
Planning, Budgeting, and Controlling— One Look at the Future: Case-Mix Cost Accounting

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This paper outlines the system for cost accounting and managerial control which is an extension of the usually accepted departmental costing systems and takes as its units the 383 Diagnosis Related Groups (DRGs) considered to be the hospital's products. It is held that such an approach offers hospital managers a more powerful, analytic, budgeting, and cost-finding tool and offers the opportunity to involve the medical staff in the issues of how their practice patterns are affecting hospital costs.

WHATEVER may be the exact role of the government in controlling the costs of hospital care, one factor is clear: the government will substitute some form of prospective reimbursement for the present form of retrospectively adjusted payment based on "reasonable cost." It makes little difference from a management viewpoint whether this reimbursement is negotiated with third party payers, including the various levels of government, or whether the rate is set by government, be it state, regional [1], or federal [2]. Prospective reimbursement in any form requires the health care manager to prepare budgets which can provide comparisons between actual experience and projected estimates which are accurate enough to provide managerial control over costs and revenue during the period covered by the prospective

rate. Further, these budgets, based on past experience, must be sufficiently sensitive to permit meaningful variance analyses when there is no agreement on a high order in these comparisons of actual and projected costs.

Many hospital managers, according to Holder [3], cannot generate such a budget at this stage in the development of the art of hospital financial management. The purpose of this paper is to present a new approach to cost finding and budgeting which satisfies the requirements of accuracy and sensitivity of management's financial information and which, further, is based on the costing and budgeting system used by most hospitals today. This extension of the present system is directly aimed at Enthoven's [4] "key issue in health care costs," which is to "motivate physicians to use hospital and other

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resources economically." Further, it attempts to develop one approach to the design of a system which satisfies Griffith's [5] requirement that the system "document the relationship between medical and administrative decisions."

One important objective of hospital costing and budgeting systems is the understanding and control of hospital costs. Costs here are defined as "... hospital expenses: a) specifically classified by a standard chart of accounts; b) allocated directly or distributed according to a uniform method of apportionment; and c) transformed into unit costs by dividing them by consistently defined and generally accepted units of service" [6]. Traditionally, the organizational settings in which cost control has proved most successful are those which have dealt with the provision of well-defined products or services with a predictable set of associated costs. The process of cost control in such settings basically entails monitoring resource and cost consumption during the production process in order to insure agreement with expected levels. The provision of different combinations of products or services results in differing levels of total resource and cost requirements.

The fundamental problem which must be solved, if effective resource and cost control is to be achieved within hospitals, is to define in a precise and manageable way the services provided by hospitals. It is not a useful observation simply to say that hospitals provide "patient care." What hospitals provide is patient care of various kinds and intensities over various durations based on the needs of the patients they treat. The total patients treated can be classified, based on selected clinical and demographic characteristics, into patient classes which consume the resources of the hospital

in a similar manner. This would provide a categorization of the services provided by a hospital and establish a product definition. Such a definition of hospital services allows the resources utilized and the costs incurred to be related directly to the types of patients the hospital treats. In other words, the relationship between the case mix of the hospital, the resources it consumes, and the costs it incurs, is established.

The Yale University Center for Health Studies has developed such a patient classification scheme. Through a classification technology [7,8], 383 mutually exclusive and exhaustive patient classes have been evolved and are currently undergoing testing and evaluation as a basis for utilization review, prospective reimbursement [9], and hospital budgeting systems [10-13]. This patient classification unit is referred to as a Diagnostic Related Group (DRG). There are three basic properties of the DRG patient classification scheme: 1) there are a manageable number of patient classes—a total of 383 DRGs; 2) each DRG is medically meaningful, i.e., there is an underlying patient care process which, in the main, follows the accepted practices of a specific field of medicine; and 3) the DRGs demonstrate a statistically stable distribution of resource use within the universe of patients treated by the hospital. Thus, the DRGs provide a means of establishing a hospital case mix by determining the relative number of patients discharged within each diagnosis-related group.

