 70 years or over
9	5	Spinal disorders and injuries
10	4	Nervous system neoplasms and/or comorbidities and complications, 70 years or over
11	3	Nervous system neoplasms without comorbidities and complications, 70 years or over
12	4	Degenerative nervous system disorders
13	4	Multiple sclerosis and cerebellar ataxia
14	5	Specific cerebrovascular disorders except transient ischemic attacks
15	4	Transient ischemic attacks
16	5	Nonspecific cerebrovascular disorders with comorbidities and complications
17	4	Nonspecific cerebrovascular disorders without comorbidities and complications

<sup>1</sup>Diagnosis-related groups from *International Classification of Diseases, Ninth Revision, Clinical Modification, 1980*.

SOURCE: Internal Working Document UH54, Health Services Management Group, Yale University, 1983.

A measure of nursing intensity was used as an independent variable in a recently reported study on length-of-stay variations with seven ICDA-8 DRG's. The nursing intensity variable was "generally positive and statistically significant" (Berki, 1984) in explaining intra-DRG variation. Unfortunately, the nursing intensity unit used was the daily room charge for the type of accommodation averaged over the days spent in that room. Room charges usually relate to the number of patients in the accommodation, and it is not known whether intensive care units were one of the types of accommodations considered. There may be a relationship between nursing intensity and the number of patients within a room, but more precise measures would be desirable when the ICD-9-CM DRG's are examined.

### **The adaptation of existing nurse staffing algorithms**

It is somewhat ironic that nursing intensity measurement would be the last element in the DRG system to be developed. No other hospital service has been examined more frequently than routine nursing care. The measurement of the demand for nursing care by individual patients began as early as 1947, however, no substantive work was published until 1961 (Connor *et al.*, 1961).

A more recent work on the allocation of nursing resources noted that "Connor's work was completed over a decade ago; his findings have not been substantially changed by numerous other researchers, and many hospitals have tried to implement controlled variable staffing in one form or another" (Trivedi, 1976).

The key phrase here is that the purpose of all the measurement systems was the implementation of "controlled variable (nurse) staffing." All of these systems gather estimates of the volume of nursing care indicated for each patient on each day of his or her stay in the hospital. Since they were used to arrive at staffing assignments, usually for the following day, the information on patient needs was discarded after that task was completed. No one linked the data on each patient for each day of stay to arrive at the total nursing resources used during the patient's entire hospital stay. Because payment was based on patient day rather than on the case, no incentive was given to examine resource use in a different way.

All of these staffing systems attempt to measure nursing time given to or desired for individual patients. This time is estimated from the characteristics of the patient, from the services the patient

receives, or from the nurses' perception of the patients need for services or combinations of the three approaches. Several reviews are available of the validity and application of these staffing systems, the most notable of which is by Aydelotte (1973). Criticisms of these systems have been concerned with the impression that many of them are measuring the time to perform nursing tasks rather than that devoted to the nursing process. They fail, then, to account for indirect patient care, and many are inadequate in their definitions of skill levels required. In spite of this lack of agreement as to their validity, the Joint Commission on the Accreditation of Hospitals' Nursing Service Standard 3, though not specifying any specific approach does state that, "The nursing department shall define, implement, and maintain a system for determining patient requirements for nursing care on the basis of demonstrated patient need, appropriate nursing intervention and priority of care" (JCAH, 1982).

No other research has been reported utilizing the nurse staffing methodology to routinely assign nursing intensity to patients over their entire length of stay. This approach was used, however, in the special study at Yale. In light of the previous discussion (where it is obvious that massive data sets will be required to derive a valid allocation statistic at the DRG level) it would certainly seem that because these data are gathered routinely in many hospitals, an attempt should be made to utilize them to estimate nursing intensity for DRG's. A promising pretest of this approach has been circulated by the Massachusetts Health Data Consortium, 1984.

### **Direct charges to patients for routine nursing care**

Many feel that the assignment of nursing resources to individual patients will not be accomplished until nursing services become a source of hospital revenue as well as a classification of expenses. In other words, specific charges should be levied for all nursing services on all inpatient units. This approach represents a radical change in hospital charging policies because it would separate the routine room rate into at least two sections—hospital hotel services and nursing services with two categories of charges. Such an approach was discussed in the recent Institute of Medicine study on nursing and one paper reporting experience with the model was reviewed (Higgerson and Van Sly, 1982). Neither related the charging system to DRG's, and no studies aimed at deriving a DRG-specific allocation statistic have been conducted that use this approach. It would seem that this system, like the adaptation of the staffing model, would certainly offer a most promising approach to solving the problem of measuring intra- and inter-DRG variability of nursing services at the DRG level.

