

**THE MULTIPLE HEALTH CARE  
APPLICATIONS OF  
PATIENT MANAGEMENT CATEGORIES**

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## THE MULTIPLE HEALTH CARE APPLICATIONS OF PATIENT MANAGEMENT CATEGORIES

Historically, clinical and epidemiological data have not been used very effectively in hospital management or in the assessment of health systems. Nevertheless, using patient data to measure case mix differences among hospitals has been recognized for some time as a critical ingredient not only for achieving more equitable payment but for improving hospital management through institutional planning and quality assessment. A case mix measure is only useful, however, to the extent that it is consistent with the medical care process. That is, analyses of morbidity, mortality, and costs are most useful and appropriate when they are based on a medically meaningful approach to classification.

The linkage between patient data and hospital management has not been made effectively using most patient classifications, including Diagnosis Related Groups (DRGs). This is primarily because the individual patient categories in these classification systems are not clinically specific enough to be both interpretable by physicians and useful in predicting total resource use or hospital costs. Patient Management Categories (PMCs), however, do provide an analytic tool for physicians because of their clinical specificity and can be used effectively by hospital management and large public and private payors in examining the costs, utilization, and quality of health care. The performance of Patient Management Categories in these areas is the subject of this paper.

### BACKGROUND AND OVERVIEW

Patient Management Categories, like DRGs, are a diagnosis-based patient classification and, also like DRGs, their development was partially funded by the U.S. federal government. There are, however, some fundamental differences between the two systems. DRGs were statistically defined using data on length of stay and hospital charges to predict resource use. It is commonly agreed that they are not clinically specific, nor do they account for severity differences among patient types and comorbidity (patients having more than one condition being managed in a single hospitalization). In contrast, Patient Management Categories were first defined by physicians and then applied to data. They combine all of the important dimensions of case mix into one system--severity and comorbidity--as well as the intensity of hospital resources required and used to manage clinically specific patient types.

The original objective of developing Patient Management Categories and the cost-based weighting scale associated with that classification was to measure the relative costs of a hospital's unique case mix in a way that is consistent with the medical care process. In order to accomplish this objective, the following analytic tools were developed:

**PATIENT MANAGEMENT CATEGORIES**--A computerized patient classification, developed with extensive clinical input from physician panels, that incorporates severity of illness distinctions and defines comorbidity more specifically than other classifications;

**RELATIVE COST WEIGHTS**--A set of cost-based relative weights (one for each PMC) that reflects the relative intensity of physician-specified services for that case type and intensity/severity weights (one for each patient) based on the particular disease conditions and complications of a particular patient (whether single disease or comorbid); and

**PATIENT MANAGEMENT PATHS**--Physician-specified clinical management strategies (one for each PMC) which consist of diagnostic and treatment services for effective care of the typical patient in each PMC.

This case mix system was designed to permit comparative hospital cost analyses and to be used in hospital payment systems. In addition, the distinct parts of the system (i.e., categories, management strategies, and relative weights) provide the tools necessary to link hospital clinical and financial information systems and to conduct effective institutional planning, utilization review, and quality assessment.

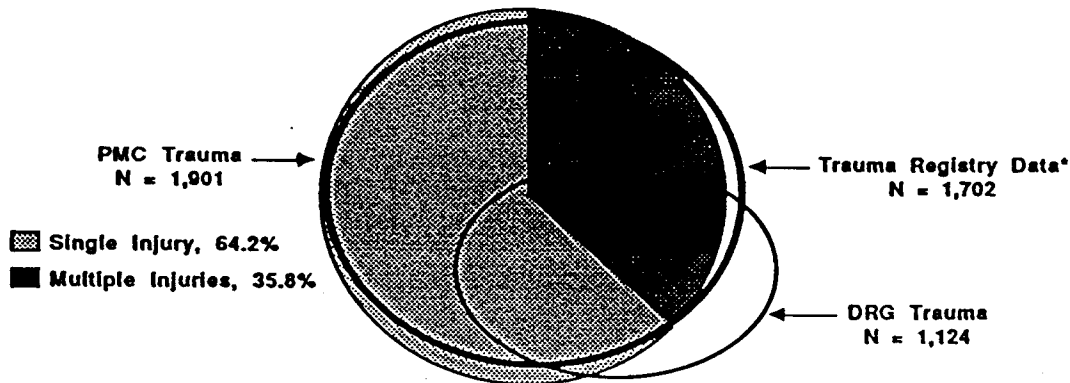
Although the data elements used for PMC Classification are the same data elements used by the DRG grouper, there is a critical difference in the way diagnosis and procedure codes are used by each of the two computer algorithms. The DRGs are primarily driven by the one diagnosis code identified as principal on the patient's discharge abstract even though secondary diagnoses are also used in some cases. In contrast, the PMC computer algorithm disregards the sequence of diagnosis and procedure codes, scans all codes, and uses combinations of interrelated diagnoses and procedures in making the appropriate PMC assignment(s). The consequence of the PMC assignment process is a much more refined sorting of patients than the DRG system achieves.