Since it is theorized that variations in resource consumption and costs across different hospitals are basically caused by differences in case mix, differences in treatment patterns for similar cases, or varying degrees of institutional inefficiencies, the DRGs, originally developed to assist in the rational implementation of utilization

review, were soon adapted to provide a meaningful unit of comparison between the consumption of resources and the costs of care between different institutions. Within a single institution, DRGs provide a means of controlling for the different types of patients in order to isolate different modes of treatment, institutional inefficiencies, and the effect on costs of changes in the volume of various patient classes treated. Like most service organizations, hospitals have little direct control over the type of patients they treat. To a certain extent, the type of patients the hospital treats depends upon the clinical specialties of its staff and the availability of special types of facilities; but a hospital treats the patients who require care and, thus, is prone to random fluctuations in case mix which it cannot control. However, hospitals are unique among service organizations in that the management lacks direct control over the consumption of the institution's resources, even within these classes. That is the responsibility of the physicians.

Case-Mix Accounting

In order to meet the demands for financial information, hospitals typically have in operation two distinct accounting systems. Through established accounting procedures, the hospital's financial accounting system can determine its financial condition. The balance sheet, income statement and funds flow statement provide a means of determining the hospital's financial and cash position at any point in time or across any time period.

Hospitals also maintain a managerial accounting system to provide financial information for internal management purposes. Traditionally, hospital managerial accounting has been responsibility oriented at the departmental

level. The hospital's managerial accounting system provides the financial information necessary for department heads to plan and run their departments. Thus, the department heads of nursing, medical records, laboratory, etc., are responsible for the financial integrity of their own departments. As a set of managerial tools to fix responsibility at the department level, this managerial accounting system must be maintained.

Two other uses of departmental accounts are central to the main concern of case-mix accounting and should also be mentioned. Most measurements of productivity, for example, manpower minutes per meal or direct cost per radiological examination, are derived from departmental accounts. One method used in estimating fixed and variable costs preliminary to the DRG type of analysis may be the departmental aggregate of each expense account [12]. Since each department contains a different proportion of many of these accounts, every cost center ends up with a different fixed variable cost ratio. However, departmental finances deal with patients in the aggregate and not on an individual basis. Thus, departmental managerial accounting has typically lacked an integrated view of the financial responsibility and implications of treating individual patients.

Since the care of patients is the basic service of a hospital, the goal of case-mix cost accounting is to provide a complete financial picture of the costs of treating individual patients grouped into similar classes based on use of resources. Under the traditional organization structure of a hospital, there is no department delegated the specific responsibility of assuring that individual patients are financially well managed. The individual physician is the one who coordinates the various hospital services and departments in

order to provide effective patient care. A case-mix cost accounting system will provide an integrated picture of the financial consequences of providing this care to individual patients.

Any comprehensive model for hospital management must address the requirement of five distinct financial functions. It is felt that the future application of case-mix cost accounting will permit new insights into 1) cost finding, 2) cost projection, 3) cost control, 4) charging policies, and 5) reimbursement policies.

Cost Determination and Budgeting of the DRGs

Figure 1 shows the process, for an individual hospital, of determining the cost of treating patients in each of the DRGs. In the financial accounting system there will be a chart of accounts which contains the historical financial information of the hospital. Each account corresponds to an amount of money that was spent or received for a specific purpose. The number and type of accounts will vary among hospitals depending on the services each hospital offers. If a collection of hospitals is to be analyzed through a case-mix cost accounting approach, it is necessary to standardize the individual hospital chart of accounts into a uniform chart of accounts which will allow the individual components of the DRG cost to be comparable across hospitals.

The types of accounts in a typical hospital chart of accounts are categorized into six distinct areas: 1) outpatient accounts; 2) nonpatient care related overhead accounts; 3) patient care related overhead accounts; 4) room, board, and other routine (here called hotel) accounts; 5) nursing accounts; and 6) ancillary accounts.

Figure 2 shows a typical chart of accounts partitioned into the six major hospital service areas. The DRGs cur-

rently encompass only the inpatient population, and the hospital outpatient costs are not included in the DRG costs.

