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medical colleges**

# **DESCRIBING AND PAYING HOSPITALS**

## **Developments in Patient Case Mix**

**May 1980**

**James D. Bentley, Ph.D.**

**Peter W. Butler, M.H.S.A.**

ORDERS

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DESCRIBING AND PAYING HOSPITALS  
Developments in Patient Case Mix

May, 1980

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## FOREWARD

### COTH INTEREST AND ACTIVITIES

At the 1979 Spring Meeting of the Council of Teaching Hospitals (COTH), a workshop examining the definition of the term "teaching hospital" was conducted. Prior to the meeting, attendees were provided with a staff paper, "Toward a More Contemporary Public Understanding of the Teaching Hospital,"<sup>1</sup> which summarized the evolution of the teaching hospital, the characteristics which fundamentally distinguish teaching from non-teaching hospitals, and the diversity among those teaching hospitals. Following a brief oral summation of the paper, attendees were divided into four discussion groups to review the paper and discuss its implications for health planning, reimbursement, and national health insurance.

While the individual workshops were organized around these separate topics, the recommendations developed by three of the four workshops were very similar. Essentially each workshop concluded that the problems facing teaching hospitals in the future resulted from three factors: atypical service costs resulting from the complexity or intensity of care provided patients; atypical institutional costs resulting from education program activities; and a wide variation in each of these costs among teaching hospitals. Because of the variation among teaching hospitals, each discussion group concluded methodologies were needed to quantify intensity and educational costs so that teaching hospitals could be classified into homogeneous groups or scaled into continuous distributions. Therefore, each discussion group recommended that the AAMC/COTH sponsor or con-

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1. "Toward a More Contemporary Public Understanding of the Teaching Hospital." Washington, D.C.; Council of Teaching Hospitals of the Association of American Medical Colleges, May, 1979.

duct a study (or studies) to quantify the intensity of patient care and the costs of educational programs. This recommendation was supported by the COTH Administrative Board and the AAMC Executive Council at their June meetings. As a first step, staff were directed to develop a state-of-the-art paper on approaches to quantifying patient intensity and an annotated bibliography on educational costs.<sup>2</sup>

The first version of the intensity paper, "Case Mix Measures and Their Reimbursement Applications," was provided to the AAMC Executive Council at its September meeting. Upon reviewing the paper, the COTH Administrative Board recommended that staff prepare a second paper summarizing the case mix research activities of others and suggesting several possibilities for COTH/AAMC-sponsored activities. At the November COTH Administrative Board meeting, staff presented the second paper, "Describing the Teaching Hospital: Alternatives for COTH Activities." The Board reviewed this paper and recommended that the AAMC establish a steering committee to assist staff in the identification, development, and evaluation of AAMC case mix activities.

In December, AAMC Chairman Charles B. Womer appointed an eleven-member Ad Hoc Committee on the Distinctive Characteristics and Related Costs of Teaching Hospitals. The Ad Hoc Committee, chaired by Mark S. Levitan, Executive Director of the Hospital of the University of Pennsylvania, includes hospital directors, chiefs of clinical services, a medical school dean, and a chief resident, see Appendix D. The Committee's charge is to guide the Association's efforts to identify the particular cost characteristics of teaching hospitals.

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2. The annotated bibliography on educational costs has been published and is available, for \$3.00, from the AAMC. Charles N. Kahn, III. Medical Education Costs in Teaching Hospitals: An Annotated Bibliography. Washington, D.C.: Association of American Medical Colleges, May, 1980.

The Ad Hoc Committee has recommended that staff pursue four case mix activities for the Association: monitoring the activities of case mix researchers and state and federal reimbursement experiments; developing a case mix workshop for AAMC members; testing the assumptions that underlie the case mix payment limitations presently being explored by the Health Care Financing Administration; and conducting a study of the case mix, patient services, educational and research programs, and financial characteristics of teaching hospitals.

This paper summarizes and reports to the COTH membership on the continuing staff efforts to monitor case mix developments. Chapter 1 provides a brief summary of case mix activities in the last fifteen years. Chapter 2 describes the major case mix measures that are presently available or under development. Chapters 3 and 4 focus on case mix reimbursement with the former describing planned and operational reimbursement applications and the latter describing major policy issues facing hospitals and payers as they consider possible case mix payment applications. The fifth chapter summarizes hospital information systems being developed to assist management in the day-to-day use of case mix for internal planning and control. Chapter 6 provides a brief description of ongoing case mix research of particular interest to teaching hospitals. Included in the research summarized is a description for an AAMC/COTH study of the case mix, service, and financial characteristics of teaching hospitals.

The authors of this paper are indebted to the many individuals who have given us time for interviews, site visits, and consultation. All case mix researchers, payer representatives, and hospital personnel have willingly and candidly explained their interests and positions. We are most appreciative. We also thank the COTH Administrative Board, Ad Hoc Committee members, and fellow AAMC staff for their interest, support, and constructive criticism.



## CHAPTER ONE

### CASE MIX ACTIVITY: 1965-1980

In the past fifteen years, interest in hospital case mix has been through three overlapping, developmental periods: a period from 1965 to 1974 which saw case mix used as an explanatory variable in econometric studies of hospitals, a period from 1974 to 1979 when many hospital representatives were active proponents of case mix, and a period from 1977 to the present when payers sought to develop and employ case mix in hospital payment experiments. This introductory chapter briefly summarizes each period.

#### Case Mix: An Explanatory Variable

Prior to 1965, researchers addressing hospital case mix focused their attention primarily on institutional characteristics. They described and differentiated hospitals by bed size, average length of patient stay, the presence of a medical school affiliation, the existence of residency training programs, the proportion of board-certified medical staff, and the provision of relatively rare clinical services.

Martin Feldstein changed this emphasis. In a study of 177 British hospitals which used the proportion of a hospital's patients in each of eight clinical services to describe case mix differences, he found that this simple measure of patient case mix could account for 25 per cent of the variation in per case costs across the hospitals.<sup>1</sup> Since Feldstein's work, economists studying differences in hospital costs have generally sought to use patient, rather than institutional,

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1. Martin Feldstein. Economic Analysis for Health Service Efficiency. Amsterdam: North-Holland Publishing Company, 1967.

characteristics to describe case mix. Significant advances in the use of case mix as an explanatory variable in case mix were taken by Judith and Lester Lave,<sup>2</sup> Judith Lave and Samuel Leinhardt,<sup>3</sup> Leonard Goodisman and Tom Trompeter,<sup>4</sup> and Robert Evans.<sup>5</sup> In general, these studies found that patient specific measures of case mix, such as diagnosis, could account for a substantial proportion of the variation in per diem costs and per case costs and charges.

The econometric studies were primarily studies of hospital cost patterns. Their focus on case mix was secondary. Thus, while these studies changed the level of analysis from institutional to patient descriptors of case mix, they did not directly develop or expand methods for describing a hospital's mix of patients. Nevertheless, these studies did demonstrate the potential of case mix, and they did stimulate an interest in it.

#### Case Mix: A Push from the Hospitals

During the Economic Stabilization Program of the Nixon Administration, industrial firms presented price increase information using a weighting of their product mix. In Phase IV of the program, hospitals were to be granted a similar methodology. While price controls would remain on hospitals beyond those on the general economy, hospitals would be allowed to separate revenue increases into changes in the types of patients treated and changes in the

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2. Judith Lave and Lester Lave, "The Extent of Role Differentiation among Hospitals," Health Services Research, VI, (Spring, 1971), 15-38.
  3. Judith Lave and Samuel Leinhardt, "The Cost and Length of a Hospital Stay," Inquiry, XIII (December, 1976), 327-343.
  4. Leonard Goodisman and Tom Trompeter, "Hospital Case Mix and Average Charges Per Case: An Initial Study," Health Services Research, XIV (Spring, 1979), 44-55.
  5. Robert Evans, "Behavioral Cost Functions for Hospitals," Canadian Journal of Economics, IV (1971), 198-215.

prices for services provided to patients. Because Phase IV never became operational, methods to implement this approach were never evaluated and approved. The proposed regulations for Phase IV, however, gave case mix and case mix adjusted costs more exposure among hospitals. As states implemented limitations on hospital revenues and as Medicare launched its Section 223 routine service cost limitations, hospitals repeatedly complained about the absence of case mix measures in setting revenue and payment limits.

Significantly, it appears that hospitals expected case mix to be used to legitimate an increase in total hospital expenditures; all types of hospitals -- urban, suburban, rural, large, and small -- expected case mix to increase their revenues. Only in late 1979 did large numbers of hospitals appear to realize that case mix could be used to redistribute revenues among hospitals rather than to increase revenues for hospitals. Case mix could be used to change the size of the pieces of the pie rather than simply to increase it. This use would create winners (i.e., hospitals with increased revenues) and losers (i.e., hospitals with decreased revenues). As a result, during 1979 hospitals and their associations appeared to move from unqualified supporters of case mix reimbursement to much more cautious, qualified, and evaluative positions.

#### Case Mix: The Current Dynamic

Funds which are revenues for hospitals are expenditures for third-party payers. As a result, hospitals and payers have somewhat different perspectives and one difference which has come to the foreground is their views of case mix. Hospitals are looking for case mix measures which describe, account for, and legitimate differences in per case or per diem costs; payers are looking for case mix measures which provide normative standards for hospitals. This dif-

ference in perspectives inevitably raises tension as payers have begun to accept and use case mix for hospital reimbursement or prospective payments.

More significantly, the payers, especially the Health Care Financing Administration, have begun to fund case mix studies. These studies focus primarily on case mix. Funds have been granted to develop new case mix measures, reformulate an old case mix measure, compare case mix measures, and experiment with case mix demonstration projects. While much of this work is developed and reported in the public domain, hospitals have not had concise references for reviewing current case mix developments. This report seeks to correct that deficiency by summarizing major case mix measures, on-going case mix reimbursement approaches, policy issues for case mix reimbursement, and several case mix studies of particular importance to the nation's teaching hospitals.

## CHAPTER TWO

### CASE MIX MEASURES

As the attention given case mix by hospitals, payers, and health service researchers has increased and intensified, institutional level descriptors of case mix<sup>1</sup> have been replaced by patient-related descriptors of case mix: diagnosis, personal characteristics, and patterns of treatment. This chapter summarizes the essential characteristics of eight distinctive approaches to measuring case mix:

- PAS List "A",
- Diagnosis Related Groups (DRG's),
- Disease staging,
- Isocost groups,
- Patient Management Algorithms,
- VA Multi Level Care groups,
- the Resource Need Index, and
- the Complexity Index.

In describing each of these approaches, more attention will be given to the diagnosis related groups because of their dominance in contemporary case mix reimbursement applications.

#### The PAS List "A"

One of the earliest attempts to categorize patients using diagnostic information is the Professional Activity Study (PAS) List "A" developed by the

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1. Institutional descriptors previously used included average length of patient stay, the presence of a medical school affiliation, the provision of relatively rare patient services, and the number of beds in different clinical services.

Commission on Professional and Hospital Activities of Ann Arbor, Michigan. The list is comprised of 350 diagnostic groups. In publishing length of stay and charge data, PAS generally adds five age variables and dichotomies for operated/not operated and/or single diagnosis/multiple diagnoses. While the resulting 3,500 or 7,000 groups have been useful for some purposes, case mix researchers, hospital administrators, and some utilization review agencies found that the number of categories was too large and included too many categories with small numbers of patients for many purposes. The problems of using these 3,500 or 7,000 categories stimulated researchers to initiate the broad array of case mix measures presently available or under development.

#### Diagnosis Related Groups (DRGs)

Diagnosis related groups were developed primarily at Yale-New Haven Hospital by health services researchers interested in defining expected lengths of patient stays so that utilization review activities could be focused on atypical patients. Using discharge abstracts, researchers found that the disease classification schemes used to code discharges had too many categories to produce statistically stable expected lengths of stay. Thus, their original research objective was to develop a procedure for aggregating similar diagnoses so that patients could be classified into medically meaningful categories, with each category having more cases and with each category having a relatively low variation in the length of patient stays.

To accomplish their objectives, Yale researchers initially collapsed diagnostic codes into 83 major diagnostic groups using the following criteria:

- major diagnostic categories must have consistency in terms of their anatomical, physio-pathological classification, or in the manner in which they are clinically managed;

- major diagnostic categories must have a sufficient number of patients; and
- major diagnostic categories must cover the complete range of codes without overlap.<sup>2</sup>

When the lengths of stay for these 83 major diagnostic groups were examined, the frequency distributions for most groups were broad and not particularly helpful in specifying expected lengths of patient stays. Therefore, the next step was to divide each of the 83 groups, if possible, into subgroups each of which had less variation in length of stay than its parent major diagnostic group. Using over one million patient records from Connecticut and New Jersey hospitals and five independent variables (primary diagnosis, secondary diagnosis, age, primary treatment procedure, secondary treatment procedures), a computer program (AUTOGRP) was used to subdivide the 83 major diagnostic groups. The statistical subdivision of a major diagnostic group was not accepted if it produced groupings the researchers judged to be medically uninterpretable and it was halted when one of the following conditions was met:

- the number of remaining cases was less than 100; or
- none of the variables reduced the unexplained variance by at least 1%.

When completed, the subdivision of the 83 major diagnostic groups yielded 383 terminal DRGs plus separate categories for deaths and for patients having extremely long lengths of stay. For example, major diagnostic category #55, urinary calculus, was subdivided into four terminal DRGs on the basis of medical vs surgical treatment, type of surgery, and type of secondary diagnosis (see Figure 1). A complete list of the 83 major diagnostic groups and the 383 terminal DRGs is included as Appendix B of this paper.

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2. R.B. Fetter et al. "Case Mix Definition by Diagnosis Related Groups." Working Paper Series B, Technical 40. New Haven: Yale School of Organization and Management, n.d. (Mimeographed).

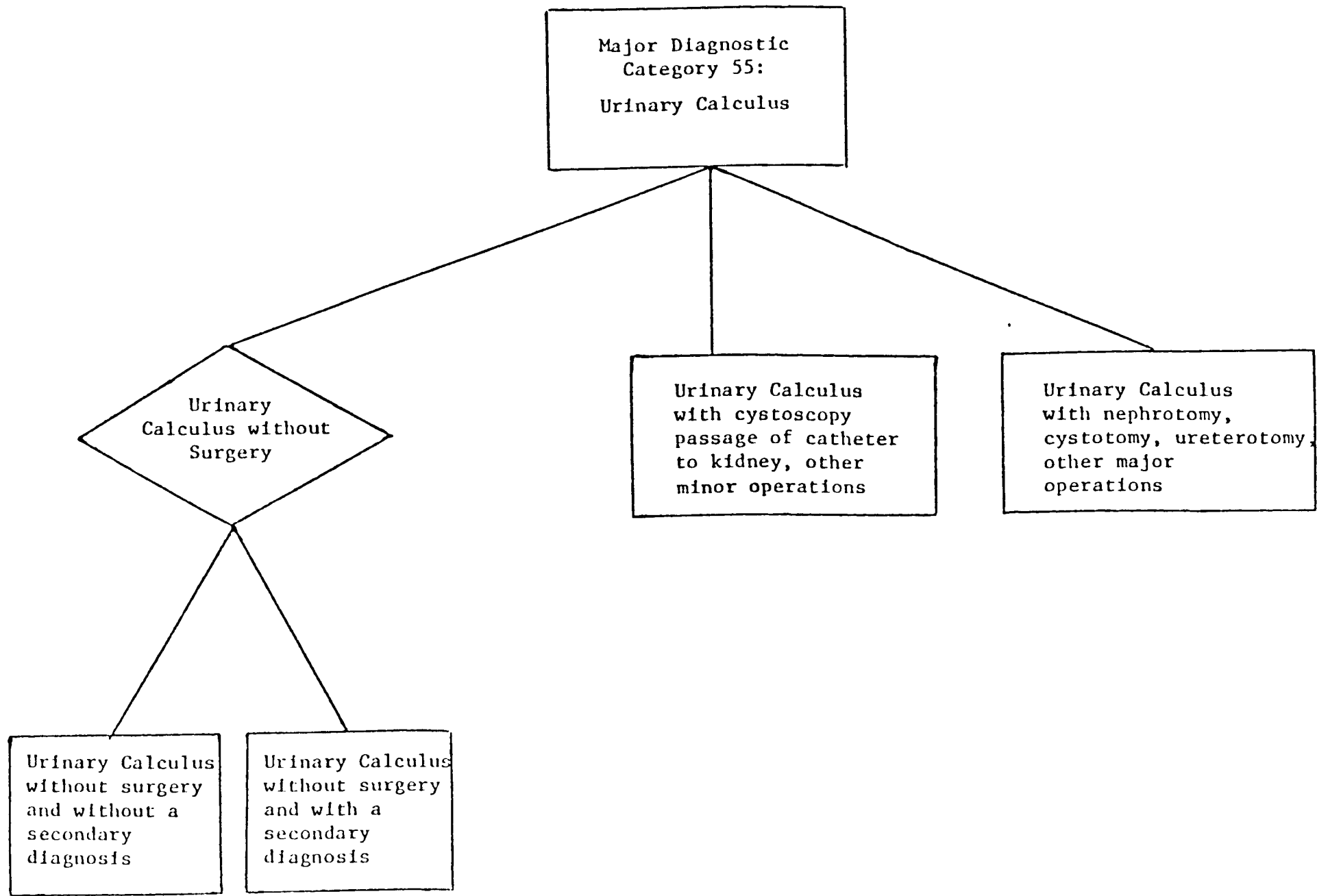


Figure 1  
Tree Diagram Illustrating Partitioning of Urinary Calculus Patients



While the DRG classification system was originally created for utilization review purposes, its creators (Robert Fetter, John Thompson, and Richard Averill) believe that the DRGs identify and describe the hospital's major products, and they assert that it has much broader applicability. Within the hospital, they believe that DRG-based systems should be used for cost control, performance evaluation, and planning. Outside the hospital, they believe DRG's should be used for inter-hospital comparisons of costs, for determining hospital reimbursement categories and rates, and for evaluating service and facility proposals in health planning.<sup>3</sup>

Most systems for categorizing patients into case mix groups are incomplete or still being developed. The DRG system, on the other hand, has been publicly available for several years, is used in some applications, and has been considered for other applications. As a result, several advantages and disadvantages have been identified. The major and most cited advantages are: DRGs

- are conceptually appealing because they
  - attempt to describe patterns of resource consumption in terms of the similarities among and differences between patients,
  - are based upon patient diagnoses, and
  - consider secondary diagnoses and surgical and medical procedures provided to the patient;
- are based upon data generally included in the discharge abstract for inpatients;
- result in a manageable number of diagnostic categories, 383;
- are organized in a hierarchical manner so that the terminal diagnostic groups can be collapsed into fewer categories which, while more heterogeneous, are still useful;

---

3. A recent discussion of these positions has been published as a supplement to Medical Care. Robert B. Fetter et al, "Case Mix Definition by Diagnosis-Related Groups," Medical Care, XVIII (February, 1980).