An example of the different classification results that are obtained using PMCs versus DRGs is shown in Figure 1. Using the same database to start, trauma patients were identified separately using PMCs (n=1,901) and DRGs (n=1,124) and results were compared to the patients included in a statewide trauma registry that included additional clinical data (n=1,702). The large shaded circle represents the single and multiple trauma patients identified by PMCs (64.2 and 35.8 percent, respectively); the small circle represents the patients identified as injuries using DRGs. Using the statewide registry data as the criterion or gold standard, 97.7 percent of all hospitalized trauma patients at one Level I trauma center were accurately identified using PMCs, whereas only 48.6 percent of all hospitalized trauma patients were identified as such by DRGs.

Only 2.3 percent of trauma patients included in the statewide registry were not identified as trauma cases using PMCs and discharge abstract data. In contrast, using the same discharge abstract data and DRGs, more than half of the injured patients (51.4 percent) were not identified as injuries at all. Primarily because DRG assignment is driven by the one diagnosis code identified as principal, these injured patients were assigned to approximately 80 DRGs that are not trauma related, ranging from medical back problems and bone and joint disorders to gastrointestinal obstruction. Note also on Figure 1 that multiple trauma patients can be differentiated from patients with single injuries using PMCs, but no such distinctions can be made using DRGs.

Figure 1

### Identification of Trauma Patients PMCs versus DRGs



\*Of trauma registry injuries,  
 97.7% were identified by PMCs  
 48.6% were identified by DRGs

Source: Allegheny General Hospital  
 The Pittsburgh Research Institute

## APPLICATIONS

Because Patient Management Categories were developed with extensive physician consultation and panel review and because an effective management strategy for the typical patient is associated with each category, the system can be used in numerous applications. It was designed for comparative cost analyses and to be used in hospital payment systems, but it is also the basis of a clinical and financial information system that is useful in other areas.

### Comparative Cost and Utilization Analyses

The relative weight for each patient that results from the PMC Classification and Cost Weighting System can be used to adjust costs, payments and lengths of stay for case mix complexity. It can be used across diseases, hospitals, and other patient populations to insure comparability.

PMCs have been compared to DRGs to examine the extent to which each system performs in explaining cost (charge or length of stay) variations. In most cases, PMCs have performed better than DRGs. Table A shows selected results from two separate evaluations conducted and reported by Dr. William Thomas and his colleagues. As you can see, the greater explanatory power of PMCs is reflected in the greater reduction in variance (higher R<sup>2</sup> values) both when PMCs are applied alone and when PMCs are added to the variance explained by DRGs alone.

Table A

## Regression of Discharge Abstract-Based Severity Models on Costs, by ADRG\*

Adjacent DRGs	R <sup>2</sup> N	All Cases	
		DRGs Alone	PMCs
89-91	R <sup>2</sup> N	0.046a 342	0.337a 342
96-98	R <sup>2</sup> N	0.017b 323	0.384a 323
106-107	R <sup>2</sup> N	0.227b 234	0.344a 234
121-123	R <sup>2</sup> N	0.035a 284	0.051c 284
148-149	R <sup>2</sup> N	0.018b 306	0.096a 306
154-156	R <sup>2</sup> N	0.064a 304	0.144a 304
182-184	R <sup>2</sup> N	0.006c 352	0.152a 352
209	R <sup>2</sup> N	n/a	0.179a 353
294-295	R <sup>2</sup> N	0.008 296	0.054b 296
354-355	R <sup>2</sup> N	0.172a 310	0.338a 310
403-405	R <sup>2</sup> N	0.024b 282	0.123a 282

\*All R<sup>2</sup> values are adjusted for sample size and degree of freedom.