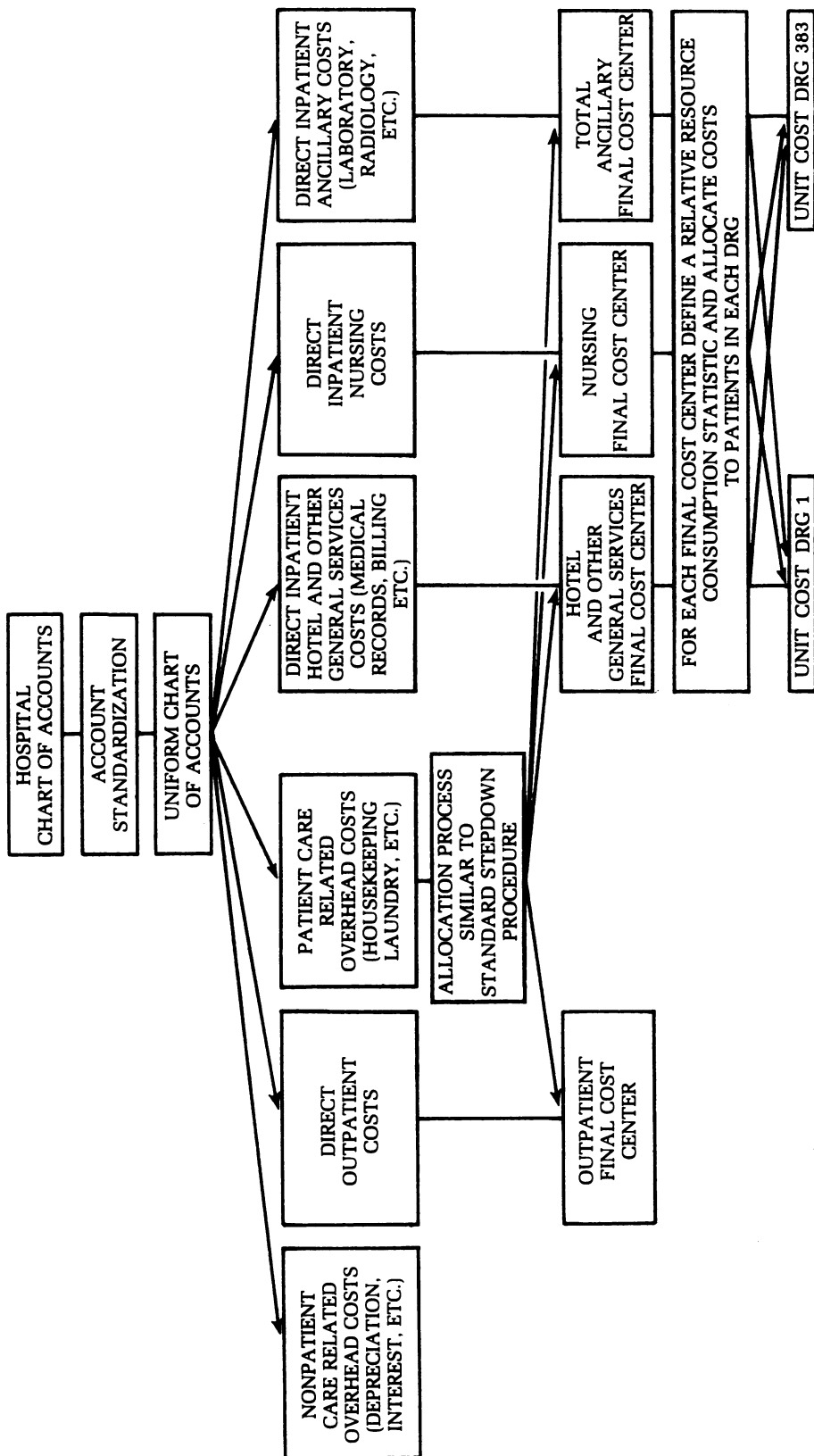
Overhead accounts are costs incurred by the hospital in its general operation, but are either not related or only indirectly related to the provision of inpatient care. Depreciation and interest charges are examples of overhead costs which are not related to patient care and, therefore, not included in selected applications of DRG cost data, although they can be considered in cost finding at the individual hospital level.

Two of these accounts alone (depreciation expense and interest expense) comprised, on the average, 5.43 percent of total operating costs in Connecticut's hospitals in fiscal year 1976. Furthermore, there was substantial variation in this percentage among these hospitals, from a high of 13.62 percent to a low of 2.48 percent of total operating expenses [14]. This variation is not significantly correlated with case-mix intensity.

Nonpatient care related overhead was included in the cost data for three of the five financial functions mentioned earlier, i.e., 1) cost finding, 4) charging policies, and 5) reimbursement policies. These classifications of accounts were not included in cost projections (budgeting) and are, therefore, absent from the cost control data used in the budget reconciliation since they are treated separately in the budgeting process.