- can be easily created using any of the major diagnostic coding conventions, except ICD-9-CM.<sup>4</sup>

In addition:

- Some who have used DRGs for internal hospital management have been able to demonstrate that changes in hospital costs can be divided into the increased costs associated with a more complex case mix and increased prices for treating the same case mix.
- Some third-party payers have accepted DRG comparisons as the basis for obtaining case mix reimbursement exceptions.

The major disadvantages of the DRGs are:

- DRGs rely upon data on discharge abstracts which often include classification and coding errors, fail to include all diagnoses and procedures, and vary by the documentation of the attending physician and the conventions of the individual coder.
- DRGs reflect the state of medical technology and practice at the time of their development. To account for advances in diagnostic procedures and therapeutic modalities, the DRGs would have to be reformulated.
- The performance of a surgical procedure often categorizes a patient into a more complex DRG. If DRGs are used for reimbursement and if the reimbursement method reflects the complexity of the DRG, surgical procedures may be encouraged because they result in higher reimbursement.
- To create, evaluate, or redefine the DRGs, an extremely large data base is required.<sup>5</sup> In addition, if hospital cost or charge data is used as the dependent (i.e., resource consumption) variable, the data base is doubled because a discharge abstract and a hospital bill are required for each patient.
- DRGs only group and classify inpatients.<sup>6</sup>

- 
4. The Yale researchers have received a grant from the Health Care Financing Administration to reformulate the DRGs using ICD-9-CM and using patient abstract data from the Commission on Professional and Hospital Activities (Ann Arbor).
  5. Blue Cross of Western Pennsylvania used a data base including 690,000 patient records to examine DRGs. Even then, when grouped into the original DRGs, many DRGs had fewer than five patients.
  6. Yale researchers are just completing their initial effort to develop DRG-like categories for ambulatory and emergency patients.

- DRGs group patients into categories asserted to be homogeneous on the basis of the historical consumption of patient days. Thus, DRGs are neither a standard of what would be done nor a measure of impact of the pattern of care upon the patient.

DRGs have been used internally by several hospitals, and they have been evaluated for and used in several reimbursement applications. As a result, several controversies surrounding the DRGs have been identified:

- While the DRG developers have asserted that the terminal DRGs group together patients who are logically similar from a broad medical viewpoint, some who have used DRGs argue
  - that the DRGs are not clinically meaningful because they group together unrelated patients. For example, DRG 39 groups together all patients whose principal diagnosis is cancer of the bone, thyroid, connective tissue, and nerves and who did not receive a surgical procedure.
  - that the DRGs are not clinically meaningful because they fail to subdivide some broad diagnostic groups. For example, DRG 121 includes all patients whose principle diagnosis is acute myocardial infarction.
  - that the DRGs are not clinically meaningful because they fail to differentiate patients in different stages of the same illness. For example, the DRGs group together in a single category lung cancer patients with a short diagnostic workup or a terminal condition.
- While the DRG developers have asserted that the terminal DRGs group together patients who use similar amounts of resources, some who have used DRGs argue
  - that the length of stay is not an appropriate measure of resource consumption.
  - that the DRGs fail to recognize the standby capacity needed for high risk patients. For example, if a high risk pregnancy results in a normal delivery, the patient is classified as a normal delivery with no recognition of the special services required to be present in case the risk had materialized.
  - that the DRGs are not statistically meaningful when applied to populations other than that on which they were originally derived. In an analysis of 690,000 patient records in Western

Pennsylvania, the statistical method used by Yale researchers to produce the 383 DRGs from Connecticut and New Jersey data did not produce identical terminal DRGs.<sup>7</sup>

- While the independent variables used to subdivide the major diagnostic groups into the terminal DRGs included patient age, many of those using DRGs have found
  - that the patient age needs to be given greater emphasis in formulating diagnostic groups. In one major Maryland teaching hospital, Medicare patients generally consumed 15% more resources than non-Medicare patients for the same DRG. In New York City, one teaching hospital found its over-65 patients stayed approximately fifty percent longer than its under-65 patients in the same DRG.
  - that the patient's socioeconomic status should be included in the formulation of diagnostic groups, and
  - that the type of patient admission (i.e., emergency, urgent, elective, referred) should be included in the formulation of the diagnostic groups.
- Some who have attempted to use the DRGs for internal management of the hospital's clinical activities find the DRGs with substantial differences in physician practice patterns often have less than five cases in a given year and it is difficult to make comparative or evaluative judgments with such small numbers. At one hospital with approximately 16,000 admissions in 1977, only twenty of the terminal DRG's had at least thirty cases.

The present DRG's were created in the early and mid-70's using discharge diagnoses coded in ICDA-8, H-ICDA, and H-ICDA-2. In 1979, many governmental programs began requiring patient diagnostic data to be coded using ICD-9-CM. Because the partitioning scheme in ICD-9-CM and ICDA-8 are different, the diagnostic related groups need to be reformulated. The Yale researchers are pre-

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7. Wanda W. Young et al. "Assessment of the AUTOGRP Patient Classification System," Medical Care, XVIII (February, 1980), 228-244.

sently working under a HCFA grant to reformulate the DRG's using ICD-9-CM. The reformulation will use the same major variables used in the original formulation -- primary diagnosis, secondary diagnosis, primary procedure, secondary procedure, age, and length of stay; however, three major differences in approach will be used in the reformulation:

- data will be drawn from a nationwide data base of discharge abstracts maintained by the Commission on Professional and Hospital Activities. This will permit testing to see if one set of DRG's is consistent across the nation or if different DRG's are necessary to reflect regional treatment patterns.
- rather than using the original 83 major diagnostic groups as the starting point for statistical subdivision, it is expected that 23 major diagnostic groups will be used.
- In subdividing each major diagnostic group, atypical and unusual patients will be placed into a separate and identifiable subgroup rather than included in each DRG.

In addition, it is expected that the documentation for the reformulated DRG's will be more complete than the documentation retained and available for the original DRG's. The expanded documentation would let critics evaluate more fully the statistical and decision criteria and the explicit assumptions used in the reformulation. It is understood that the reformulated DRG's will be available late in 1980 or early in 1981.

#### Disease Staging

Disease staging defines patient case mix by linking major disease categories with their levels of severity. The staging approach is based on the concept that medical diagnosis and a diagnostic case mix system should have four

elements:<sup>8</sup> 1) identification of organ affected by disease; 2) cause of disease; 3) manifestations of disease; and 4) severity of illness. The concept can be traced back to work at NIH with cancer chemotherapy where stages of cancer were defined in order to evaluate the effectiveness of various treatment protocols.

The disease staging methodology splits a disease or medical problem into three levels of severity:

- Stage I: Condition with no complications or problems of minimal severity.
- Stage II: Condition with local complications or problems of moderate severity.
- Stage III: Condition with systemic complications or problems of a serious nature.

Unlike DRGs which rely on statistical measures for grouping diagnoses, disease stages are based on physician judgments of the progression of a condition through levels of severity. Staging has been applied to both surgical and medical problems, although levels of severity appear to be more readily identifiable for surgical cases. Staging can also be applied to diseases that have more than one etiology, such as diarrhea. Diseases are generally staged into three levels, but subdivisions within stages can also be made. One example of a staged disease, appendicitis, is shown in Figure 2.

Joseph Gonnella, M.D., Associate Dean of Jefferson Medical College, and panels of medical school faculty physicians have now staged 66 medical and surgical problems, accounting for about 50 percent of all patients (see Figure

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8. D. Louis et al, Application of the Staging Methodology to the Analysis and Evaluation of PHDDS Hospital Utilization Data, Santa Barbara, California: SysteMetrics, April, 1979, p. 21.

Figure 2

APPENDICITIS

STAGE I: Appendicitis documented by pathological report

STAGE II: A. Appendicitis with perforation leading to

localized peritonitis

or

abscess in peritoneum

B. Appendicitis with perforation leading to a subphrenic abscess

STAGE III: Problems listed in Stage II plus

diffuse peritonitis

or

septicemia (sign of infection in one or more organs)

or

shock (hypotension, oliguria, obtundation, signs of peripheral vascular collapse)

or

intestinal obstruction

or

pylephlebitis with or without liver abscess

Figure 3

STAGED DISEASES

ALCOHOLISM  
APPENDICITIS  
ATHEROSCLEROSIS - CORONARY ARTERY  
BACTERIAL MENINGITIS  
BACTERIAL PNEUMONIA  
BENIGN PROSTATIC HYPERTROPHY  
BIRTH TRAUMA  
BRONCHIAL ASTHMA  
BRONCHOPNEUMONIA ORGANISM NOT SPECIFIED  
CARCINOMA OF THE BREAST  
CARCINOMA OF THE CERVIX  
CARCINOMA OF THE PROSTATE  
CATARACT  
CHOLECYSTITIS  
CIRRHOSIS OF THE LIVER  
COLON CARCINOMA  
DELIVERY (CESAREAN SECTION)  
DELIVERY (VAGINAL)  
DIABETES MELLITUS  
DIARRHEA (GASTROENTERITIS)  
DIVERTICULITIS  
DYSFUNCTIONAL UTERINE BLEEDING  
ECTOPIC PREGNANCY  
EXTERNAL HERNIA  
FRACTURE ABOUT THE ANKLE  
FRACTURE OF (META)TARSAL BONE(S)  
FRACTURE OF CAPARAL BONE(S)  
FRACTURE OF FEMUR - NOT UPPER END  
FRACTURE OF HUMERUS  
FRACTURE OF RADIUS AND/OR ULNA  
FRACTURE OF THE PELVIS  
FRACTURE OF TIBIA AND/OR FIBULA  
FRACTURE OF UPPER END OF FEMUR  
GONORRHEA  
GOUT  
HEMOLYTIC DISEASE OF NEWBORN  
HEMOPHILIA  
HODGKINS DISEASE  
HYPERTENSION  
LEAD POISONING, CHRONIC  
LEUKEMIA, CHRONIC GRANULOCYTIC  
LEUKEMIA, CHRONIC LYMPHOCYTIC  
MYOCARDIAL INFARCTION  
OBESITY  
OTITIS MEDIA  
PANCREATITIS  
PELVIC INFLAMMATORY DISEASE  
PEPTIC ULCER DISEASE  
PNEUMONIA-ACUTE INTERSTITIAL  
PNEUMONIA-EATON'S AGENT  
PNEUMONIA-UNSPECIFIED  
RENAL CALCULUS DISEASE  
RHEUMATOID ARTHRITIS  
RUPTURED INTERVERTEBRAL DISC  
SEPSIS OF THE NEWBORN  
SINUSITIS  
SPONTANEOUS ABORTION  
STREPTOCOCCAL PHARYNGITIS  
SYPHILIS  
THROMBOPHLEBITIS (PERIPHERAL)  
TRAUMA THORACIC, LUMBAR, SACRAL  
TRAUMA TO CERVICAL SPINE  
ULCERATIVE COLITIS  
URINARY TRACT INFECTION  
VAGINAL BLEEDING IN ANY TRIMESTER  
VIRAL PNEUMONIA



3). The data processing for this work has been provided by Jim McCord and Dan Louis of Systemetrics. With support from the National Center for Health Services Research, additional diseases will be staged so that within the next year approximately 90 percent of all hospital admissions can be categorized.

A computer software system has been developed to apply the staging criteria to data from discharge abstracts. The ICDA codes have been matched with the staging definitions, although in some cases, the ICDA codes are not as detailed as the original stage definitions; in others, the discharge abstract does not contain some data that would add greater specificity to the severity level. In order to make staging criteria compatible with automated discharge abstract data, stage definitions were modified and where there was a choice, a condition was classified into the less severe stage. However, a patient having conditions meeting the criteria of more than one stage is always classified into the most severe stage.

While staging has not been as widely applied as DRGs, it has been tested sufficiently to demonstrate that the stage of the disease is associated with length of stay, ancillary utilization, and total patient charges. For one short-term hospital, the results shown in Figure 4 were found for medical and surgical patients.<sup>9</sup>

In evaluating disease staging as a case mix measure, its attractive features are:

- Disease staging criteria are easily understood and accepted by physicians because of their clinical meaningfulness.

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9. Mohan Garg, "Evaluating Inpatient Costs: The Staging Mechanism," Medical Care, XVI (March, 1978), p. 194.

Figure 4

Average Charges and Length of Stay,  
by Disease Stage,  
for Patients in a Single Hospital

	<u>Stage</u> (No. of Patients)	<u>Length of Stay</u>	<u>Average Charges(\$)</u>	
			<u>Total</u>	<u>Ancillary</u>
Medical	All (5,036)	11.1	\$1,398	\$ 557
	I (3,335)	10.3	1,264	497
	II ( 819)	11.6	1,491	611
	III ( 882)	13.7	1,820	737
Surgical	All (2,104)	11.3	1,503	686
	I (1,671)	10.5	1,300	558
	II ( 433)	14.3	2,286	1,176

- Disease staging adds a severity dimension to the classification scheme which is not present in most case mix schemes.
- Patients may be classified into disease stages using presently available data sources with computer assistance; and
- Data suggest that disease stages are systematically related to variations in resource consumption and costs.

Some of the following limitations of disease staging are of concern:

- not all diseases have been staged, and it appears that some diseases, such as congestive heart failure, can never be staged;
- because no statistical measure of resource consumption is used in categorizing patients, the staging of some diseases may be homogeneous in a medical sense, but heterogeneous from a resource consumption viewpoint;
- levels of severity are not necessarily comparable across disease categories. For example, Stage II of one disease may not be as severe as Stage II of another disease.
- Severity may not always be related to resource consumption. There may be very little that can be done for some terminally ill Stage III patients beyond providing custodial care. In contrast, a number of treatments, which may be costly, can be successfully used to treat Stage II patients.

A variation on the disease staging approach has been developed by Baltimore area researchers, including Susan Horn, Ph.D., of the Johns Hopkins Center for Hospital Finance and Management. Called As-Score, the method classified patients into four levels of severity based upon:

- A - Age of patient
- S - System (organ) involvement
- S - Stage of disease of patient
- Co - Complications
- Re - Response to therapy

Two methods of scoring severity using this classification system have been tested. The first uses a physician or nurse to review the patient record and assign the patient to the appropriate category. The second is to quantify the approach by assigning numerical values to each of the variables. For example,

for age, patients 0-40 years old are assigned one point, 41-60, two points; 61-74, three points; 75 and above, four points. A similar scale has been developed for each of the other variables so that a total patient score can be computed. Initial testing of the approach has shown a strong correlation between subjectively-evaluated severity and the point scoring system.