### **The nursing diagnoses approach**

One of the most imaginative attempts to estimate the intensity of nursing services required by individual patients was explored using the nursing diagnoses

approach (Halloran, in press). Halloran demonstrated that nursing diagnoses better explained variability in the volume of nursing care than did selected DRG's. He stated that more accurate representation of nursing intensity could be gained from the nursing diagnoses than from tracking certain characteristics of the patient (which are used in nursing staffing methodologies). By extension, the nursing care plan projected for the patient during his or her length of stay could serve as the basic element in estimating the intensity of that care.

As intriguing as was this finding, it requires much more development to make it a valid indicator of nursing intensity in the DRG system. In the first place, there must be wider professional acceptance of the nursing diagnosis concept now that there is some general agreement about the accepted list of nursing diagnoses. Secondly, it seems as though some estimate has to be made of the intensity implications of these diagnoses singly and in combination. In other words, some resource values should be attached to the diagnoses similar to those used in the staffing algorithm so that it can be assigned to DRG's. Such research deserves further development, but its application to each of the DRG's would, indeed, take some time.

### **Accounting for nursing services**

It seems possible, then, that any one or a combination of these four approaches might be applied to arrive at an allocation statistic or nursing intensity weight to assign nursing resources expended at the DRG level. All but one approach begs the question of the routine allocation of actual nursing resources. Basic and rather substantive changes must be made in the cost accounting system for nursing care if a more accurate instrument is developed to measure changing patterns of nursing care or to determine whether major changes in medical treatment patterns would result in different patterns of nursing intensity. The first step would be the unbundling of nursing costs from "general inpatient routine service costs" (HCFA-2552-83, D-1). A step in this direction was taken by the hospitals in New Jersey by isolating their acute care unit costs as illustrated in Table 2.

The studies on nursing intensity described in the earlier section of this paper demonstrate the wide variation of nursing care required on the inpatient unit, depending upon the mix of patients. There are those in nursing who feel that the costing problem will not be solved until nursing service becomes a revenue center as well as a cost center and there are specific charges levied for all nursing services in all inpatient units. Without further developing the argument presented above, it can be said that if more accurate costing became the standard, the direct nursing care to patients on regular inpatient units could be isolated and allocated according to several alternative assignment statistics. A proposed allocation scheme to separate nursing costs on the patient floors from hos-

pital hotel expenses was included in the overall DRG costing model illustrated in Figure 1. The rationale behind the model was stated as:

“The nursing and hotel services represent a disaggregation of the basic room and board or ‘routine services’ category currently assigned to each patient based on his length of stay. Such disaggregation is necessary in order to reflect more precisely the consumption of these resources by patients in the different DRG’s. For example, it is not appropriate to levy these (nursing) costs per patient day uniformly to patients with open heart surgery and to patients with acute upper respiratory infection. Each of these services should have its costs allocated to patients on a more precise basis” (Thompson, Averill, and Fetter, 1979).

If, indeed, such a costing exercise were accepted, much more precision would be gained in understanding and applying the DRG costing model to routine nursing services. When joined with the nursing care resources expended in the various special care units, a workable allocation statistic could be developed and implemented.

### Discussion

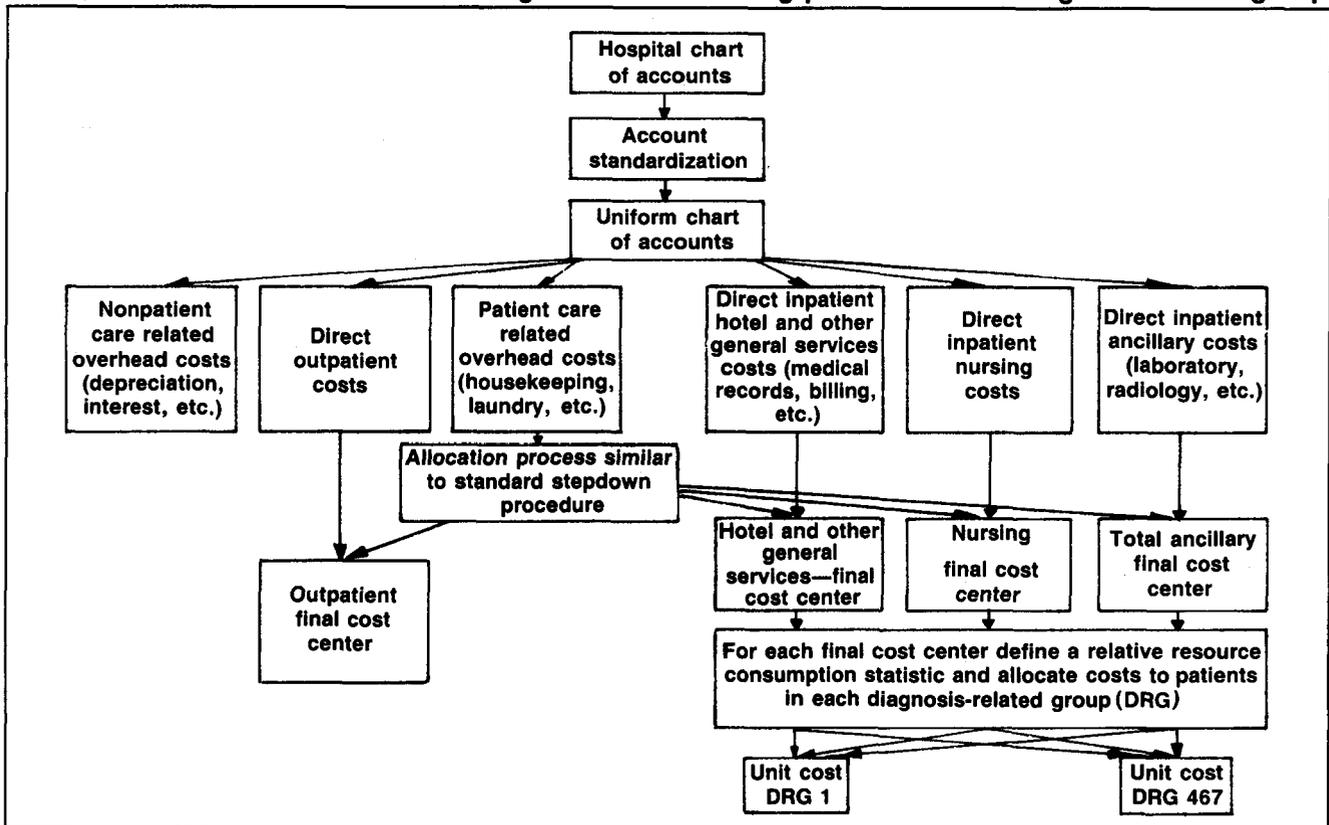
This section covers one weakness in the proposed approaches, will iterate the research strategy of choice at this time, and will outline the policy and manage-