Other overhead accounts, such as housekeeping or laundry, are indirectly related to the provision of patient care and are included in all DRG costs. In other words, the definition of the overhead accounts, which are considered as patient care related versus nonpatient care related, can vary depending upon the use to which the case-mix cost accounting system is put. The remaining three types of accounts, i.e., hotel and other general services, nursing, and

Figure 1:
Overview of the Method for Determining the Cost of Treating Patients in Each DRG



ancillary services, can all be directly related to patient care. These three types of accounts, with the addition of the outpatient account, will be referred to as final cost centers, since the services associated with these accounts can be directly related to individual patients allowing their costs to be apportioned to each patient. Many of the final cost centers will correspond closely to the responsibility centers in the hospital's managerial accounting system.

The Cost-Finding Process

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 a disaggregation is necessary in order to reflect more precisely the consumption of these resources by patients in the different DRGs. For example, it is not appropriate to levy these 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.

The patient care related overhead services cannot be directly levied as costs to patients. The costs of the patient care related overhead services must, therefore, be recovered through the final cost centers. As shown in Figure 1, the costs of the patient care related overhead services are apportioned to the final cost centers through an allocation process similar to the standard hospital accounting step-down procedure. Figure 2 provides an example of the allocation statistics which can be used as the basis for this allocation.

The overhead allocation process is circular in nature, with the overhead accounts being allocated simultane-

ously to each other before ultimately being allocated to the final cost centers. The standard stepdown method only approximates this circular behavior and, thus, does not preserve the identity of the original source of every dollar allocated to the final cost centers. In order to deal precisely with the circular nature of the allocation process, a special allocation algorithm was developed which generates a set of linear equations whose solution provides the identifiable fraction of each account allocated to each final cost center [12].

The direct costs of each final cost center and the portions of the cost of the patient care related overhead accounts allocated to each final cost center represent the total cost of providing the service associated with each final cost center. As shown in Figure 1, an allocation statistic is associated with each final cost center and used as the basis of apportioning the costs to the patients in each of the DRGs. Figure 2 indicates the allocation statistic used for each of the final cost centers. The cost of admitting is allocated to patients by dividing the total cost of the admitting final cost center by the number of discharges in the period and allocating a uniform cost per case. Billing costs are allocated to patients based on the dollar amount billed for all special services, since this measure closely approximates the transactions volume required for the bill and is easily obtained from the patient record.

An analysis of the type of meals and the relative cost of each meal type has resulted in the development of a per diem dietary weight for each of the DRGs. The product of a patient's length of stay and the appropriate dietary weight provides a measure of the relative consumption of dietary resources. By normalizing this dietary measure across all patients, the costs of the

dietary final cost center can be allocated to the individual patients. Most other hotel services are allocated to patients based on a uniform per diem.

The cost of medical records is allocated to patients based on the number of weeks of stay. The relative medical records workload per patient was found to increase in a stepwise fashion with each additional week of stay. For the house staff and social services final cost centers, the number of residents or social workers assigned to each hospital service is known as well as the hospital service on which each patient received his or her care. Weights for each hospital service can be developed based on the relative number of residents or social workers assigned to each service. The product of the patient's length of stay on each service times the weight for that service provides a measure of the relative consumption of house staff and social service resources.

For the nursing final cost center, 25 nursing activities were defined and the number of minutes of nursing time required for each of these activities determined [13]. A study was performed in which the number of these activities performed for each patient was recorded for each nursing shift. From this data, a per-diem nursing weight for each DRG was developed. By normalizing the product of a patient's length of stay and the appropriate nursing weight across all patients, the cost of nursing can be allocated to the individual patient.

Finally, the cost of each of the ancillary service final cost centers is allocated based on the normalized charges levied for each of the ancillary services. The practice of hospitals in measuring and charging for minutes of operating room time, relative laboratory units consumed, relative radiology units consumed, etc., all based on standard

measures of differential resource requirements, make the individual relative ancillary service charges an effective basis for the allocation of costs to the patient classes [10].

While all of the allocation statistics possess some defects, they are designed to reflect more equitably the quantity of an institution's resources consumed by the patients in each DRG. As better allocation statistics become readily available, they can easily be incorporated into the methodology.