- a. Significant at P < 0.01  
b. Significant at P < 0.05  
c. Significant at P < 0.10

Source: "Measuring Severity of Illness: Comparison of Seven Severity Systems in Terms of Ability to Explain Variations in Costs," J. William Thomas, Ph.D., Marie L. F. Ashcraft, Ph.D., August 1989.

R<sup>2</sup> Values within Adjacent DRGs

Category	All Cases	
	DRG R <sup>2</sup>	PMC ECW** R <sup>2</sup>
DRGs 89-91	.052	.513
DRGs 182-184	.006	.102
DRG 209	-	.069
DRGs 294-295	.001	.205
DRGs 403-405	.016	.073

\*\*"PMC ECW" is PMC Expected Cost Weight.

Source: "An Evaluation of Alternative Severity of Illness Measures for Use by University Hospitals: Management Summary," J. William Thomas, Ph.D., Marie L. F. Ashcraft, Ph.D., Janet Zimmerman, MPP, December 1986.

Although PMCs perform quite well on statistical measures of variability in resource use, these measures do not indicate the predictive validity of the system with respect to resource need. One of the strengths of the PMC System is that the relative cost weights associated with the system are reflective of expected resource need versus actual use. By comparison, the DRG weights reflect average resource use and as such, do not provide a useful tool to identify or measure efficient care.

### Quality Measurement: Process

One unique characteristic of PMCs is that a physician-specified management strategy for effective care of a typical patient has been developed for each PMC and is referred to as a Patient Management Path. These management strategies (one for each PMC) consist of physician-specified diagnostic and treatment services that reflect the intensity of hospital resources required for effective management. Using these paths, one can examine the appropriateness of the level of care rendered (e.g., special care unit utilization, acute care length of stay, or potential ambulatory patients), use of a particular technology (e.g., CT scan), or the appropriateness of particular surgical procedures.

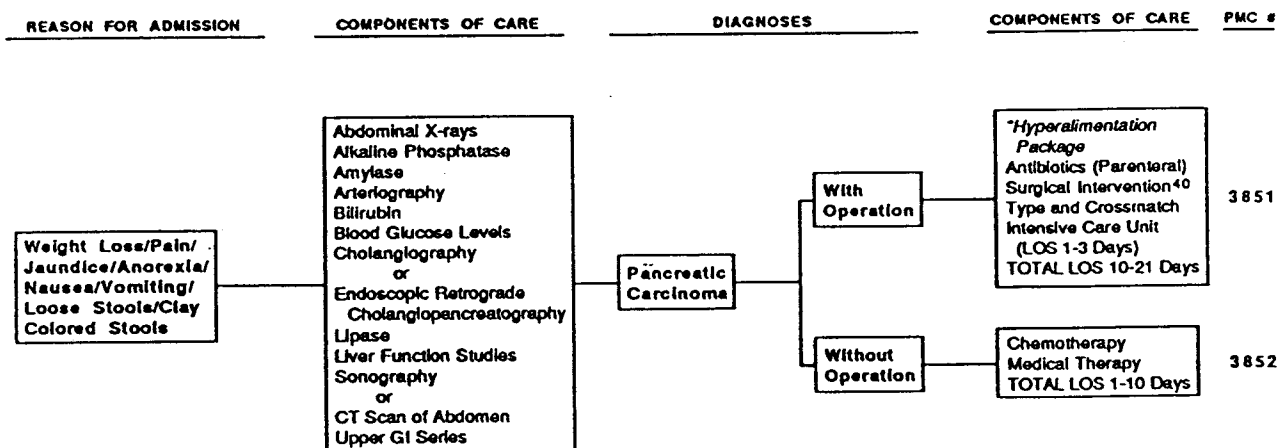
In the past, the benchmark in utilization monitoring and pattern of care analyses has always been average use, regardless of whether such use was warranted. In fact, by using Patient Management Categories, the point of comparison can be either the average use as defined empirically by a comparison group or the types and quantities of services (components of care) specified by physicians as effective care of the typical patient in a

category. For utilization appropriateness, however, it is important to have a comparative standard that is independent of actual use data and one that is linked to hospital resource needs as perceived by physicians. Such a comparative standard is even more important for hospital-specific analyses.