Most of the developmental and experimental work with As-Score has been done at a 300 bed, acute general hospital in Baltimore. The developers have not applied it to all diseases and specialties and in fact, suggest that it may not be appropriate for all disease categories. Because an initial analysis of 370 patient records showed a relationship between severity class and average charges per case, lab charges, length of stay, and number of consultations, researchers plan to continue their efforts to develop and test As-Score.

#### Isocost Groups

The DRGs developed at Yale have been used in Maryland by PSROs and the State's Cost Review Commission. In using the DRGs, many of the disadvantages previously discussed have been identified and researchers at Johns Hopkins Center for Hospital Finance and Management -- Dale Schumacher, M.D., and Susan Horn, Ph.D. -- have sought to develop a modification of the DRGs. Their approach involves two key differences: the dependent variable is total cost per case, rather than length of stay, and the grouping and subdividing, being done by panels of board-certified specialists, is judgmental rather than statistical.

To conduct a pilot test of this approach, Schumacher and Horn selected three major disease areas: malignancy of the gastrointestinal tract, cardiology conditions, and pulmonary conditions. A separate physician panel was selected for each of the three specialty areas. Panelists initially were asked to

review the original Yale major diagnostic categories in their specialty. Each of the panels rejected the Yale major diagnostic groups and formulated new diagnostic groups (see Figure 5). Within the new major diagnostic groups, panelists are being asked to establish patient and disease characteristics which subdivide the diagnostic group into categories having small variations in the expected cost per case.

The isocost grouping procedure is still in its infancy. Additional research funds are presently being sought to establish panels beyond the original three. When more of the isocost groups have been established, the Hopkins researchers plan to compare isocost groups with the DRGs to determine which of the approaches is the better way to categorize patients diagnostically.

#### Patient Management Algorithm

With support from the Health Care Financing Administration, Wanda Young, Sc.D. of Blue Cross/Blue Shield of Western Pennsylvania, is developing a patient management algorithm approach to case mix measurement. The unique characteristic of this approach is that it is based on the "admissions state" of the patient rather than on the patient's ultimate diagnosis. Discharge diagnosis is not used as the starting point for accurately predicting treatment patterns because patients with the same diagnosis may require different diagnostic and treatment processes to assess their symptoms and effect the course of the illness. Thus, Young believes a better starting point to assess the appropriateness of treatment is the patient's admission state as characterized by presenting symptoms. Underlying this methodology is the belief that physicians diagnose and treat patients based on their known symptoms, not on diagnoses which may remain unidentified for several days after admission.

Figure 5

SOME MAJOR CATEGORIES USED IN THE DRG AND ISOCOST COST SYSTEMS FOR CASE MIX

<u>Specialty Penal</u>	<u>Yale Major Diagnostic Groups</u>		<u>Hopkins Isocost Categories</u>
	<u>No</u>	<u>Description</u>	
GI malignancy	02	Malignant Neoplasm of Digestive System	1) Head and Neck G. I. Tract Malignancy 2) Stomach, Bowel and Rectum Malignancy 3) Pancreas, Liver and Biliary Tract Malignancy
Cardiology	25	Hypertensive Heart Disease	1) Acute Myocardial Infarction
	26	Acute Myocardial Infarction	2) Chest Pain and Ischemic Heart Disease (except AMI)
	27	Ischemic Heart Disease except AMI	3) Hypertension
	28	Arrhythmia and Slowed Conduction	4) Heart Failure
	29	Heart Failure	5) Valvular Disease
	30	Carditis, Valvular, and other diseases	6) Carditis
Pulmonary	01	Infectious Diseases (Pulmonary)	1) Pulmonary Embolism
	03	Malignant Neoplasm of Respiratory System	2) Chronic Obstructive Lung Disease
	33	Pulmonary Embolism	3) Lung Malignancy
	37	Acute URI and Influenza	4) Pulmonary Infections
	38	Other Diseases of Upper Respiratory Tract	5) Asthma
	39	Pneumonia	6) Other pulmonary
	40	Bronchitis	
	41	Asthma	
	42	Other Lung and Pleural Diseases	

The development of patient management algorithms is a three step process:

- patients are categorized based on symptoms at the time of admission;
- diagnostic and treatment services provided to each admission-state (i.e., the algorithm) are identified; and
- costliness weights are developed by identifying the costs of the diagnostic and treatment algorithms.

A general model of a patient management algorithm is shown in Figure 6.

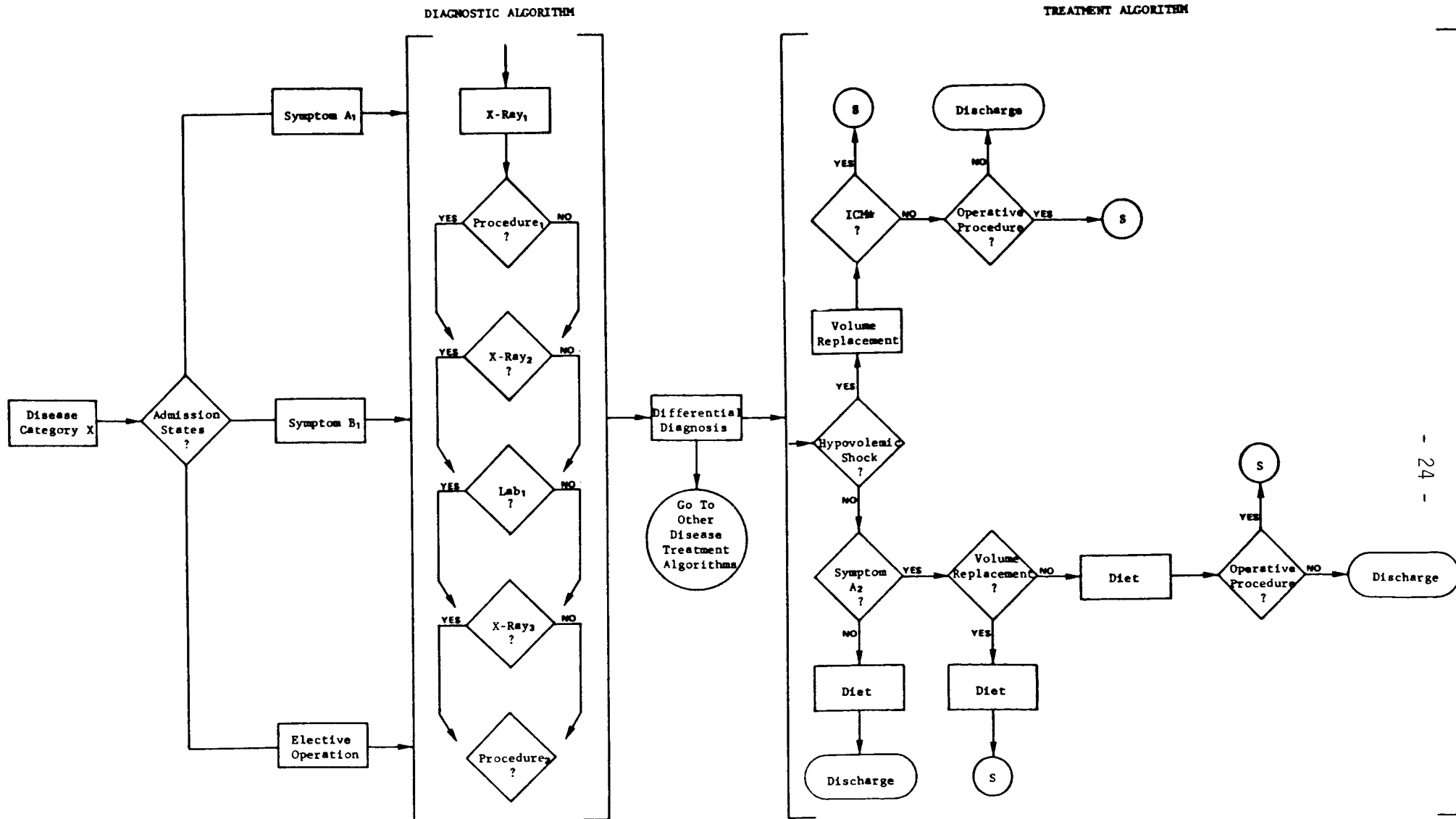
Because the admission-focused approach could lead to a large number of categories, the researchers have limited themselves to "typical" admission states and patterns of diagnosis and treatment. The information and judgments used to identify typical management algorithms are being developed using medical records from six Pennsylvania hospitals and advisory panels of full-time hospital physicians and senior residents.

#### Veterans Administration Multi-Level Care Groups

The VA Multi-Level Care (MLC) Project is modeled after the progressive patient care concept tested in several community and teaching hospitals in the mid-1960's. Designed and developed by VA medical center and Central Office staff, the MLC Project is presently being field tested in ten hospitals in two VA regions. Medical/surgical patients admitted to these VA hospitals are assigned to one of six levels of care:

- Intensive care,
- Acute I care,
- Acute II care,
- Extended Hospital Care I,
- Extended Hospital Care II, and
- Minimal Care.

Figure 6  
 PATIENT MANAGEMENT ALGORITHM: GENERAL MODEL



\*Intensive Care Monitoring

(S) = Operative Procedure Algorithm for Disease X



The assignment is based on several subjective evaluations of the patient's needs and on an estimate of the hours of nursing care required. A patient may be reassigned during the course of treatment as his condition changes. As originally planned, the intensive, extended, and minimal care beds would be physically and organizationally separated, and patients would be moved depending on the level of care needed. As the project progressed, this policy was abandoned because of its disruptive impact on patients and staff.

If successful, the project will describe each VA hospital in terms of the number of patients in each category, and using a to-be-developed budgeting and accounting system, hospital costs will be assigned and allocated to each of the six classes of patients. As a result, the VA will have an estimate of the types of patients treated in its hospitals and the relative costliness of its major types of medical and surgical care. While the use of only six categories would not be acceptable in the private sector where costs already are aggregated by patient, the MLC Project is an important step for hospitals which have not costed or priced their different products by patient.

#### Resource Need Index

The resource need index (RNI) was developed in the mid-seventies by Richard Ament at the Commission on Professional and Hospital Activities (CPHA). The basic approach of the RNI is to use individual patient charges from a group of hospitals to construct a relative value scale that weights a hospital's mix of cases and creates a single number summarizing patient intensity.

There are two essential components to the RNI concept. The first is the resource need unit (RNU) which is the average charge for a specific group of patients divided by the average charge for all patients in the data base. For example, if the average charge for all appendectomies is \$800 and the average

for all patients, regardless of diagnosis, is \$1,600, the RNU value for appendectomies would be .50, half the average RNU value of 1.0. The second component, the RNI, is simply the average number of RNUs per patient for a selected group of patients. For example, the RNI for a group of three patients -- one with an appendectomy (RNU = .50), one with a hysterectomy (RNU = .90), and one with open heart surgery (RNU = 2.5) -- would be  $(.5 + .9 + 2.5/3) = 1.3$ .

Resource need index values can be developed for any patient diagnosis or group of diagnoses, for clinical services, or on a hospital wide basis. The initial application of the RNI was based on 1975 data from 76 hospitals participating in the Study of Patient Charges (SPC), an extension of CPHA's Professional Activity Study (PAS). Analysis at CPHA of the SPC data showed that teaching hospitals in general have higher resource need indices than non-teaching hospitals. Major teaching hospitals (those with approved residency programs, including four of the following: medicine, surgery, obstetrics-gynecology, pediatrics, pathology) had resource need indices that are approximately 10 percent higher than those of non-teaching hospitals.

#### Complexity Index

The complexity index developed at Johns Hopkins University is an institutional measure of case mix ". . . based on the assumption that relatively rare or complex cases will be concentrated in a few specialized institutions while common or less complex conditions will be distributed more evenly . . ." <sup>10</sup> To

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10. Susan Horn and Dale Schumacher, "An Analysis of Case Mix Complexity Using Information Theory and Diagnostic Related Grouping," Medical Care, XVII (April, 1979), p. 383.

compute the complexity index, data on all patients for every hospital being compared must be analyzed using a two-step procedure. In step one, each patient is categorized according to case characteristics<sup>11</sup> and each hospital is described according to the proportion of its patients in each case type. In the second step, a mathematical formula is used to compare the hospitals by the proportion of their patients in each case type. The result of the formula is a numerical index in which the more complex hospitals have higher scores.<sup>12</sup> Significantly, the index number provides no information on actual or estimated cost of treating a given mix of patients. Thus, unless further work establishes a relationship between the index and a measure of hospital cost, this approach appears to be more useful to those doing statistical analysis than to those interested in new or revised reimbursement approaches.

#### Comparing Alternative Case Mix Measures

Of the eight distinctive case mix measures, only three are completed: the PAS List "A", the diagnosis related groups, and the resource need index. All remaining measures are in various stages of development. Given this paucity of completed case mix measures, few studies have been undertaken to compare alternative case mix measures.

In an interesting but highly limited comparison, diagnosis related groups were compared with disease staging using Medicare and Medicaid discharge abstracts from twelve PSROs. Significantly, 77% of the available abstracts had to be excluded from the study because they involved discharges for which disease

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11. In an application of the method to Maryland hospitals, a collapsed version of the Yale DRGs with 272 case categories was used to classify cases.
  12. In an application using all Maryland hospitals, the index for small, rural hospitals was 0.67 to 0.88, for Baltimore community teaching hospitals it was 0.93 to 1.11 and for Baltimore university hospitals it was 1.21 and 1.37.

staging criteria had not been established. Both the DRG's and the disease stages reduced the overall variation in length of stay; however, the variance reduction obtained by the DRGs, 26%, was considerably larger than the variance reduction obtained using disease staging, 16%.<sup>13</sup> When the disease staging criteria were modified to create separate groupings for the presence and absence of surgery, the variance reduction obtained by disease staging, 23%, approached the variation reduction of the DRG's, 26%. It is unclear, however, whether this finding using the presence or absence of surgery demonstrates the significance of recognizing surgery in case mix or simply reflects the fact that the modification increased the number of disease staging categories from 94 to 160 which is much closer to the 175 DRGs used in the comparison. The overall interpretation of these findings is handicapped by the fact that 77% of the discharges considered had to be eliminated. That 77% may be more important in determining the relative power and usefulness of the two approaches than the 23% that were studied.

At the present time, the Commission on Professional and Hospital Activities (Ann Arbor, Michigan) has a contract with the Health Care Financing Administration to do a comparison of the resource need index, diagnosis related groups, and disease staging. Health economists at the University of Washington are major subcontractors to CPHA for this study. While the study's final report was originally scheduled for completion in February, 1980, it now appears that final results will be available in the summer of 1980.

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13. Daniel Louis et al. "Use of Disease Staging in Patient Clustering: An Analysis of PHDDS Data," Application of the Staging Methodology to the Analysis and Evaluation of PHDDS Hospital Utilization Data. Santa Barbara: Systemetrics, Inc., April, 1979. P. 13.

Research on case mix measures is presently receiving substantial attention: old ideas are being refined and reformulated, new approaches are being completed, and new ideas are being developed. While these measures are being developed, at least in part, to explain and predict resource consumption, most assume that existing diagnostic coding systems are an appropriate starting point for forming case categories. The appropriateness of this assumption has not been tested. In addition, research studies have not compared:

- the similarity between the individual categories established by the different measures;
- the sensitivity of the different measures to alternative discharge coding procedures;
- the ability of the various measures to reduce within category variation in length of stay, routine service costs, and ancillary service costs;
- the ability of patients, physicians, hospital administrators, and payers to cognitively understand and accept the various measures;
- the stability of the measures across time; and
- the ease of revising measures to reflect changes in diagnostic and treatment practices.

Hopefully, additional research funding will be made available to investigate these issues.

## CHAPTER THREE

### CASE MIX REIMBURSEMENT APPLICATIONS

At the present time, there are essentially three different approaches to paying hospitals: charge based payments, retrospectively determined allowable costs, and prospectively determined payment rates. As payers and public agencies have established payment limitations on each of these approaches, hospitals have increasingly argued that each approach must recognize differences in the number and types of patients treated by different hospitals. Within the past five years, some payers have developed reimbursement experiments that attempt to recognize these differences. This chapter describes seven specific case mix reimbursement approaches:

- Maryland's Guaranteed Inpatient Revenue System,
- New Jersey's case specific payment system,
- Georgia's approach to establishing hospital peer groups,
- New York State's case mix exception process,
- New York State's case mix payment study,
- HCFA's case mix approach to Section 223 limits, and
- a VA district's budget allocation system.

These approaches are in various stages of development and implementation.