Cost Finding and Analysis

Series of management reports can be derived from case-mix cost accounting which will permit management to identify those factors which seem to be operative in explaining the differences between historical costs, i.e., cost variations from year to year. Four such examples are given (Tables 1, 2, 3, and 4) to illustrate the kinds of insights that can be gained by management by analyzing the behavior of these DRGs. They illustrate the application of this information both to cost explanation and to rate setting and reimbursement policies.

These management reports consist of a summary and a detailed report of yearly charges in costs by each DRG by the various cost centers. The second illustration, DRG 131 (Table 2), Arrhythmia and Slowed Conduction with the Insertion of Heart Device, contains both types of reports. Since the purpose of both reports is for internal management, all costs including nonpatient care related overhead costs were allocated to the DRGs.

It is obvious from examination of the first example, DRG 282 (Table 1), Delivery with Complications with Caesarean Section, that the reason for the large cost increase is a substantial change in volume. A review of the related DRGs, i.e., Caesareans without Complications

Table 1:
DRG 282, Delivery with Complications with Caesarean Section

	Volume & Cost 1975	Volume & Cost 1976	Difference	Percent Change
Number of Patients	255	329	74	29.02%
Number of Bed-Days	1,752	2,200	448	25.57
Average Length of Stay	6.87	6.69	-0.18	-2.62
Total Cost	\$293,889.31	\$404,309.50	\$110,420.19	37.57
Cost per Case (Unit)	1,152.51	1,228.90	76.39	6.63
Cost per Day	167.72	183.81	16.09	9.59
Total Charges	344,052.94	470,027.54	125,974.60	36.61
Average Charges per Case	1,349.23	1,428.66	79.43	5.89
Ratio: Costs/Charges	0.85420	0.86018	—	—
	<u>Total</u>	<u>Accounted for by Volume</u>	<u>Accounted for by Unit Cost</u>	<u>Unexplained Interaction</u>
Cost Change	\$110,420.19	\$85,285.50	\$19,481.23	\$5,653.46
Percent of Total	—	77.24	17.64	5.12

and Normal Deliveries, reveals fewer such cases, resulting in a shift in the pattern of deliveries at the hospital. Whether the increase in Caesareans is due to more frequent intervention in response to some of the new fetal monitoring techniques is not known at this time, but this new trend will have to be tracked.

The actual difference in the unit costs over the two periods was only 6.63 percent, and a review of the cost centers indicates that the main contributors to these increases were in hotel, operating room, anesthesia, laboratory, and medical-surgical supply costs. Nursing costs, which make up about 35 percent of the total cost of the DRG, actually declined. The financial implications of this volume change to the hospital (\$85,286 in total costs) illustrate the fairly dramatic influence changes in volume of selected DRGs can have on a hospital's financial picture, both at the cost and charge level.

The next example, DRG 131 (Table 2) Arrhythmia and Slowed Conduction with the Insertion of Heart Device, illustrates the role of technology on cost.

As far as volume of patients treated is concerned, this is a fairly stable DRG, there being a difference of only two patients between the two years. In spite of this close agreement, there was a \$175,042 (64.6 percent) difference in the total cost experience for this DRG. Table 3 examines this by each cost center and indicates differences in the way patients were treated in the hospital during the two years.

This change in the detailed treatment pattern for DRG 131 resulted in a longer length of stay and a consequent increase in nursing costs. More of these patients received their postoperative care in the intensive care unit rather than the coronary care unit. Laboratory costs increased for this DRG far more than the average of all DRGs for this period. The most notable increase in dollars, if not percentage, is the cost of the device itself, which is reflected in the medical-surgical supplies cost. The exact reason for this \$1,184 change per case must be identified in any cost control examination.

Table 2:
DRG 131, Arrhythmia and Slowed Conduction with Insertion of Heart Device

	Volume & Cost 1975	Volume & Cost 1976	Difference	Percent
Number of Patients	69	71	2	2.90%
Number of Bed-Days	629	833	204	32.43
Average Length of Stay	9.11	11.73	2.62	28.76
Total Cost	\$271,037.87	\$446,079.69	\$175,041.82	64.58
Cost per Case (Unit)	3,928.09	6,282.81	2,354.72	59.95
Cost per Day	431.21	535.42	104.21	24.17
Total Charges	269,103.87	370,307.90	101,204.03	37.61
Average Charges per Case	3,900.06	5,215.60	1,315.54	33.73
Ratio: Costs/Charges	1.00719	1.20462	—	—
	<u>Total</u>	<u>Accounted for by Volume</u>	<u>Accounted for by Unit Cost</u>	<u>Unexplained Interaction</u>
Cost Change	\$175,041.81	\$7,056.17	\$162,470.12	\$4,709.48
Percent of Total	—	4.49	92.82	2.69