ment implications of the derivation of a DRG-specific allocation statistic for nursing intensity.

Ideally, any nursing intensity measure should contain two factors: the volume of services and the skill level at which they were given. Most of this presentation was concerned with the volume of services given over a single hospital stay. Any allocation statistic so derived will reflect the staffing mix of the study hospitals. A recommended normative mix of registered nurses and other personnel is a matter of much professional concern in nursing. Nurses are fearful that under the DRG payment system, lower paid and less qualified personnel will replace registered nurses on the hospital floors (*Modern Health Care*, 1983). On the other hand, some evidence has been presented claiming that such a substitution would result in false economies (Robertson, 1983 and Christman and Jelmek, 1967), resulting in higher cost for nursing care in the general hospital. The problem is that unless we arrive at volume estimates, we cannot approach the type of cost quality-effectiveness studies at the DRG level so necessary to answer the qualification mix question. It may be that the desired staffing patterns within a hospital depend on the case mix of that institution. DRG’s, then, would add another dimension within which these inquiries could be addressed.

As was suggested earlier, the research strategy of choice would be the extension of existing staffing models to create nursing time estimates for the total

**Figure 1**  
Overview of the method for determining the cost of treating patients in each diagnosis-related group



length of hospitalization for each patient. The main advantage of such an approach is the use (albeit differently) of existing data. Faster startup time is possible because of the minimal rater education process, once the determination is made that accurate and meaningful data are being collected. It is estimated that about 30,000 patients' records would be required to obtain allocation statistics in nursing intensity and examine the variability around these statistics within a single DRG. Such a sample size could begin to consider differences in resource use by day of hospital stay.

The most parsimonious source for such a large data base would be from that now routinely gathered by hospitals.

An additional value of such a strategy would be the elaboration of a methodology which is transportable. Hospitals could conduct their own studies based on their staffing algorithm to determine their experience with nursing intensity.

The policy and management implications of the ability to include nursing intensity as a separate factor in the DRG algorithm are a bit more complex. Because nursing costs have been included in total costs, however sloppily, it is difficult to predict how much the relative value of the individual DRG cost weights will be affected by such an additional refinement. The DRG payment system, on the other hand, is based on the premise that to contain total case costs, all important subsets of that cost must also be contained. If an important component of case costs (nursing costs) cannot be measured, it weakens the structure of the total program.

Changes in the management of hospitals in response to the DRG payment system are already being developed. Each component of a hospital's experience in treating patients within high volume DRG's is being examined, including X-ray films, laboratory examinations, and operating room times. Budgets are being projected on the basis of anticipated DRG volume and mix. Unless the important component of nursing care can be measured, projected, and monitored, the hospitals cost control model may not be including from 20 to 30 percent of care costs.

It should not be felt that the total purpose of generating nursing intensity measures is to strengthen the DRG payment system by the inclusion of nurse staffing costs. The DRG management system envisions many other applications of DRG costing, varying from budgeting to the bases of transfer prices to clinical firms and the creation of a research tool that could make more sophisticated assessments of the value of nursing in patient care altogether. It is sincerely hoped that research into nursing intensity will continue, so that management of this important and costly resource can be related to the overall goal of quality patient care in a cost-effective fashion.

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