#### Maryland: The Guaranteed Inpatient Revenue System

In 1971, the State of Maryland established the Health Services Cost Review Commission (HSCRC) to review, evaluate, and approve the rates charged for hospital services. In its brief history, the HSCRC has reviewed the budgets of all Maryland hospitals, established approved revenues for all hospitals, imposed uniform financial and discharge abstract reporting, and tried several different approaches to determining allowable hospital revenues. The Guaranteed

Inpatient Revenue system, a prospective payment system recognizing changes in case mix, was introduced in 1976; today it is being used in several different forms in fourteen Maryland hospitals. The essential steps of the GIR system may be summarized, in an oversimplified manner, as follows:

- the Rate Commission and the hospital select a base period during which the hospital operated with Commission approved revenues;
- the hospital arrays its live discharges by diagnostic group and principal source of payment;<sup>1</sup>
- for each discharge-payer category, the average hospital charges per admission are computed;
- the Commission establishes an inflation factor which is used to convert average per admission charges, by diagnostic group and payer, from the base period into GIR target charges for the payment year;
- the hospital's actual revenues, by diagnosis and payer, are compared with the GIR target charges. Because this comparison is done by diagnostic category and principal source of payment, the hospital's GIR target revenue reflects both changes in the diagnostic mix and changes in the mix of payers.
- If the hospital's actual revenues are less than the GIR target revenues, the hospital may include 50% of the difference in its future allowable revenues and this additional revenue, when collected, may be spent as discretionary income. If, on the other hand, the hospital's actual revenues are greater than its GIR target revenues, the hospital will have to subtract a portion of the difference from its approved rates.

In the fourteen hospitals presently under the GIR system, several variations of this general approach are used: some hospitals use the Yale DRGs by payer for case mix, some use the DRGs without recognition of payer, and some use the ICDA codes.

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1. Principal payment sources are Medicare, Medicaid, Blue Cross, and all other.

To date, there has been no comprehensive evaluation of the Guaranteed Inpatient Revenue System. Some HSCRC staff and some hospital executives, however, are questioning its usefulness. Uniform and consistent coding has been difficult to achieve. Large year-to-year changes in low volume case categories have led to concerns about windfall gains and unintended penalties. Some have concluded that these coding and case mix changes lead to substantial swings in allowable revenue which may not be attributable to management effectiveness. As a result, some state officials are considering modifying the GIR system to base the target on average revenue per admission, perhaps by payer, with case mix used only in an exception process to correct for significant changes in types of patients admitted.

The Maryland approach to case mix reimbursement may have a limited potential for application in other settings. It must be remembered that Maryland is a small state with only fifty hospitals, the Commission staff have evaluated each hospital's revenues and operations and understand the hospitals they control, and the state hospital association and hospital executives generally have a favorable view of the competence and objectivity of the Commission staff. If these factors were absent, the GIR system, despite its clear recognition of the financial impact of changes in case mix, might be opposed rather than accepted.

#### New Jersey's Case Specific Payment Rates

In New Jersey, the case mix system was an experiment through 1979. Beginning January 1, 1980, the program became operational with twenty-six hospitals, nine volunteers and seventeen conscripts. The approach has been difficult to implement and hospitals expect to receive their first payment based on case mix



on May 1, 1980. By the end of the year, however, state officials plan to make the reconciliation payments necessary, in effect, to have begun the program on January 1, 1980. On January 1, 1981, the state plans to mandate the participation of an additional group of hospitals; on January 1, 1982, all remaining short-term general hospitals in the state will be included in the program.

The New Jersey case mix system, which established 383 case specific payment rates for each of the twenty-six hospitals, has the following essential characteristics:

- each participating hospital is required to submit a discharge abstract for each patient, a copy of each patient's inpatient hospital bill, and a standard hospital financial report to the State Health Department.
- the State Health Department divides each hospital's costs into a case mix related set of costs and a set of costs not related to case mix. Using these two sets of costs and each patient's bill to identify the specific services used, the case mix costs and the fixed costs are computed for each discharge.
- hospitals and their patients are divided into two groups: teaching hospital discharges and community hospital discharges.<sup>2</sup>
- within each group of hospitals (teaching and non-teaching) patients are categorized by the Yale DRGs into 383 categories, and the average hospital cost per DRG are determined for case mix related costs.
- prospective DRG payment rates for each hospital are established using a combination of the hospital's own cost for treating that DRG and the average teaching or community hospital's cost for treating that DRG. The proportions used to form the combination depend upon the observed variation, across hospitals, in the costs of treating that DRG.

--If hospitals vary significantly in the costs of producing a DRG, relatively more of the individual hospital's costs are included in determining its prospective rate.

--If hospitals produce the DRG at relatively similar costs, relatively more of the average cost are used in each hospital's prospective rate.

- A hospital's allowable revenue is determined by adding: (1) the product of the number of discharges in a DRG and the DRG-related prospective rate, (2) the hospital's actual costs for deaths and

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2. A teaching hospital is defined as one having at least two residents in each of four specialties including family practice.

for treating patients with unusually long lengths of stay in a DRG, and (3) the hospital's approved budget for costs determined not to vary with changes in case mix.

The New Jersey experiment has been controversial. The hospital concerns focus in several specific areas:

- hospitals are concerned that the DRGs are being accepted as "the only case mix measure available" despite their disadvantages and controversies;
- urban and teaching hospitals are especially concerned that the DRGs make no allowance for the socioeconomic status of the patient or his stage of illness. There is a fear that DRG reimbursement without these factors will lead to patient dumping by community and suburban hospitals;
- by selecting the average hospital's cost of producing a DRG, some hospitals, by definition, always exceed the standard; this approach is perceived as punitive;
- the data processing procedures used by the state do not permit hospitals to audit or reconcile either patient discharge or hospital financial data;
- the data processing procedure involves long time lags between data input and returned reports. Some hospitals feel this lag prevents the hospital from using the system in the management of clinical activities;
- the administration of the project requires enormous time and effort both for the Health Department and the participating hospitals;
- the methodology used to set the DRG rates is complicated and difficult to understand; and
- the technical implementation issues, such as initiating a new billing system at each hospital, have not been sufficiently resolved.

In addition, some hospitals have concluded that the state's primary interest is a reduction in hospital payments rather than a more equitable payment system. This perception leads the hospitals to be suspect of and question each change proposed by the state.

A current controversy surrounding the case mix payment program concerns the nature of the Medicare "waiver" which permits services for Medicare patients

to be paid on the case specific basis. In granting the waiver, HCFA stipulated that its liability under the case-specific system would not be permitted to exceed its payment liability under Medicare's existing retrospective cost-based reimbursement system. Hospitals have objected to the low inflation rate HCFA projects for the waiver period and to HCFA's position that any computed over-payments under the waiver must be calculated on a hospital-by-hospital basis with the individual hospital responsible for repaying HCFA.

The Health Research and Educational Trust of New Jersey, an affiliated organization of the New Jersey Hospital Association, is presently conducting an evaluation of the New Jersey case specific payment program. The evaluation, directed by J. Joel May, has an advisory council which includes the New Jersey Commissioner of Health, the hospital association president, the state senator who chaired the committee that legislated hospital cost containment, the president of the state medical society, the dean of one of the New Jersey medical schools, and a representative from the state's largest employer. In the two and one-half year project, the following issues will be examined:

- the statistical stability of the DRGs,
- the symmetry of the length of stays in a DRG,
- the allocation of costs to the DRGs,
- the quality and accuracy of discharge abstract data,
- the alternatives for computing DRG rates,
- the procedure for regrouping DRGs to account for changes in practice patterns,
- the impact of the DRG rates on individual hospitals,
- the cost of operating the state system, and
- the cost/benefit implications of the system.

As designed, the project staff will include state employees, hospital association employees, contract professionals, and staff from Coopers and Lybrand.

### Georgia Medicare and Medicaid Experiment

Under a grant from the Health Care Financing Administration, the Georgia Department of Medical Assistance is conducting an experiment to develop a reimbursement system for Medicare and Medicaid payments. The approach will classify hospitals into peer groups and maximum per admission reimbursement targets will be set for each group. In addition, hospitals will have individual limits which will be based on applying an inflation factor to the hospital's own base year costs. Hospitals will be denied payments for costs if they exceed the lesser of the group limit or the individual limit. A hospital also could receive incentive payments if its costs are below its individual target rate.

Under the experiment, each hospital's Medicare and Medicaid patients would be categorized by DRG. Using each hospital's DRG case mix pattern, hospitals are clustered into statistically similar groups. Data from the State Health Planning and Development Agency on hospital facilities and services also would be employed in a second statistical clustering. Finally, the case mix clusters and the facility/services clusters would be used to create "peer groups" of hospitals. Using the peer groups, Georgia officials argue that differences in costs between hospitals in the same group reflect differences in productivity and efficiency rather than differences in the types of patients treated and services offered.

The Department of Medical Assistance had planned to implement the new system on July 1, 1980. However, after vetoing a bill requiring a two year delay for project evaluation, the Governor of Georgia has ordered that a two-month study of the impact of the system be conducted. This will probably delay the starting date until Fall of 1980 at the earliest.

### New York State's Case Mix Exceptions Process

For several years, hospital payments for Medicaid and Blue Cross patients in New York State have been established by the state using peer groups of hospitals. In some cases, hospitals with costs exceeding the assigned rate have complained that the rate-setting process fails to recognize hospital specific differences in case mix. To correct this perceived deficiency, hospitals have filed for exceptions to the assigned rates using case mix differences as one basis for the increased dollars requested. In 1977, the state established a case mix exception procedure which classifies patients using diagnosis related groups and weights each DRG by "costliness" weights developed by Maryland's Health Service Cost Review Commission. State officials can then compare two hospitals or all of the hospitals in a peer group by determining how they would have compared had each hospital treated its patients at the Maryland costs. Because case production costs are standardized in this manner, resulting differences can be attributed, at least in part, to differences in case mix. This approach allows the state to evaluate and grant case mix exceptions to established rates. Appeals from 1977-79 have been based on 1977 DRG data. For 1980 appeals, 1978 case mix data is being used.

### New York State Case Mix Payment Study

In 1978, the New York State Office of Health Systems Management began a major case mix reimbursement study using diagnosis related groups. The study is designed to:

- evaluate DRGs as a methodology for measuring case mix,
- develop methods for relating the costs of hospital operations to the DRG mix of the hospital, and

- investigate the feasibility of using DRG case mix measures and standardized cost reporting to begin reimbursing hospitals on a prospective payment basis with the rates either set by DRG or adjusted by the hospital's overall DRG complexity.

The New York project is organized into four major phases, three of which have been completed.

In Phase I, five New York City teaching hospitals were studied. Each hospital provided the study with discharge abstracts and a detailed bill for each 1977 patient and with supplementary hospital financial reports. Using these materials, each patient was assigned to a DRG and each patient's care was costed out by (1) allocating nursing costs using a nursing intensity measure, (2) allocating dietary costs using a dietary weighting scale, (3) allocating the remaining costs on a per diem basis, and (4) allocating ancillary costs by applying the hospital's ratio of cost to charges to the patient's gross ancillary charges. In Phase II, additional financial data on 35 "natural cost elements" for each cost center were obtained for the five teaching hospitals and a more detailed matrix method for allocating costs to individual DRGs was created. In the third phase, discharge and financial data from 31 hospitals across the state were being collected and DRG specific costs were developed using the methodology developed in Phase II. These DRG costs are being examined by hospital type, hospital size, teaching status, and source of payment. In the final phase, reimbursement, planning, and internal management applications will be developed using the data from Phase III.

At the present time, there appears to be a difference of opinion within the state about the use of project findings: some officials would like to use a DRG-based intensity index with "peer" groups of hospitals to individualize payment and revenue rates; other officials would like to establish case-specific prospective payment rates for each hospital. At this time, it appears that multiple approaches to using the data will be employed with a small number of

hospitals paid on a case specific rate, with a larger group of hospitals having costs reviewed and screened using a DRG-weighted hospital index, and with the remaining hospitals assigned to "peer groups" using their case mix and the DRG weights.

### The Medicare Program

In 1972, Congress passed Medicare amendments, P.L. 92-603, allowing Medicare to establish limits on the allowable hospital costs it would recognize for care provided to Medicare beneficiaries. To date, Medicare has used this authority only to establish per diem limits on routine operating inpatient service costs using "peer" groups of hospitals to determine the limitation. In using a limitation methodology which assumes all hospitals within a given bed size range are comparable, Medicare has been repeatedly criticized for its failure to recognize and adjust for differences in hospital case mix.

Currently, Medicare officials are actively working to add a case mix feature to their system. Their efforts remain in the developmental stage; they hope to adopt an approach consistent with the following five step outline:

- (1) hospitals would be grouped into comparison categories using the hospital's bed size and its rural-urban location;
- (2) for each hospital in a category, the average per admission costs (including ancillaries) for Medicare beneficiaries -- excluding costs for capital, medical education, and nursing education expenses -- would be determined;
- (3) a statistical threshold would be selected and used to identify the reimbursement limitation or ceiling for each group of hospitals.

In applying the group limitation to the individual hospital, the hospital would multiply its group limitation by a case mix index created by HEW as follows:

(4) For each hospital:

(4a) determine the percentage of the hospital's Calendar Year 1978 Medicare patients in each of the Yale DRGs using a 20% sample of Medicare hospital discharges, and

(4b) determine the average cost for all sampled cases and the average cost for each DRG by applying the hospital's 1978 ratio of cost to charges to the charges shown for each sampled patient (see Figure 7),

(5) With the data from steps 4a and 4b for each hospital, the case mix index for each hospital in a bed size group would be created by:

(5a) establishing a "329 by N" matrix where the columns are the 329 DRG's provided to Medicare patients,<sup>3</sup> the rows are the individual hospitals in the bed size groups, the tabular entries are the percentage of a hospital's cases in each DRG, and the column totals are the mean costs of producing a DRG across all hospitals; (see example in Figure 8);

(5b) computing the row totals as the DRG weighted mean cost per case as the product of (1) the percentage of the hospital's cases in each DRG, the tabular entries, and (2) the average costs across hospitals of treating each DRG, the column totals, (see example in Figure 8), and

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3. Medicare plans to use fewer than 383 DRG because some of the DRGs, such as those for pediatric and obstetrical conditions, are not used by Medicare beneficiaries; others are used so infrequently that the data is unstable.



Figure 7

HCFA's Conversion of Charges to Inpatient Costs

<u>Service</u>	<u>Charges</u>	Hospital 00A Patient 001 <u>1978 Cost-to-Charge Ratio</u>	<u>Imputed Cost</u>
Routine Care Days	\$ 800	.90	\$ 720.00
Special Care Days	600	.85	510.00
Laboratory Services	175	.75	131.25
X-ray Services	55	.80	44.00
Pharmacy Services	65	.85	55.25
Operating Room	500	.80	400.00
Medical Supplies	30	.70	21.00
Other Ancillary	<u>125</u>	.75	<u>93.75</u>
Total Billed Charges	\$2,350		
Total Imputed Costs			\$1,975.25

Figure 8

EXAMPLE OF HCFA HOSPITAL CASE MIX INDEX

Hosp.	Total	Percentage of Admissions in Each of Nine DRGs*									DRG Weighted Mean Cost/ Case **	Case-Mix Index ***
		1	2	3	4	5	6	7	8	9-329		
A	100	1.3	.5	6.8	4.6	13.1	6.8	6.8	12.7	47.4	\$1434.56	1.21
B	100	1.2	1.9	7.5	2.9	11.8	22.1	20.3	4.7	27.6	\$1118.25	.94
C	100	.7	0	20.0	14.3	2.8	30.7	6.4	6.4	18.6	\$983.11	.83
D	100	.6	2.8	8.9	5.0	25.6	20.6	2.5	1.6	32.4	\$1139.01	.96
E	100	2.6	.3	4.2	4.2	12.9	13.5	1.3	2.9	58.1	\$1385.03	1.17
F	100	5.2	.7	12.0	19.1	13.5	21.7	.4	3.0	24.4	\$1034.57	.87

Average Cost per DRG's across all hospitals

909	291	690	662	1114	634	892	2191	1720	1182.42
-----	-----	-----	-----	------	-----	-----	------	------	---------

\* \* Adjusted to make these 9 DRGs hypothetically represent all 383 DRGs.  
 \*\* For hospital A, \$1434.56 = (.013) (909) + (.005) (291) + (.068) (690) + ... + (.474) (1720)  
 \*\*\* For hospital A, 1.21 = \$1434.56 divided by \$1182.42

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(5c) computing the case mix index for the hospital by dividing each hospital's DRG weighted mean cost per case by the grand total DRG weight cost per case, (see example in Figure 8).

To date, HCFA has not finished analyzing the data necessary to create the case mix index developed in steps (4a) - (5c) and has not, therefore, determined the precise way in which the index will be used in setting the per admission limitation.