Table 3:
DRG 131, Arrhythmia & Slowed Conduction with Insertion of Heart Device

Final Cost Center	Unit Cost 1975	Unit Cost 1976	Difference	Percent Change
1. Dietary	\$ 56.28	\$ 72.95	\$ 16.67	29.60%
2. Admitting	20.45	23.43	2.98	14.60
3. Billing	139.46	209.72	70.26	50.40
4. Hotel	117.23	167.21	49.98	42.60
5. Nursing	516.84	630.50	113.66	22.00
6. House Staff	53.23	68.98	15.75	29.60
7. Medical Records	14.57	23.33	8.76	60.10
8. Social Services	11.03	16.54	5.51	50.00
9. Newborn Intensive Care	—	—	—	—
10. Intensive Care	9.36	208.03	198.67	2,122.50
11. Coronary Care	305.92	288.01	-17.91	-5.90
12. Operating Room	176.11	206.05	29.94	17.00
13. Recovery Room	5.20	11.43	6.23	119.80
14. Anesthesia	129.88	162.42	32.54	25.10
15. Delivery Room	—	—	—	—
16. Diagnostic Radiology	128.89	210.41	81.52	63.30
17. Radioisotopes	4.90	10.37	5.47	111.60
18. Radiotherapy	—	2.34	2.34	—
19. Laboratory	198.11	473.44	275.32	139.00
20. EKG, EEG	38.66	45.28	6.62	17.10
21. Med-Surg Supplies	1,782.37	2,966.98	1,184.61	66.50
22. Physical Medicine	9.42	22.57	13.15	139.60
23. Respiratory Therapy	30.65	110.69	80.04	261.10
24. IV Therapy	28.30	49.49	21.19	74.90
25. Pharmacy	85.49	213.88	128.39	150.20
26. Renal Dialysis	23.60	39.77	16.17	68.50
27. Renal Transplant	—	—	—	—
28. Urology	—	—	—	—
29. Emergency Room	10.06	13.59	3.53	35.10
30. Clinics	2.12	2.54	.42	19.80
31. Outpatient	—	—	—	—
32. Miscellaneous	29.95	32.87	2.92	9.80

The last DRG illustrated is 321 (Table 4), Immaturity, Hyaline Membrane Disease or Conditions of Infancy with Secondary Diagnoses. A review of the statistics also reveals a 9 percent increase in length of stay for this case which, though it contributed to the difference between the 1975 and 1976 costs, did not explain all of the increases in the unit cost.

The staff in the perinatal intensive care unit claimed that most of this cost increase was due to the fact that the patients treated in this fiscal year were, indeed, "sicker" than those of the year before. A review of the statistics of patients within those DRGs usually treated in the perinatal intensive care unit revealed a shift from the less complex to the more complex cases. The findings may indicate that, in spite of actual stable volume of complicated cases treated in the perinatal ICU, some of the cost increases may be due to the fact that the shift in case mix altogether increased the costs of operating the unit. A more disturbing finding is the most unfavorable charging, rate setting, and reimbursement position based on the ratio of costs to charges. This is particularly true if the hospital were to be reimbursed on a cost or charge basis, whichever is less. It is obvious from this review that the charges for the use of the perinatal intensive care unit have not increased to reflect costs, leaving the hospital in a very dangerous fiscal position. This DRG, then, both from a cost and charges aspect, is out of control.

The three examples cited, though illustrating the kinds of analyses which can be carried out at the specific DRG level, do not indicate the wide variation in costs over all DRGs. The DRG individual unit costs in the test hospitals typically varied by more than a hundred fold. The following DRG costs illustrate this variation:

DRG		Typical 1976 Unit Cost
127	Ischemic Heart Disease Except Acute Myocardial Infarction with Shunt or Other Major Operation	\$9,934
187	Gastric and Peptic Ulcer with Gastric Resection or Other Major Operation with a Secondary Diagnosis	\$7,362
112	Otitis Media, Chronic Mastoiditis or Otosclerosis without Any Operation	\$ 264
273	False Labor without Any Operation	\$ 89