In this way, the PMCs permit the evaluation of both the content and process of patient care. This is something no other available patient classification or severity system can do. By linking hospital resource requirements with clinically specific patient types, the management strategies associated with PMCs also provide the basis for communication with physicians which is critical for management within a case mix environment. An example of the Patient Management Paths for two PMCs in the gastrointestinal disorders module are shown in Figure 2.

Figure 2

Example Of Patient Management Path



Quality Measurement: Outcomes

PMCs were designed to be clinically homogeneous with respect to resource needs. Thus, patients within each category are not only expected to have similar resource use, but they should also be similar with respect to their risk of dying during hospitalization and their probability of developing complications. These outcomes can be assessed much more accurately than with other less clinically specific classifications. Since discharge status (dead or alive) is not used to define separate PMCs, category-specific death rates for hospitalized patients can be examined using this system.

For example, using DRGs one can only identify an overall in-hospital death rate for all acute myocardial infarction patients (approximately 13-16 percent depending on the database we have used). In contrast, PMCs differentiate acute myocardial infarction patients by severity as shown by the PMC-specific death rates in Tables B and C. These rates not only reflect severity distinctions that are important to capture, but they appear to be relatively stable over time reflecting the validity of the category definitions. Table

C illustrates the importance of being able to identify and measure comorbidity. As shown, the presence of comorbidity can have a significant impact on death rates. The PMC System identifies specific comorbidities, whereas DRGs do not.

Table B

**Acute Myocardial Infarction  
Patient Management Categories  
Single Assignment Cases**

Classification Hierarchy	Death Rate		
	FY 1986	FY 1987	FY 1988
308 Cardiogenic Shock	83.4	80.2	80.2
306 Congestive Heart Failure w Op	N/A	N/A	N/A
307 Congestive Heart Failure w/o Op	11.2	12.3	12.8
302 Tachyrrhythmia	5.3	6.4	7.7
303 Bradyrrhythmia/Heart Block	7.2	6.3	6.3
304 Hypertension	2.8	3.7	2.9
301 Acute Myocardial Infarction	5.1	5.8	5.1

Table C

**Acute Myocardial Infarction  
Patient Management Categories**

Classification Hierarchy	Single Assignment Death Rate FY 88	Comorbid Assignment Death Rate FY 88
308 Cardiogenic Shock	80.2	84.8
306 Congestive Heart Failure w Op	N/A	N/A
307 Congestive Heart Failure w/o Op	12.8	24.3
302 Tachyrrhythmia	7.7	17.8
303 Bradyrrhythmia/Heart Block	6.3	14.4
304 Hypertension	2.9	5.9
301 Acute Myocardial Infarction	5.1	16.1

## DISCUSSION

In 1983, with health care costs rising uncontrollably, the federal government of the United States changed its method of paying hospitals from a retrospective cost-based system to a prospective per case payment rate based on DRGs. One obvious objective of this change was to control the rate of increase in payments made to hospitals by the federal government. It is clear, however, that if cost control had been the only objective, such a revolutionary change would not have been necessary. In fact, the objective of cost control was addressed by moving from retrospective reimbursement to prospective payment and any unit of payment (days or cases) would have been sufficient.

The reason for introducing diagnosis based classification into a payment system is not to pay more or less. Rather, a case mix measure is presumed to introduce a more equitable distribution of payments by accounting for the diverse resources that are required to manage different types of patients.

DRGs were the only patient classification ready for implementation by the U.S. federal government in a nationwide payment system in 1983. This is not the case now. It is, therefore, extremely important for other countries to evaluate the U.S. experience and to use the resultant information to build more effective and integrated financial and clinical management information systems.

In order to develop acceptable measures of hospital performance and productivity based on a hospital's patient mix, the patient categories that are the basis of payment and/or management must be clinically specific and relevant to the medical staff at each hospital. Unfortunately, the units of payment selected for use in the U.S. Prospective Payment System--the DRGs--are not consistent with the medical care process. They do not define patient types that are clinically specific, nor do they incorporate severity distinctions among patient types. Consequently, most hospitals have already concluded that DRGs are not sufficient to facilitate efficient and effective hospital management and they are actively seeking alternative systems for this purpose. Effective hospital management, which involves linking financial analysis with utilization review, quality assessment, and institutional planning, is possible only with a patient classification that is clinically specific and consistent with the medical care process. Patient Management Categories represent such a classification.