This HCFA approach to adjusting reimbursement ceilings for case mix raises several questions:

- Are the DRGs created using length of stay data for Connecticut and New Jersey hospitals appropriate categories when applied only to elderly patients?
- Are the diagnostic and procedural codes shown on hospital claim forms (HCFA 1453) sufficiently accurate to classify Medicare patients by DRG?
- Will using a hospital's 1978 cost-to-charge ratio to estimate per case costs produce unbiased estimates of the costs of each DRG?
- Will the 20% sample of Medicare patients provide an unbiased estimate of the DRG distribution of all Medicare patients?
- Will the 20% sample of Medicare patients provide an unbiased estimate of the DRG costs of treating all Medicare patients?
- Does the hospital's 1978 Medicare case mix accurately describe the hospital's current Medicare patients?
- Do the hospital's relative costs per 1978 DRG accurately describe its present relative costs per DRG?

To date, HCFA has neither publicly addressed these questions nor publicly established the criteria it will use to answer them.

#### VA District Budget Allocation

In the past decade, Veterans Administration medical facilities have been organized into medical districts with several districts coming together to form

a medical region. Resources are distributed to the district from the VA's Central Office and then to the individual hospital. Both of these allocations are reviewed and approved by the newly established Regional Director. In the Michigan district (Medical District 14) -- which has hospitals in Allen Park, Ann Arbor, Saginaw, and Battle Creek -- the District Executive Council directed the VA's Health Services Research and Development Program to develop workload related methods for allocating resources and budgets among the four medical centers. Health services research staff, under the direction of Marie Ashcraft, Ph.D. and Sylvester Berki, developed a DRG-based resource allocation system which is being used by the District Executive Council to allocate fiscal year 1981 funding.

The budget allocation system, which allocates resources for inpatient services, was constructed as follows:

- for all admissions in each of the four medical centers, patients in a base year were categorized by diagnosis related groups;
- each admission was weighted according to the 1976 "DRG costliness" weights for New Jersey hospitals with one day stays assigned a uniform weight regardless of DRG and with atypically long stays weighted by the average per diem cost for that particular VA medical center;
- for each of the four medical centers, the total weighted admissions were determined by adding the "costliness" weights assigned to each admission; and
- for each medical center, its share of the medical district's inpatient budget was computed as the percentage obtained by dividing the medical center's total weighted admissions by the sum of the total weighted admissions for all four district medical centers.

Following its application in Medical District 14, similar allocation estimates were prepared for each of the districts in the Great Lakes Region, and their use is being reviewed at this time.

Summary

This chapter has reviewed case mix reimbursement applications that are presently underway or in experimental stages. It is clear from this review that the availability of the Yale diagnosis related groups has led to their adoption in each of the reimbursement applications. It is also clear, from site visits, that many hospitals are suspicious of the DRGs and regard them as not validated for reimbursement purposes. Some state and federal officials share this concern but most defend the DRGs' use for two reasons: (1) in spite of some practical shortcomings in the DRGs, their general conceptual approach is appealing; (2) hospitals have pushed payers to use case mix and the DRG is the only case mix measure available. The hospital concern about the validity of the DRGs is seen by some state and federal officials as a "red herring." These officials believe that hospitals now realize that case-mix payment systems will create winners and losers, and that hospitals will not endorse DRGs until they either learn how the system will impact upon them or until they learn to manipulate the system. Thus, in many areas, the move toward case mix reimbursement is taking place with the hospitals believing the payer is accepting case mix to provide "academic respectability" to a method for reducing hospital payments and with the paying agencies believing hospitals are more interested in the number of dollars received than in the equity of the payment system.

## CHAPTER FOUR

### REIMBURSEMENT POLICY ISSUES

In the previous two chapters, the available case mix measures and their present reimbursement applications were summarized. This chapter complements these by describing nine major policy issues faced by payers and hospitals interested in case mix reimbursement:

- choosing the case mix measure;
- tying the case mix measure to reimbursement;
- determining and allocating case related costs;
- identifying, collecting, and processing the data;
- defining atypical patients;
- trending historical data;
- deciding which third parties will participate;
- meeting the needs of different types of hospitals; and
- designing an exceptions process.

Decisions on these issues will directly affect the impact, equity, and acceptance of any reimbursement application using case mix.

#### Choosing a Case Mix Measure

To date, the DRGs have been the choice of most reimbursement experiments. Undoubtedly, this choice reflects the fact that the DRGs are completed, presently available, and use only information generally included in a patient's discharge abstract. As the other case mix measures are completed and provide alternatives, case mix measures will need to be comparatively evaluated and selected for their equity across providers and payers, stability across hospitals and through time, and their ease of application.

### Tying Case Mix to Reimbursement

There are at least five quite different ways in which the selected case mix measures may be used in developing reimbursement methodologies.

#### Diagnosis Specific Rates - Purchasing Cases

The most direct application of case mix to reimbursement is to set per admission rates for each specific diagnostic category. New Jersey's current reimbursement experiment is essentially taking this approach using DRGs as the case mix measure. Prospective per admission rates have been set for each of the 383 DRGs and payers are, in effect, purchasing cases of care.

The financial incentives of the diagnostic specific rates are clear: a hospital's revenue is tied directly to the number and types of patients treated, and the hospital's financial performance will be determined by its ability to treat these patients at or below the standard or average rates for all hospitals. Thus, except to the extent that its costs are included in the calculation of the mean for all hospitals, the rates a hospital receives are totally independent of its own performance. It should be noted that New Jersey has not moved quite this far in that a significant portion of a hospital's reimbursement is determined using its actual costs rather than the average costs per case for all hospitals.

#### Case Mix Index

A second method to tie a case mix measure to reimbursement is to construct a relative value scale which weights each diagnostic category by its average cost across hospitals. A hospital's case mix is then defined as the index value obtained by comparing its cost-weighted case mix with that of all other hospitals. The Health Care Financing Administration (HCFA) is headed in this direction in setting Medicare payment limits under Section 223.

### Cap on Revenues or Costs

The first two methods of tying case mix to reimbursement use all hospitals as the basis for setting rates. A hospital's reimbursement is directly related to how its costs, by diagnosis, compare to the costs of other hospitals. Placing a cap on revenues for each diagnosis for a single hospital creates a different base for comparison. A hospital is not compared to others, but to its performance in its base year. This approach is the one most similar to that being tested by Maryland's Health Services Cost Review Commission.

### Hospital Peer Groups

Reimbursement applications need not link a case mix measure directly to the amount of payment allowed. Less direct applications are also possible. One indirect method is to use case mix only as a variable to establish "peer" groups of hospitals having "comparable" case mixes. The actual grouping process could be carried out in several ways. The case mix measure could be the principle grouping variable or it could be one of many, including bed size, geographic region, teaching status, and facilities and services offered. Once grouped, reimbursement limits within each group could then be set without using a case mix measure. Georgia's Medicare and Medicaid experiment is currently testing this approach using DRGs.

### Exceptions Requests

Many hospitals exceeding Medicare or state-imposed payment limits have often argued that their higher costs are not attributable to inefficiency but rather to case mix. Depending upon the methodology used to set the limits, at least three case-mix exception procedures are feasible: (1) hospitals could separate revenue (or expense) increases into changes in charges (costs) and



changes in the mix of patients; (2) hospitals with limits set on a "peer group" basis could have the limits adjusted for a case mix that is more expensive than their peers, and (3) the change in a hospital's case mix could be compared with the change in the case mix of its "peer group" and limits could be adjusted for hospitals experiencing atypical changes. The exceptions options for using case mix would be especially worth pursuing in states where total revenue caps recognize neither present case mix nor, more importantly, annual shifts in case mix.

#### Determining and Allocating Case Related Costs

One objective of those advocating case mix reimbursement experiments is to relate hospital payments to the types of patients treated. To accomplish this objective, hospital costs must be collected and reported on a patient specific basis. Figure 9 illustrates a general model that explains the process of moving from total hospital costs to diagnosis specific costs. The first step in the process is to classify hospital costs into three broad categories:

- Non-case related costs or institutional costs are essentially fixed costs that do not vary in the short-term with changes in volume or types of patients.<sup>1</sup> Examples have included depreciation, interest, medical education, and energy costs.

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1. In the New Jersey experiment, capital, utility, administrative, fiscal, and teaching costs are included in non-patient related costs. In the New York study of case mix, the definition of non-patient care-related costs is more restricted, limited primarily to depreciation and rental expenses of buildings and fixtures. The differences in these definitions do not necessarily reflect differences in opinion about what constitutes non-patient related costs from an accountant's point of view. They are simply decisions about which institutional costs should be spread across all cases rather than treated as a separate category of costs.

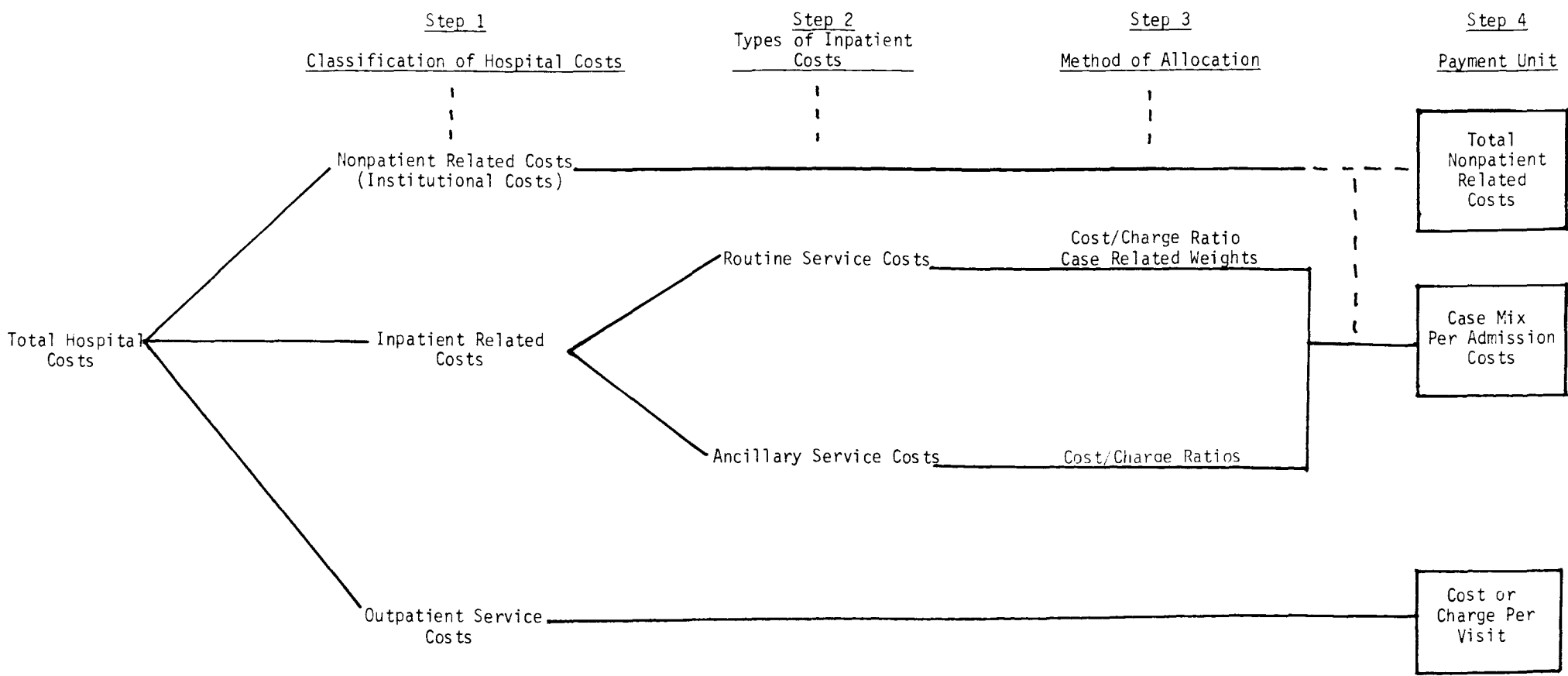
- Case related costs are direct patient care service costs and patient-related overhead costs. While the direct patient care costs are well-defined, the cost components in patient-related overhead will vary depending on how non-case related costs are defined. For example, in one instance, energy costs may be treated as case related while in another, they may be classified as non-case related.
- Outpatient costs include direct outpatient service costs and related overhead allocated to the outpatient area.

Once case-related hospital costs are defined, they need to be further subdivided (Step 2, Figure 9) into routine services -- such as nursing, admitting, and dietary expenses -- and ancillary services, such as laboratory, operating room, and radiology. The final and most complicated step in determining case-related costs is deciding on the basis for allocating these costs to individual patients. For ancillary services, where individual patient bills generally identify the patient's use of specific ancillary services, the only method presently being used to allocate ancillary costs is patient charges adjusted by cost to charge ratios. For routine service costs, where patients are generally billed on a per diem basis, two alternatives are possible. The administratively easiest method to allocate routine service costs to each patient is to adjust the patient's routine service charges by the cost to charge ratio for the routine service cost center. A second, more detailed approach is to allocate one or more categories of routine service costs on a services-consumed basis which may more accurately reflect actual resource consumption.<sup>2</sup> For example, admitting costs, which should not vary by length of stay, can be allocated on a per admission rather than per day basis. Another more complicated example is nursing costs, which can be allocated on a daily basis using estimates of

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2. For a more detailed example of this approach, see J. Thompson, R. Averill, and R. Fetter, "Planning, Budgeting, and Controlling - One Look at the Future: Case Mix Cost Accounting," Health Services Research, Summer, 1979, pp. 111-125.

Figure 9



each patient's use of nursing services. Similarly, dietary cost weights can be developed for each meal type and then can be used to allocate these costs on a basis more directly related to any special nutritional needs prompted by the patient's condition.

These alternative allocation procedures should be central to any discussion of case mix payment systems. The allocation statistics selected have a significant impact on diagnosis specific rates and ultimately, the financial viability of hospitals. In selecting allocation statistics, the administrative costs of developing a more sophisticated system must be carefully weighed against the perceived accuracy and equity of the weighting scheme.

Step 4 in Figure 9 indicates that the final results of the allocation process are three types of payment units: outpatient costs separate from the case mix reimbursement system; average per admission costs for each diagnosis; and a total budget for non-case related costs. For payment purposes, however, the non-case related costs may be spread equally across the per case rates based on either the projected number of admissions or the projected number of patient days. At year end, adjustments in the payment for the non-patient related costs may be made for the difference in projected versus actual number of admissions/patient days.

#### Identifying, Collecting, and Processing the Data

Developing a case mix reimbursement system requires substantial data collection and data processing. This is a burden to the hospitals, payers, and those responsible for developing the payment system. Moreover, the costs of these activities increase provider and payer costs with no corresponding increase in health care services. Thus, these data costs are the costs of the regulatory approach, not of the health services.

A sensitive issue among hospitals in regard to data issues is the need for a hospital to be able to audit and confirm or challenge the accuracy of the reports and proposed rates generated by the data processors. To obtain hospital acceptance, there needs to be a regular reporting program that permits them to check out peculiarities in the data reports.

#### Defining Atypical Patients

Present case mix measures can not categorize all patients into homogeneous diagnostic groups. There are always atypical patients requiring special types of treatment. While the percentage of atypical patients may be small, the amount of resources required to treat them is disproportionately high. Thus, criteria need to be established to identify these "outliers" so that the payment system recognizes their unusual resource consumption patterns.

In New Jersey, the outliers are defined as all patients falling outside the 98th percentile for each DRG's length of stay. Length of stay, while easy to measure, need not be the only way to define atypical patients. Cost per case is obviously an alternative that could be used. It should be noted that although most outliers have abnormally long lengths of stay and high total costs, criteria should also be developed to identify outliers with abnormally short stays or costs so they, too, are explicitly considered in determining hospital rates. It seems appropriate, for example, that a heart failure victim who dies 10 minutes after admission should not be averaged in with other patients with heart failure who recover and are discharged an average of two weeks later. Whether or not all deaths, however, should be identified as outliers is an issue that needs separate analysis and consideration.

### Trending Historical Data

A characteristic common to all present case mix reimbursement experiments is that they set target rates using historical data. This use of prior year's data requires that an estimate be made in advance of inflation for the wages, services, and goods the hospital will have to purchase to provide care. This need to trend and "roll forward" data is characteristic of most prospective payment systems, including those incorporating case mix measures. The data sources one may rely on for these trend factors are numerous; none is ever ideal. As a result, the selection of indicators for projected rates requires a careful sorting out of the options so that subjectivity is minimized and equity is maximized.

Provisions must also be made for unforeseen shifts in volume. The marginal cost per admission of treating additional admissions may be lower than the average cost. In contrast, a drop in admissions probably will not result in a proportionate drop in costs. Without a mechanism to recognize changes in volumes and to make appropriate adjustments in payments, hospitals could experience excess revenues or unfair payment penalties.

### Deciding Which Third Parties Will Participate

The decision about which third parties will participate in a case mix reimbursement system is often beyond the control of hospitals or even third parties themselves. In New Jersey, for example, state law mandates the participation of all payers. In other states, funding from the Health Care Financing Administration for the experiment has been contingent upon participation by certain third parties. Whether participation is voluntary or mandatory, several important issues will arise.