Even within a specific diagnostic area, the DRGs provide a high degree of cost discrimination. For example, patients with a primary diagnosis of urinary calculus encompass four DRGs with the following typical 1976 unit costs:

Urinary Calculus DRG		Typical 1976 Unit Cost
239	Without an Operation or Secondary Diagnosis	\$ 394
240	Without an Operation with a Secondary Diagnosis	\$ 774
241	With Minor Operation such as Cystoscopy or Catheter to Kidney	\$1,032
242	With Major Operation such as Nephrotomy, Cystotomy or Ureterotomy	\$2,293

Thus, even within this narrow diagnostic area, the unit costs across DRGs varied by nearly a factor of six. It is held, then, that if cost finding and cost explanation in hospitals are to be carried out with any rigor, it must be approached at the DRG level.

Hospital Budgeting

The full case-mix cost accounting approach, consisting of cost control and cost projection (budget formulation), has been applied in one test hospital. The unit costs, i.e., average cost per patient, in each DRG were

determined in the initial year. In order to establish the following year's budget [15] by DRGs, it was necessary to 1) project the hospital's case mix, and 2) apply the appropriate anticipated personnel and material inflation factors. In these projections, nonpatient care related overhead (a portion of fixed costs) was removed from the cost data. Deviations from the budget due to case mix could then be detected and the established unit costs isolated. This portion of overhead amounted to 11.45 percent of hospitalwide total costs for inpatient services.

Although experience in projecting and budgeting is very limited at this stage of development, two or three characteristics emerged from the study. The first is related to the relative stability of volume projections on the number of patients treated within each DRG. The second accents the relative importance in the cost projections of relatively few DRGs.

When budgeted and actual volumes across DRGs were compared, the fol-

lowing observations resulted. Overall, the hospital treated some 35,729 inpatients in fiscal year 1976, or 82 patients less than projected. The budgeted median size of a DRG was 46 patients, while the actual median size was 47 patients. A review of the frequency distributions on patient volume by DRG indicates that 267 DRGs, or 65 percent, experienced a positive or negative volume change of less than 10 patients. More than 85 percent of all DRGs fell within a volume change of less than 20 patients.

As historical data on the volume fluctuation of these DRGs is gathered, more accurate predictions can be drawn. It must be remembered that these present projections were made on the basis of just one year of historical DRG data. Of particular interest is the finding that a majority of the 16 DRGs with an absolute volume change of 50 or more patients were related to birth, babies, and young children. We are all familiar with the downward trends in some, and outpatient treatment in

Table 4:
DRG 321, Immaturity, Hyaline Membrane Disease, Other Major Diseases or
Conditions of Infancy with Secondary Diagnosis

	Volume & Cost 1975	Volume & Cost 1976	Difference	Percent Change
Number of Patients	216	202	-14	-6.48%
Number of Bed-Days	2,409	2,461	52	2.16
Average Length of Stay	11.15	12.18	1.03	9.24
Total Cost	\$382,082.56	\$553,365.81	\$171,283.25	44.83
Cost per Case (Unit)	1,768.90	2,739.43	970.53	54.87
Cost per Day	158.58	224.85	66.27	41.79
Total Charges	354,386.56	403,830.06	49,443.50	13.95
Average Charges per Case	1,640.68	1,999.19	358.51	21.85
Ratio: Costs/Charges	1.07815	1.37027	—	—
	<u>Total</u>	<u>Accounted for by Volume</u>	<u>Accounted for by Unit Cost</u>	<u>Unexplained Interaction</u>
Cost Change	\$171,283.25	\$-24,764.61	\$209,635.31	\$-13,587.47
Percent of Total	—	-14.46	122.29	-7.90

others, of these conditions. Close investigation of future projections will have to be considered.

Overall, 70 percent of the DRGs were budgeted too low, while only 30 percent were budgeted too high. This reflects the fact that costs increased at a faster rate than anticipated.

Another finding was the contribution of relatively few DRGs to the total financial picture. There were 12 DRGs with unit costs above \$5,000, and although they represent 3.5 percent of all DRGs and 144 patients (3.20 percent of all patients treated), they accounted for 20 percent (\$10,107,710) of total expenditures in fiscal year 1976.