First, the effect case mix reimbursement may have on the competitive positions of the third parties must be considered. If one of the third party's subscribers, on average, have more illnesses requiring more intensive treatment, a shift to case-related payments could result in higher payments by that third party, and consequently, higher premium prices over time.

A second issue may arise if all cost-based payers do not participate in a case mix reimbursement experiment. With case mix incorporated into a payment system, the financial liability of each payer reflects the types of patients insured. If the payers participating in the case mix system have a relatively low cost mix of beneficiaries, their expenditures for hospital services will be reduced. This reduction in expenditures will result in a corresponding reduction in hospital revenues unless non-participating payers having a relatively high cost mix of beneficiaries agree to increase their payments to hospitals. When all payers are not participating in the case mix system, there is no assurance that payers with high cost patients will agree to this increase.

Third, the financial obligation of third parties to providers could fluctuate widely depending on the method used to allocate costs to cases. For example, the use of nursing intensity weights to allocate nursing costs to each of the diagnostic groupings could result in much different per case costs than allocating nursing costs based only on days of care.

Fourth is the issue of charity patients. Many hospitals provide a significant amount of free care to patients who are unable to pay. Municipal or state governments sometimes provide some support for treating these patients, but it is almost always below the average cost of the services used. To ensure that hospitals which treat the indigent population are not financially penalized, two of the state experiments with case mix reimbursement require each payer to assume its proportionate share of costs in treating charity patients. This

problem is undoubtedly more difficult to resolve if all third parties are not participating. This issue and the others associated with the participation of multiple payers require careful study, negotiation, and compromise if equitable and workable solutions are to be achieved. It is important to assess not only the short term implications of these decisions for each third party, but also whether the long term consequences are desirable.

#### Meeting the Needs of Different Types of Hospitals

Just as the consequences for participating third parties must be thoroughly thought through, so must the implications for various types of hospitals. A reimbursement system incorporating case mix will require adjustments to meet the unique characteristics of individual hospitals or groups of hospitals. For example, in New Jersey, the teaching hospitals as a group have consistently higher costs by DRG than the non-teaching hospitals. To recognize the higher costs associated with their educational mission, teaching hospitals have been grouped separately from non-teaching hospitals for setting prospective rates. There also appear to be some difficulties in applying case mix measures to small hospitals, where the relatively small number of discharges may not provide an adequate profile of the case mix. A hospital with only 2,000 discharges spread across 383 DRGs or any other case mix measure may be much more financially vulnerable to small changes in case mix or abstract coding errors than a large hospital which has a large patient volume. If the case mix measure is being used only to develop a case mix index or to group hospitals rather than to "purchase" cases of care, one approach to the small hospital problem might be to base the case index on two or three years of diagnostic data rather than one year. Special attention should also be given to specialty hospitals such as children's hospitals and rehabilitation institutes where intensive services are provided in a limited number of diagnoses.



### Designing an Exceptions Process

Whatever modifications are made to tailor the system to the diversity among participating hospitals, careful thought should also be given to a well-conceived exceptions process for hospitals exceeding the payment limits. This is especially crucial in the early stages of implementation when efficient hospitals may be unintentionally or unfairly penalized. For example, a case mix payment system may not take into account unforeseen patient transfer patterns. A newborn with a birth defect may be born in a community hospital but transferred to a children's hospital after a day or two for intensive treatment. In some instances, the baby may be assigned to the same diagnostic group in each hospital and thus would also be eligible for the same payment rate regardless of the legitimate differences in treatment provided by the two hospitals. These types of transfer patterns need to be carefully monitored so that hospitals will not be penalized for referring or receiving patients needing special medical resources. At the same time, there is also a need to be able to identify hospitals who are "dumping" patients solely because of financial risks so that they are not financially rewarded for these patient transfers.

There is a more profound question -- quality of care -- that may be of even greater importance in establishing an exceptions process for case mix reimbursement. Payment tied to patient by diagnosis will focus increased attention on differences in treatment provided for patients with the same medical problem. If a hospital on average provides more services resulting in higher costs than similar patients in other hospitals, the hospital ultimately will be asked to provide evidence that more costly treatment is resulting in better patient outcomes. The elementary state of current methods for measuring outcomes is widely known, but there may be opportunities in some well-defined disease categories for hospitals to demonstrate that quality of care can be a part of

the reimbursement equation. If a hospital can show that the prognosis for patients entering their institution is more favorable than the outlook at other hospitals, both patients and payers will be more likely to go beyond cost issues in judging hospital performance. The data may never be available to explain many of the differences in quality, but the importance of including quality as a part of an exceptions procedure should not be overlooked.

### Discussion

There has been a great deal of skepticism among hospitals about the worthiness of applying DRGs to reimbursement. Some have suggested that the system is just one more set of complex regulations that will require additional paperwork and administrative staff and will be used as a weapon to indiscriminately threaten the hospital's financial viability. Many of these fears may be justifiable, but some would probably be lessened if the issues important to the development of case mix reimbursement were better clarified and communicated to all parties involved. Hospitals and third parties should understand that choices are available. Case mix measures can be tied to reimbursement in dramatically different ways and each of the methods will have different impacts on patients, hospitals, payers, and physicians.

CHAPTER FIVE

INTERNAL MANAGEMENT APPLICATIONS

As hospitals have sought to identify the impact of case mix and case mix changes on their costs and operations and as third-party payers have developed case mix payment systems, hospitals have become increasingly interested in developing and evaluating internal information systems keyed to or based on case mix. Some individual hospitals have developed sophisticated case mix management systems; however, most of these systems are hospital specific. More generalizable approaches have been developed by the Illinois Hospital Association with Ernst and Whinney and by Arthur Andersen.

Diagnosis Related-Patient Care Unit Study

Relative to commercial industries, cost accounting practices in the hospital industry have been unsophisticated, and little is known about the actual cost of producing specific types of services. Hospital accounting systems often do not go beyond aggregate figures and frequently rely heavily on patient charges to estimate actual costs. The present accounting practices also make it difficult to assign costs accurately to diagnosis-related cases of care.

To address the shortcomings of current hospital cost accounting and provide hospital management with a useful tool, the Illinois Hospital Association sponsored a two year project to develop a Diagnosis Related-Patient Care Unit (DR-PCU) system. The purpose of the study was to design a system which linked clinical, financial, and productivity data so that hospital managers and physicians could more accurately monitor and control hospital costs. The DR-PCU project was pilot-tested in four Illinois hospitals: Evanston Hospital, Glenbrook Hospital, Christ Hospital, and Katherine Shaw Bethea Hospital. The

Chicago office of Ernst and Whinney had primary responsibility for the technical development and implementation of the project. The Health Care Service Corporation and Chicago Community Trust also participated and helped to fund the study.

The DR-PCU system has two basic components. The first and most critical is the Patient Care Unit (PCU). PCUs are defined as discrete patient care units of service, which generally identify a service for which a patient is typically charged. PCUs include services such as individual radiological procedures, specific lab tests, physical therapy procedures, and different levels of nursing care. In total, PCUs were developed for over 600 clinical services. Costs were developed for each PCU at each hospital using management engineering techniques which included monitoring of labor input and specific identification of the amount and costs of materials required to produce a service. Four types of costs were assigned to each PCU: labor (direct, indirect, and vacation), direct material, departmental overhead, and general allocated overhead. The sum of those costs produced a total cost for the PCU. An example of a PCU is illustrated in Figure 10.

PCUs provide a measure of productivity for specific clinical services. They do not measure productivity in terms of the mix and volume of clinical services used to treat patients with various diagnoses. The second component of the DR-PCU system addresses this issue by linking the PCUs with patient diagnosis. To accomplish this match, the standard PCUs costs for treating each patient are aggregated and assigned to the DRG for the patient. An example of this linking process is shown in Figure 11. Thus, accumulating PCUs by DRG is one approach to monitor, evaluate, and control the volume and types of clinical services used to treat patients.

Figure 10

A Patient Care Unit

HOSPITAL X - Department of Radiology			
PCU (No.) 1928			
(Name) Abdomen X-Ray flat & erect			
CATEGORY	STANDARD	UNIT COST	STANDARD COST
<b>I. DIRECT LABOR</b>			
1. Transport	.31	\$5.73	\$ 1.78
2. Supervisory/Special	0	22.83	0
3. Regular Tech	.25	14.45	3.61
		SUBTOTAL	<u>\$ 5.39</u>
<b>II. DIRECT MATERIAL</b>			
1. Films			
a. No. of films (adjusted by e = .03)			
8 x 10	0	.38	0
10 x 12	0	.52	0
11 x 14	0	.75	0
14 x 14	0	.89	0
14 x 17	2.40	1.08	2.59
7 x 17	0	.23	0
9 x 9	0	.42	0
		SUBTOTAL	<u>\$ 2.59</u>
2. Supplies (\$ amount adjusted by f = .28)	1.28	0	<u>0</u>
<b>III. DEPARTMENTAL-OVERHEAD EXPENSES</b>			
1. Room Equipment/Facility Cost			
1. General & Tomography	0	16.79	0
2. Skull Bones	0	60.86	0
3. General	.22	8.66	1.91
4. General	0	11.22	0
5. Fluoroscopy	0	42.73	0
6. Fluoroscopy	0	46.07	0
7. Fluoroscopy	0	59.58	0
8. Mammography	0	42.95	0
9. Special Procedures	0	29.43	0
10. I.V.P.	0	28.85	0
11. I.V.P.	.09	34.05	3.06
12. Ultrasound	0	32.93	0
		SUBTOTAL	<u>\$4.97</u>
2. Darkroom Expense - Total Films	2.40	.07	<u>.17</u>
3. General Overhead			
Total Tech Time	.25	24.87	<u>6.22</u>
<b>IV. ALLOCATED OVERHEAD</b>			
Total Tech Time	.25	28.83	<u>7.21</u>
		PCU STANDARD COST	<u>\$26.55</u>

Figure 11

COMPONENTS OF DR-PCU INFORMATION

I. DIAGNOSIS RELATED GROUP

DRG No. 193 – Appendicitis (without Peritonitis)  
w/o Dx2

Hospital X

<u>RESOURCE CONSUMPTION PROFILE</u>	<u>QTY.</u>	<u>UNIT COST</u>	<u>TOTAL COST</u>
PCU No. 1 Nursing Care, Level 1	2	\$ 65.78	\$ 131.56
PCU No. 2 Nursing Care, Level 2	2	89.32	178.64
PCU No. 32 Dietary, Meal (std.)	12	2.50	30.00
PCU No. 68 Operating Room	6	24.78	148.68
PCU No. 71 Recovery Room	1	30.50	30.50
PCU No. 72 Anesthesia	1	42.75	42.75
PCU No. 198 Lab Test	1	6.95	6.95
PCU No. 205 Lab Test	4	11.32	45.28
PCU No. 206 Lab Test	3	4.16	12.48
PCU No. 614 IV Therapy	2	6.15	12.30
PCU No. 1892 Pharmacy	1	15.10	15.10
PCU No. 1928 Abdomen X-Ray	1	26.55	26.55
PCU No. 2000 Misc.			189.26
		Total Cost	<u>\$870.05</u>

The reports generated by the DR-PCU system provide data that hospitals may use internally in the planning and budgeting process. The DRG information could be helpful in describing the overall institutional impact of changes in both the numbers and types of patients treated, while the PCU data is most useful in projecting departmental budgets and operations that accompany expanding volume or changing case mix.

The developers of the DR-PCU concept have focused on hospital management as the primary user of the system. Standards for PCUs that could be applied to a group of hospitals have not been developed, although it is possible that hospitals attracted to the DR-PCU approach could adopt the PCU standards developed at similar institutions. The primary benefit of the DR-PCU project is its potential as a mechanism to assist a hospital in (1) understanding its own productivity and identifying areas for improvement and (2) adjusting its resource requirements for changes in case mix.

#### Care Monitoring System

A second case mix management information system, the Care Monitoring System, is an outgrowth of the Michigan Blue Cross prospective reimbursement experiment in the mid-70's. One of the 11 participating hospitals, Providence Hospital in Southfield, Michigan, argued that the primary reason for exceeding the prospective limit was a change in its case mix. To evaluate this claim, Blue Cross agreed to partially fund the development of the Care Monitoring System. The Detroit office of Arthur Andersen has had primary responsibility for developing the Care Monitoring System. Since implementation at Providence Hospital, one other Michigan hospital has begun using the system and several major teaching hospitals around the country have made commitments to initiate work at their institutions.

The Care Monitoring System presently has three stated objectives: to monitor productivity, to identify the cause of changes in hospital charges, and to encourage internal cost containment efforts. The reports generated by the Care Monitoring System permit analysis of changes in charges attributable to physician practice patterns, patient mix and volume, and price. The present use of this system is for internal management purposes, particularly for the medical staff to identify trends in their practice patterns.

The case mix grouping system employed by the Care Monitoring System was developed by a group of physicians at the Commission for Professional Hospital Activities (CPHA) for use in its Medical Audit Program (MAP). In total, there are 348 diagnostic groups, which are based on the diagnosis causing hospitalization and the clinical service assignment of the attending physician. The derivation of these groups did not rely on statistical analysis but did take into account homogeneity of care within the group, patient volume within the group, and ease of management review. At least one of the hospitals planning to use the Care Monitoring System will substitute the diagnosis related groups for the CPHA categories.

Data for the Care Monitoring System comes from two sources: clinical information is obtained from the medical data abstract, which contains the medical information from the patient's medical record that most discharge abstracts include; financial information includes the charges on the patient's bill. No hospital expenditure data or cost report data is required. As a result, the reports do not present actual costs, only charges.

The Care Monitoring System can generate a variety of reports. For example, the performance of a clinical department by diagnostic grouping can be monitored. Figure 12 shows the distribution of patients across diagnostic groups for the department of medicine. The data indicates performance in the base year in



terms of physician practice, patient condition (specific diagnosis within the broad diagnostic group), and volume of patients with the broad diagnostic category. Other reports are available that show such information as total utilization and charges by service (Figure 13), routine and ancillary utilization and charges by diagnosis (Figure 14), and utilization and charges by physician (Figure 15).

The use of Care Monitoring System at Providence Hospital has been primarily to monitor utilization patterns among departments and specialties. For example, Dr. Joseph Rinaldo, Medical Director, has conducted detailed analysis of variations in treatment patterns for peptic ulcers, depending on whether the patient is treated medically or surgically, and depending on the specialty of the physician.

The next phase of development of the Care Monitoring System is to move from charge based data to the development of standards to which costs may be assigned. For example, standards will be developed for X-rays that will include an estimate of inputs such as technician time, clerical time, and materials required to produce an X-ray. Unlike the DR-PCU project, the standards used in this model will be based on external standards derived from other studies and research rather than internally generated standards. These standards, which will be developed for each department, will be used as benchmarks against which a department can compare its actual performance. This work is also being done at Providence Hospital and is continuing to receive support from Blue Cross/Blue Shield of Michigan.