A comparison of the budget forecast for fiscal year 1976 with the cost comparison between fiscal years 1975 and 1976 is somewhat clouded because of the different cost base used in the two exercises. The cost comparison included all costs, while the budget projections excluded nonpatient care related overhead. The basic data on the three examples are included in Table 5, along with the data for all DRGs. Although there is some improvement in

predicting changes in cost by using the budgeted projections, much more must be done if these budgets are to become more useful management tools for cost control than simple year by year cost comparisons.

Conclusions

One could say that this future extension of financial management in the area of planning, budgeting, and cost control is just an exercise in flummery. Purists might hold that the cost allocation system for hospitals is altogether too shaky to allow for further extensions beyond departmental costing. Classical economists would buttress this criticism with their general caveat concerning the difficulty of pricing single products in a multiproduct firm.

It is not held that allocation of patient care related overhead is perfect as yet. Further refinements of the allocation process should allow a more equitable distribution of this rather sizeable block of expenses. However, it is held that a very valuable management tool for the future is being developed and

Table 5:
Volume & Cost Comparison & Budget Reconciliation on Volume & Cost per Case

	Volume							
	All DRGs		DRG 282		DRG 131		DRG 321	
	Number of Patients	Number of Patients	Number of Patients	Number of Patients	Number of Patients	Number of Patients	Number of Patients	
Fiscal Year 1975	35,691	—	255	—	69	—	216	—
Projected 1976	—	36,549	—	272	—	69	—	232
Fiscal Year 1976	35,729	35,729	329	329	71	71	202	202
Percent Change	0.11	-2.24	29.02	20.96	2.90	2.90	-6.48	-12.93

	Cost per Case							
	All DRGs		DRG 282		DRG 131		DRG 321	
	Cost Comparison	Budget Reconciliation	Cost Comparison	Budget Reconciliation	Cost Comparison	Budget Reconciliation	Cost Comparison	Budget Reconciliation
Fiscal Year 1975	\$1,422	—	\$1,153	—	\$3,928	—	\$1,769	—
Projected 1976	—	\$1,307	—	\$1,060	—	\$3,712	—	\$1,812
Fiscal Year 1976	\$1,598	\$1,416	\$1,228	\$1,127	\$6,283	\$5,554	\$2,739	\$2,479
Percent Change	12.38	8.34	6.50	6.32	59.95	49.62	54.83	36.81

that determining cost and revenue in terms of the diagnostic mix of the hospital has enormous implications, both at the level of the individual hospital and for reimbursement patterns and cost comparisons across hospitals. There can be little invocation of cost controls at the state or regional level without valid comparisons across hospitals which correct for case mix [16].

If we will return to the three concerns expressed at the beginning of this paper, i.e., the inability of hospitals to identify a product, the absolute necessity of influencing physician behavior, and the ability to link medical and administrative decisions, it is held that a case-mix cost accounting system does address these issues.

Implications of changes in product or diagnostic mix can clearly be identified and planned under this system. The implications of actual or proposed changes in diagnostic mix can be estimated. Whether these changes be additive or negative changes, or additive in some areas and negative in others, makes little difference; all can be approached by the same methodology. The financial implications of these changes and their consumption of specific resources by type and kind can be understood. This can only be done if one can generate from the total population a series of describable "patient products" which use similar resources.

The implications of changing or different patterns of medical practice can be identified. It is felt that these implications can be stated in terms which both physicians and administrators can understand. The implications of the way physicians allocate resources and the consequences of that allocation

process on the administrator's concern with the finances of the hospital can now be explained in terms more meaningful to the physician than nursing costs per day or raw food costs per meal. Whether this will result in a change in the behavior of either is another question, but the main problem now is that we can test whether or not the increased information and subsequent education can change the physician's allocation behavior or that of administration. Our existing departmental costing mechanisms do not permit the physician to make the connection between pounds of laundry per day and the way he is treating certain patients, and, up until now, this inability has too often been termed irresponsibility by those managing the hospital. What is needed is a way to enter into a new era of understanding costs by both management and medical staff at the hospital level.

More importantly, the case-mix accounting approach supplies a basic link between financial management, utilization review, and quality measurement. When dollars (operating or capital) and end results can be related to populations, then an integrated health services management system may, for the first time, be possible. When the three mandated control systems now in place—the PSROs for utilization, the HSAs for community planning, and the various state commissions for cost control—and the hospitals themselves are using the same patient related unit and a common data base on the way these units behave, perhaps the intractable problem of soaring hospital costs can be understood and approached.

Therein, lies the future.

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