Figure 12

COMMUNITY HOSPITAL  
CARE MONITORING SYSTEM  
REPORT NO CM260-02

COST OF CARE BY DIAGNOSIS GROUP  
MEDICINE  
BASE PERIOD 1977 THIS YTD 9-30-78

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----- BASE PERIOD -----			DX GRP	DIAGNOSIS GROUP DESCRIPTION	-- THIS YTD --		PROJECTED CHARGES (AT BASE)	PROJECTED ANNUAL CHANGE		PRACTICE	CONDITION	VOLUME/ MIX
NO OF PATS	COST/ PAT	CHARGES			NO OF PATS	COST/ PAT		CHARGES	%			
20	\$ 3900	\$ 78000	001	VIRAL HEPATITIS	0	\$ 0	\$ 0	78000-	100-%	\$ 0	\$ 0	\$ 78000-
92	\$ 2100	\$ 193200	002	OTHER INFECTIVE	78	\$ 2606	\$ 281448	\$ 88248	46 %	\$ 24648	\$ 30000	\$ 33600
32	\$ 3300	\$ 105600	018	LEUKEMIA	13	\$ 12401	\$ 223218	\$ 117618	111 %	\$ 113818	\$ 50000	\$ 46200-
404	\$ 3900	\$ 1575600	022	CANCER EX LEUKEMIA	442	\$ 5952	\$ 3642624	\$ 2067024	131 %	\$ 655824	\$ 600000	\$ 811200
12	\$ 4200	\$ 50400	026	OTHER NEOPLASM	13	\$ 35854	\$ 645372	\$ 594972	999 %	\$ 169772	\$ 500000	\$ 25200
8	\$ 3000	\$ 24000	028	THYROID	0	\$ 0	\$ 0	\$ 24000-	100-%	\$ 0	\$ 0	\$ 24000-
168	\$ 2700	\$ 453600	029	DIABETES MELLITUS	130	\$ 2565	\$ 461700	\$ 8100	2 %	\$ 79300	\$ 350000	\$ 32400
4	\$ 1500	\$ 6000	033	NUTRITIONAL, METABOL	26	\$ 4520	\$ 162720	\$ 156720	999 %	\$ 98720	\$ 10000	\$ 48000
40	\$ 4500	\$ 180000	034	HEMATOLOGIC	13	\$ 4222	\$ 75996	\$ 104004-	58-%	\$ 4004-	\$ 1000-	\$ 99000-
44	\$ 2400	\$ 105600	056	MENTAL	13	\$ 672	\$ 12096	\$ 93504-	88-%	\$ 29104-	\$ 2000-	\$ 62400-
56	\$ 2700	\$ 151200	059	NERVOUS SYSTEM	39	\$ 650	\$ 35100	\$ 116100-	77-%	\$ 100700-	\$ 10000-	\$ 5400-
8	\$ 900	\$ 7200	070	EYE	0	\$ 0	\$ 0	\$ 7200-	100-%	\$ 0	\$ 0	\$ 7200-
4	\$ 3000	\$ 12000	075	EAR	13	\$ 570	\$ 10260	\$ 1740-	14-%	\$ 35740-	\$ 2000-	\$ 42000
76	\$ 2400	\$ 182400	077	HYPERTENSION	26	\$ 2190	\$ 78840	\$ 103560-	57-%	\$ 7060-	\$ 500-	\$ 96000-
336	\$ 4800	\$ 1612800	078	AC MYOCARDIAL INFARC	286	\$ 4798	\$ 1900008	\$ 287208	18 %	\$ 1792-	\$ 1000	\$ 288000
1008	\$ 2485	\$ 2504972	079	OTHER HEART	819	\$ 2764	\$ 3134376	\$ 629404	25 %	\$ 56294	\$ 260000	\$ 313110
248	\$ 2700	\$ 669600	083	CEREBROVASCULAR	182	\$ 3325	\$ 837900	\$ 168300	25 %	\$ 77500	\$ 80000	\$ 10900
132	\$ 3600	\$ 475200	088	OTHER VASCULAR	65	\$ 4433	\$ 398970	\$ 76230-	16-%	\$ 54970	\$ 20000	\$ 151200-
4	\$ 300	\$ 1200	090	ACUTE URI	39	\$ 2156	\$ 116424	\$ 115224	999 %	\$ 10224	\$ 90000	\$ 15000
108	\$ 3600	\$ 388800	091	PNEUMONIA	273	\$ 3483	\$ 1316574	\$ 927774	239 %	\$ 24226-	\$ 22000-	\$ 972000
52	\$ 2400	\$ 124800	092	BRONCHITIS	195	\$ 3650	\$ 985500	\$ 860700	690 %	\$ 137500	\$ 200000	\$ 523200
196	\$ 2700	\$ 529200	100	OTHER RESPIRATORY	182	\$ 3385	\$ 853020	\$ 323820	61 %	\$ 122620	\$ 50000	\$ 151200
100	\$ 2058	\$ 205300	104	PEPTIC ULCER	80	\$ 4618	\$ 507980	\$ 302180	147 %	\$ 71993	\$ 209614	\$ 20572
92	\$ 2700	\$ 248400	105	MOUTH-OTH UPPER GI	0	\$ 0	\$ 0					
8	\$ 1500	\$ 12000	108	HERNIA	0	\$ 0	\$ 0					
40	\$ 2400	\$ 96000	109	DIVERTICULAR DISEASE	39	\$ 2498						
76	\$ 2400	\$ 182400	110	OTHER INTESTINE	39	\$ 3075						
44	\$ 2100	\$ 92400	112	BILIARY TRACT DISEAS	39	\$ 4432						
72	\$ 2700	\$ 194400	113	LIVER AND PANCREAS	65	\$ 2434						
44	\$ 3600	\$ 158400	114	NEPHROSIS-NEPHRITIS	13	\$ 1387						
12	\$ 2700	\$ 32400	117	CYSTITIS	0	\$ 0						
20	\$ 3900	\$ 78000	121	URINARY EX CYS-RENAL	39	\$ 2001						
4	\$ 3300	\$ 13200	128	MALE GENITAL	0	\$ 0						
16	\$ 900	\$ 14400	136	FEMALE GENITAL	13	\$ 2920						
32	\$ 2100	\$ 67200	165	SKIN & SUBCUT TISSUE	52	\$ 2523						
28	\$ 3900	\$ 109200	169	ARTHRITIS	13	\$ 3509						
76	\$ 2700	\$ 205200	176	MUSCULOSKEL EX ARTHR	26	\$ 5305						
16	\$ 2100	\$ 33600	181	CONGENITAL ANOMALY	0	\$ 0						
4	\$ 1500	\$ 6000	182	PERINATAL CONDITION	0	\$ 0						
336	\$ 2400	\$ 806400	193	SIGNS & SYMPTOMS	221	\$ 1825	\$ 558450	\$ 247950-	31-%	\$ 35950	\$ 140000	\$ 72000-
136	\$ 1500	\$ 204000	220	TRAUMA	26	\$ 2677	\$ 96372	\$ 107628-	53-%	\$ 37372	\$ 5000	\$ 150000-
88	\$ 1800	\$ 158400	224	ADVERSE EFFECTS	37	\$ 4711	\$ 241348	\$ 82948	52 %	\$ 39548	\$ 110000	\$ 66600-
168	\$ 2700	\$ 453600	225	SPECIAL CONDITIONS	13	\$ 569	\$ 10242	\$ 443358-	98-%	\$ 37358	\$ 1000	\$ 405000-
4464	\$ 2868	\$ 12802752	TOT	MEDICINE	3562	\$ 3643	\$ 17967246	\$ 5164494	40 %	\$ 922270	\$ 2900000	\$ 610962
												MIX \$ 731262

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Figure 13

COMMUNITY HOSPITAL  
CARE MONITORING SYSTEM  
REPORT NO CM260-02

COST OF CARE BY SERVICE  
INPATIENT  
BASE PERIOD 1977 THIS YTD 09-30-78

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10/31/78

BASE PERIOD			SERVICE	THIS YTD		PROJECTED CHARGES (AT BASE)	PROJECTED ANNUAL CHANGE		\$ CHANGE DUE TO			
NO OF PATS	COST/PAT	TOTAL CHARGES		NO OF PATS	COST/PAT		CHARGES	%	PRACTICE	CONDITION	VOLUME	MIX
4464	\$ 2868	\$12802752	MEDICINE	3562	\$ 3643	\$17967246	\$ 5164494	40	\$ 922270	\$2900000	\$ 610962	\$ 731262
446	\$ 2600	\$ 1159600	FAM. PRACT	754	\$ 3406	\$ 3553636	\$ 2394036	206	\$ 439236	\$ 400000	\$ 55337	\$1499463
7084	\$ 2220	\$15726480	SURGERY	5304	\$ 2270	\$16658964	\$ 932484	6	\$ 100000	\$ 255284	\$ 750485	\$ 173285-
5300	\$ 1360	\$ 7208000	OB/GYN	3835	\$ 1356	\$ 7193358	\$ 14642-	0-	\$ 27242-	\$ 1000-	\$ 343974	\$ 330374-
432	\$ 4828	\$ 2085696	PSYCHIATRY	416	\$ 4692	\$ 2701719	\$ 616023	30	\$ 20209-	\$ 59000-	\$ 99532	\$ 59570
396	\$ 1027	\$ 406692	PEDIATRICS	884	\$ 600	\$ 733878	\$ 327186	80	\$ 123170-	\$ 400000-	\$ 19408	\$ 830248
18122	\$ 2173	\$39389220	SUBTOTAL	14755	\$ 2389	\$48808801	\$ 9419581	24	\$1290885	\$3095284	\$1279698	\$2152714
3336	\$ 402	\$ 1341072	NEWBORN	1482	\$ 615	\$ 1261112	\$ 79960-	6-	\$ 400000	\$ 36238	\$ 63997	\$ 582195-
21458	\$ 1898	\$40730292	TOTAL	16237	\$ 2227	\$50069913	\$ 9339621	23	\$1690885	\$3131522	\$1943695	\$2573519
									4.2%	7.7%	4.8%	6.3%

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Figure 14

CARE SUMMARY BY COST CENTER											PAGE 29	
COMMUNITY HOSPITAL CARE MONITORING SYSTEM REPORT NO.. CM260-08											MEDICINE --PEPTIC ULCER	
BASE YEAR 1977 THIS YTD 09-30-78											10/31/78	
PATIENTS 100 PATIENTS 80												
--- BASE PERIOD ---			----- THIS YTD -----			PROJECTED		\$ CHANGE DUE TO				
% PAT	UNITS / PAT	COST/ PAT	CST CTR	COST CENTER DESCRIPTION	% PAT	UNITS / PAT	COST/ PAT	ANNUAL CHANGE CHARGES	%	PRACTICE	CONDITION	VOLUME
100	10.3	\$ 1360	010	GENERAL NURSING CARE	100	6.8	\$ 896	\$ 38159-	28-%	\$ 51762-	\$ 0	\$ 13603
4	3.0	\$ 900	638	SPECIAL CARE UNIT	75	5.2	\$ 1550	\$ 124275	999%	\$ 0	\$ 123915	\$ 360
100	0.0	\$ 26	676	CSPD-PROCESSING & DI	100	0.0	\$ 317	\$ 32300	999%	\$ 32040	\$ 0	\$ 260
TOT ROUTINE								\$ 118416	83 %	\$ 19722-	\$ 123915	\$ 14223
96	1.6	\$ 6	702	LAB - IMMUNOLOGY	75	1.2	\$ 8	\$ 70	13 %	\$ 14	\$ 0	\$ 56
100	5.3	\$ 72	703	LAB - CHEMISTRY	100	29.3	\$ 310	\$ 26859	374 %	\$ 22827	\$ 3312	\$ 720
0	0.0	\$ 0	704	LAB - RADIOIMMUOSSA	38	1.7	\$ 96	\$ 3939	999%	\$ 0	\$ 3939	\$ 0
100	14.1	\$ 86	706	LAB - HEMATOLOGY	100	42.3	\$ 239	\$ 17705	207%	\$ 14805	\$ 2040	\$ 860
32	2.6	\$ 44	707	LAB - TISSUE	50	1.5	\$ 53	\$ 1533	110%	\$ 0	\$ 1393	\$ 140
80	3.1	\$ 13	708	LAB - MICROBIOLOGY	38	3.7	\$ 91	\$ 2722	265%	\$ 421	\$ 2198	\$ 103
80	1.2	\$ 19	712	EKG	88	2.0	\$ 40	\$ 2350	157%	\$ 2200	\$ 0	\$ 150
0	0.0	\$ 0	713	LAB - COAGULATION	88	10.1	\$ 76	\$ 7288	999%	\$ 7288	\$ 0	\$ 0
4	1.0	\$ 30	714	EEG	13	1.0	\$ 45	\$ 499	416%	\$ 0	\$ 487	\$ 12
4	11.0	\$ 183	718	PULMONARY FUNCTION	0	0.0	\$ 0	\$ 732-	100-%	\$ 0	\$ 805-	\$ 73
32	1.9	\$ 73	719	NUCLEAR MEDICINE	25	2.0	\$ 173	\$ 2408	103%	\$ 0	\$ 2174	\$ 234
100	3.6	\$ 98	720	DIAGNOSTIC RADIOLOGY	88	3.1	\$ 66	\$ 3457-	35-%	\$ 4990-	\$ 549	\$ 984
TOT DIAGNOSIS								\$ 61184	183 %	\$ 42565	\$ 15287	\$ 3332
0	0.0	\$ 0	660	OPERATING ROOM	25	8.5	\$ 689	\$ 18920	999%	\$ 0	\$ 18920	\$ 0
72	1.0	\$ 20	678	EMERGENCY ROOM	75	2.8	\$ 78	\$ 4950	344%	\$ 3195	\$ 1611	\$ 144
68	4.5	\$ 138	710	BLOOD BANK	0	0.0	\$ 0	\$ 9396-	100-%	\$ 6302-	\$ 4034-	\$ 940
0	0.0	\$ 0	711	TRANSFUSION	75	22.8	\$ 538	\$ 44330	999%	\$ 22837	\$ 21493	\$ 0
100	0.0	\$ 89	730	PHARMACY	100	15.0	\$ 359	\$ 30550	342%	\$ 27580	\$ 2080	\$ 890
0	0.0	\$ 0	735	ANESTHESIOLOGY	25	4.5	\$ 152	\$ 4180	999%	\$ 0	\$ 4180	\$ 0
16	0.0	\$ 115	736	RESPIRATORY THERAPY	25	119.5	\$ 718	\$ 17849	966%	\$ 0	\$ 17664	\$ 185
4	5.0	\$ 65	737	PHYSICAL MED & REHAB	13	23.0	\$ 351	\$ 4566	999%	\$ 0	\$ 4540	\$ 26
68	1.3	\$ 118	780	CLINIC	88	1.9	\$ 155	\$ 6951	87%	\$ 1800	\$ 4354	\$ 797
4	9.0	\$ 90	782	ALCOHOLISM THERAPY	0	0.0	\$ 0	\$ 360-	100-%	\$ 0	\$ 396-	\$ 36
TOT TREATMENT								\$ 122540	406 %	\$ 49110	\$ 70412	\$ 3018
TOT								\$ 4618		\$ 71993	\$ 209614	\$ 20573
---		\$ 2058	TOT		---		\$ 4618	\$ 302180	147 %	\$ 71993	\$ 209614	\$ 20573

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Figure 15

COMMUNITY HOSPITAL  
CARE MONITORING SYSTEM  
REPORT NO CM291-12

INPATIENT ACTIVITY BY PHYSICIAN  
MEDICINE --GASTROENTEROLOGY  
CASES COMPLETED YTD 09-30-78

PHYS ID	TOT PATS	COST PER PATIENT			ADMIT		DISCH		----- LENGTH OF STAY -----					2ND DX		AGE		SEX							
		TOT	DIAG	TRMT	% ER	% RE	% DTH	% EXT	AVE DAYS	DAY 50	% 50	% 75	% 90	IN %	SCU DAYS	%	AVE NO	YR	% 65	% FE	% OP	% TR	% INF	% CMP	% CON
1111	13	13186	2483	4576	100	100	0	100	30.0	12.0	100	100	0	100	5.0	100	4.0	74	100	0	100	100	0	0	100
2222	65	2464	1023	468	80	60	0	20	6.2	1.2-	40	0	0	20	1.0	40	2.5	43	20	80	40	0	0	0	60
3333	26	2134	628	280	100	0	0	0	10.0	4.0	100	50	0	0	0.0	100	1.0	46	0	50	50	50	0	0	50
4444	104	2501	576	699	63	50	0	1	8.0	3.4-	29	2	0	13	3.0	50	1.3	55	50	75	63	13	0	0	38
5555	39	3458	834	521	67	33	0	33	14.0	4.0	33	33	0	33	5.0	100	2.0	78	100	67	33	0	0	0	33
6666	39	3177	734	852	100	33	0	0	8.3	3.7-	33	0	0	100	3.0	33	3.0	53	0	0	100	0	0	0	67
TOT	286	3167	826	781	77	45	0	14	9.6	0.4-	43	14	0	32	3.3	59	1.9	55	41	59	59	14	0	0	50

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## CHAPTER SIX

### RESEARCH ON CASE MIX IN TEACHING HOSPITALS

The development of case mix measures and their application to reimbursement is of particular interest to teaching hospitals. The higher average per diem cost of teaching hospitals has subjected them to criticism from those interested in reducing hospital costs or health program expenditures. Potentially, case mix measures provide one means of demonstrating that these higher average costs result from the types and intensity of services needed by patients admitted to teaching hospitals. At least five research studies have been developed to investigate teaching hospital costs:

- the Hospital Cost and Utilization Project of the National Center for Health Services Research,
- a proposed study comparing teaching and non-teaching hospitals in New Jersey and Maryland,
- a study comparing hospital-based ambulatory care with office-based ambulatory care,
- the Yale-New Haven Hospital study of unit costs and case mix in major teaching hospitals, and
- the COTH study of teaching hospital case mix, programs and services, and financing.

In addition, the Health Research and Educational Trust (HRET) of the American Hospital Association (AHA) is developing a study to assess the potential for using DRGs and/or other case mix measures for internal management decisions such as resource allocation, product pricing, cost control, and quality control. As presently conceptualized, HRET efforts would be directed at encouraging experimentation at the individual hospital level so that the use of DRGs for management purposes could be better understood and so that health providers affected by DRG reimbursement applications can provide constructive criticism in evaluating payment methodologies.

### Hospital Cost and Utilization Project

The National Center for Health Services Research has initiated an intramural research program, the Hospital Cost and Utilization Project under the direction of Mark Hornbrook, Ph.D., to develop an economic model quantifying the sources of cost differences between hospitals. For the 410 hospitals included in the study, the data base includes a year of discharge abstracts, a year of patient charge data, Medicare cost reports, and information describing the hospital itself. The case mix measure which will be used in this model is the disease staging technique developed by Systemetrics. As a part of the project, the National Center is funding Systemetrics efforts to complete disease staging.

### Comparing Teaching and Non-Teaching Hospitals

In a proposal limited to inpatient costs, researchers at New York Hospital - Cornell Medical Center -- Hirsch Ruchlin; George Reader, M.D.; Livingston Farrand; Mary Goss, Ph.D., and David Thompson, M.D. -- have submitted a grant application to the National Center for Health Services Research to compare teaching and non-teaching hospitals. The study, which would use diagnostic and cost data from New Jersey and Maryland, would explore the following questions:

- do teaching hospitals treat a more severely ill population?
- when adjusted for case mix, is the length of stay longer in teaching hospitals?
- when adjusted for case mix, is ancillary service utilization greater in a teaching hospital?
- when adjusted for product mix, are departmental costs greater in a teaching hospital?
- is the quality of care higher in a teaching hospital? and

- does a hospital's participation in medical education programs increase or decrease its financial viability?

The grant application was submitted to the National Center about November first. The proposal is presently being evaluated by a panel of non-governmental reviewers for its scientific merit. The panel's recommendation is expected to be known in June.

#### Comparing Hospital and Office Based Ambulatory Care

In a grant application submitted to the Robert Wood Johnson in July, 1979, Brandeis University researchers -- led by Stuart Altman, Ph.D. and Joanna Lion, Ph.D. -- propose a study comparing the cost of hospital-based and office-based ambulatory care. As proposed, the study will compare the mix of cases treated in hospital and office practices, the impact of mandatory and elective cost allocation procedures for ambulatory hospital services, and the impact of situation costs (e.g., medical education, social services, and bad debts) upon hospital-based ambulatory care. Thus, while the study's primary objective is not a comparison of teaching and non-teaching hospitals, the dominance of teaching hospitals in the provision of hospital-based ambulatory care will hopefully permit analyses and conclusions concerning the role and cost of teaching hospital outpatient services.

#### Yale-New Haven Hospital Study of Major Teaching Hospitals

At the request of the Connecticut Commission on Hospitals and Health Care, Yale-New Haven Hospital has undertaken a study of major teaching hospitals. The purpose of the study is to make comparisons between Yale-New Haven, other major teaching hospitals, and community hospitals along two dimensions: unit costs and case mix adjusted length of stay.



The Yale-New Haven study is divided into three phases. Using data from the American Hospital Association's 1979 Annual Survey, the first phase examines adjusted per admission and per diem costs by nine regions, four hospital bed-size groups (0-99 beds, 100-249 beds, 250-499 beds, and 500 + beds), and four levels of teaching:

- 94 hospitals designated as primary affiliates of medical schools,
- 668 other hospitals which have a medical school affiliation and approved residency programs,
- 170 hospitals which have approved residency programs but no medical school affiliation, and
- 4,788 hospitals with no participation in medical education.

The second phase of the study is an analysis of the unit costs of primary affiliates based on data from Medicare cost reports. Approximately 50 of the 94 hospitals identified as primary affiliates of medical schools have provided copies of their Medicare cost reports for fiscal year 1978. A consulting firm has reviewed the reports to ensure comparability and completeness of data, and the final analysis of the reports is expected in the summer of 1980.

The third phase of the Yale-New Haven project will address differences in length of stay adjusted for case mix. To conduct this analysis, the hospital is collecting 1978 discharge abstract data from approximately 25 of the 94 hospitals classified as primary affiliates. This data will be sorted into the diagnosis related groups (DRGs) and a mean length of stay for each DRG for the group will be computed. The resulting group means will then permit determination of the extent to which variation in a hospital's overall length of stay from the group mean is attributable to a difference in case mix (as defined by DRGs) versus a difference in treatment patterns. The data collected from the primary affiliate group will also be compared to the length of stay data for Connecticut hospitals. At this time, there are no plans to link the DRG length of stay data with the financial data. Thus comparative costs by DRGs will not be available.

COTH Study of Teaching Hospital Characteristics \_\_

Under the guidance of the AAMC Ad Hoc Committee on the Distinctive Characteristics and Related Costs of Teaching Hospitals, Association staff is presently completing the research design for a study of the membership of the Council of Teaching Hospitals (COTH) which would:

- provide quantitative descriptions of contemporary teaching hospitals,
- identify relationships between hospital/patient characteristics and hospital costs, and
- attempt to classify teaching hospitals into peer groups of relatively homogeneous hospitals.

To accomplish these objectives, a five part study is being developed. In the first three parts, relatively independent projects would create three profiles for a sample of teaching hospitals: a case mix profile, a program and services profile, and a financial profile. In Part Four, data from each of the three profiles would be combined to produce a comprehensive description of the similarities and differences among sample hospitals. For Parts One through Four of the project, approximately 30 COTH members will be included in the sample. These 30 -- chosen to include differences in bed size, geographic region, affiliation relationship, number of residency programs, residents per bed, and personnel per adjusted admission -- will be asked to furnish extensive data for their fiscal year ending in 1978. Published findings for the study would be limited to aggregate data which preserved the confidentiality of the participating hospitals.

The fifth and final part of the study is contingent upon successful completion of Part Four. If the findings of Part Four identify a limited number of variables which may be used to describe and characterize different types of teaching hospitals, all COTH members will be surveyed for these

variables and a comprehensive description of the characteristics of COTH member hospitals will be produced.

The teaching hospital profiles constructed in Parts One through Three of the study are the essential ingredients of the project. Therefore, the objectives for these parts are listed below. The objectives of the case mix profile of teaching hospitals are to establish a data base combining clinical and financial information on one year's admissions in a sample of COTH hospitals which can be used:

- to identify the types of cases most frequently treated in teaching hospitals,
- to identify the most expensive types of cases most frequently treated in teaching hospitals,
- to describe the variation in the types of cases treated by teaching hospitals,
- to assess the ability of diagnosis related groups to identify relatively homogeneous groups of teaching hospital patients based on costs per admission and ancillary service costs,
- to assess key assumptions underlying Medicare's proposed methodology for Section 223 limitations, and
- to identify variables which account for differences in case costs across teaching hospitals.

For the profile of teaching hospital programs and services, the objectives are to describe the sample of teaching hospitals in terms of their facility, patient service, educational program, and research and development characteristics and, where possible, to compare teaching hospitals with non-teaching hospitals for these characteristics. The financial profile would be developed to describe the financial characteristics of teaching hospitals and to provide a reference source which non-sampled hospitals may use for comparisons with their own financial characteristics. In addition to the individual profile objectives, each of the three profiles will be designed to provide a data

source for the comprehensive profile of teaching hospitals, Part Four of the study.

At the present time, AAMC staff expect to have completed final data requirements, final questionnaire, and final sample selections by late June, 1980. Hospitals that will be asked to participate in the study will be contacted in early July.

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## Diagnosis Related Group Descriptions

MAJOR DIAGNOSIS CATEGORY	DIAGNOSIS RELATED GROUPS
01: Infectious Diseases	001 Infectious Disease (Enteritis, Diarrhea) with Age less than 16 002 Infectious Disease (Enteritis, Diarrhea) with Age greater than 15 003 Infectious Disease (Viral Disease, VD, Meningitis) without Secondary Diagnosis 004 Infectious Disease (Viral Disease, VD, Meningitis) with Secondary Diagnosis 005 Infectious Disease (Blood Infection, TB, Salmonella) without Surgery 006 Infectious Disease (Blood Infection, TB, Salmonella) with Surgery
02: Malignant Neoplasm of the Digestive System	007 Cancer of the Mouth, Tongue, Large Intestine, Liver, Gallbladder without Surgery 008 Cancer of the GI System (Esophagus, Stomach, Pancreas, Small Intestine, Rectum) without Surgery 009 Cancer of the GI System with Surgical Procedure (Biopsy, Endoscopy, Local Excision, Centesis) without Secondary Diagnosis 010 Cancer of the GI System with Surgical Procedure (Biopsy, Endoscopy, Local Excision, Draining) with Secondary Diagnosis 011 Cancer of the GI System with Surgery (Gastric Resection, Colon Resection, Esophagus Resection)
03: Malignant Neoplasm of the Respiratory System	012 Cancer of the Respiratory System (Trachea, Lung, Larynx, Thorax, Mediastinum) without Surgery without Secondary Diagnosis 013 Cancer of the Respiratory System (Trachea, Lung, Larynx, Thorax, Mediastinum) without Surgery with Secondary Diagnosis 014 Cancer of the Respiratory System with Surgical Procedure (Biopsy, Endoscopy, Excision of Lesion) without Secondary Diagnosis 015 Cancer of the Respiratory System with Surgical Procedure (Biopsy, Endoscopy, Excision of Lesion) with Secondary Diagnosis 016 Cancer of the Respiratory System with Surgery (Lobectomy, Laryngectomy, Radical Resection)
04: Malignant Neoplasm of the Skin	017 Cancer of the Skin except Malignant Melanoma without Secondary Diagnosis 018 Cancer of the Skin except Malignant Melanoma with Secondary Diagnosis 019 Cancer of the Skin - Malignant Melanoma with Surgical Procedure without Secondary Diagnosis 020 Cancer of the Skin - Malignant Melanoma with Surgical Procedure with Secondary Diagnosis
05: Malignant Neoplasm of the Breast	021 Cancer of the Breast without Surgery with Age less than 63 022 Cancer of the Breast without Surgery with Age greater than 62  023 Cancer of the Breast with Surgery without Secondary Diagnosis 024 Cancer of the Breast with Surgery with Secondary Diagnosis
06: Malignant Neoplasm of the Female Reproductive System	025 Cancer of the Female Reproductive System (Uterus, Cervix, Vagina, Ovary, Fallopian Tube) without Surgery without Secondary Diagnosis 026 Cancer of the Female Reproductive System (Uterus, Cervix, Vagina, Ovary, Fallopian Tube) without Surgery with Secondary Diagnosis 027 Cancer of the Female Reproductive System with Surgical Procedure (D&C, Biopsy, Excision of Lesion) without Secondary Diagnosis 028 Cancer of the Female Reproductive System with Surgical Procedure (D&C, Biopsy, Excision of Lesion) with Secondary Diagnosis 029 Cancer of the Uterus Body with Surgery (Removal of Uterus) 030 Cancer of the Uterus, Cervix, Ovary with Surgery (Removal of Uterus or other Major Operation)

- 01: Malignant Neoplasm of the Male Reproductive System
- 031 Cancer of the Male Reproductive System (Penis, Prostate, Testicle) without Surgery
  - 032 Cancer of the Male Reproductive System with Surgical Procedure (Biopsy, Cystoscopy, Removal of Testicle) without Secondary Diagnosis
  - 033 Cancer of the Male Reproductive System with Surgical Procedure (Biopsy, Cystoscopy, Removal of Testicle) with Secondary Diagnosis
  - 034 Cancer of the Male Reproductive System with Surgery (Amputation of Penis, Removal of Prostate, Radical Excision of Lesion)
- 02: Malignant Neoplasm of the Urinary System
- 035 Cancer of the Urinary System (Bladder, Urethra, Kidney, Ureter) without Surgery
  - 036 Cancer of the Urinary System with Surgical Procedure (Cystoscopy, TUR, Excision of Lesion) without Secondary Diagnosis
  - 037 Cancer of the Urinary System with Surgical Procedure (Cystoscopy, TUR, Excision of Lesion) with Secondary Diagnosis
  - 038 Cancer of the Urinary System with Surgery (Removal/Excision of Bladder, Kidney, Ureter, Urethra)
- 03: Malignant Neoplasm of Other and Unspecified Sites
- 039 Cancer of the Bone, Thyroid, Connective Tissue, Nerves without Surgery
  - 040 Cancer of the Brain, Secondary Cancer, Multiple Cancer Sites without Surgery without Secondary Diagnosis
  - 041 Cancer of the Brain, Secondary Cancer, Multiple Cancer Sites without Surgery with Secondary Diagnosis
  - 042 Cancer of the Thyroid, Connective Tissue, Nerves with Surgical Procedure (Biopsy, Excision)
  - 043 Cancer of a Secondary Site, Multiple Sites with Surgical Procedure (Biopsy, Excision)
  - 044 Cancer of the Bone, Connective Tissue, Nerves, Secondary Site, Multiple Sites with Surgery
- 04: Neoplasm of the Lymphatic and Hemopoietic Tissue
- 045 Tumor of the Lymphatic System, Blood Making Tissue without Secondary Diagnosis with Age less than 16
  - 046 Tumor of the Lymphatic System, Blood Making Tissue with Secondary Diagnosis with Age less than 16
  - 047 Disease of the Lymphatic System, Hodgkins Disease, Sarcoma without Surgery without Secondary Diagnosis with Age greater than 15
  - 048 Disease of the Lymphatic System, Hodgkins Disease, Sarcoma without Surgery with Secondary Diagnosis with Age greater than 15
  - 049 Tumor of the Lymphatic System, Multiple Myeloma, Leukemia without Surgery with Age greater than 15
  - 050 Tumor of the Lymphatic System, Blood Making Tissue with Surgical Procedure (Excision of Node) without Secondary Diagnosis with Age greater than 15
  - 051 Tumor of the Lymphatic System, Blood Making Tissue with Surgical Procedure (Excision of Node) with Secondary Diagnosis with Age greater than 15
  - 052 Tumor of the Lymphatic System, Blood Making Tissue with Surgery (Splenectomy, Radical Resection) with Age greater than 15
- 05: Benign Neoplasm of the Female Reproductive System
- 053 Benign Tumor (Papilloma, Polyp) of the Uterus, Vagina, Vulva without Secondary Diagnosis
  - 054 Benign Tumor (Papilloma, Polyp) of the Uterus, Vagina, Vulva with Secondary Diagnosis
  - 055 Benign Tumor (Fibroma) of the Uterus, Ovary without Surgery
  - 056 Benign Tumor (Fibroma) of the Uterus, Ovary with Surgical Procedure (D&C, Excision of Lesion) without Second Surgery
  - 057 Benign Tumor (Fibroma) of the Uterus, Ovary with Second Surgery
  - 058 Benign Tumor (Fibroma) of the Uterus, Ovary with Surgery (Removal of Ovary)
  - 059 Benign Tumor (Fibroma) of the Uterus, Ovary with Surgery (Removal of Uterus)

- 12: Benign Neoplasm of Other Sites
  - 060 Benign Tumor of the Intestines, Urinary System, without Surgery
  - 061 Benign Tumor of the Brain, Pituitary Gland without Surgery
  - 062 Benign Tumor of the Skin, Bone, Urinary System (Kidney, Bladder), Connective Tissue with Surgery without Secondary Diagnosis
  - 063 Benign Tumor of the Skin, Bone, Urinary System (Kidney, Bladder), Connective Tissue with Surgery with Secondary Diagnosis with Age less than 43
  - 064 Benign Tumor of the Skin, Bone, Urinary System (Kidney, Bladder), Connective Tissue with Surgery with Secondary Diagnosis with Age greater than 42
  - 065 Benign Tumor of the Intestines, Nerves with Surgical Procedure (Excision, Other) without Secondary Diagnosis
  - 066 Benign Tumor of the Intestines, Nerves with Surgical Procedure (Excision, Other) with Secondary Diagnosis
  - 067 Benign Tumor of the Intestines, Nerves with Surgery (Colon Resection Craniotomy Radical Resection, Other Major Operation)
  - 068 Benign Tumor of the Stomach, Brain, Respiratory System, Esophagus, Pituitary Gland with Surgery
- 13: Diseases of Thyroid and Other Endocrine Glands
  - 069 Disease of the Thyroid (Non-Toxic, Simple), Other Endocrine Glands (Adrenal, Pancreas) without Surgery
  - 070 Disease of the Thyroid (Toxic), Low Function Pituitary without Surgery
  - 071 Endocrine Disorder with Surgical Procedure (Thyroidectomy, Other)
  - 072 Endocrine Disorder with Surgery
- 14: Diabetes
  - 073 Diabetes without Surgery without Secondary Diagnosis or with Minor Secondary Diagnosis with Age less than 36
  - 074 Diabetes without Surgery without Secondary Diagnosis or with Minor Secondary Diagnosis with Age greater than 35
  - 075 Diabetes without Surgery with Major Secondary Diagnosis
  - 076 Diabetes with Surgical Procedure (Endoscopy, Biopsy)
  - 077 Diabetes with Surgery (Amputation of Extremity, Other Major)
- 15: Nutritional and Other Metabolic Diseases
  - 078 Metabolic Disorder (Gout, Blood Cholesterol) without Secondary Diagnosis
  - 079 Metabolic Disorder (Gout, Blood Cholesterol) with Secondary Diagnosis (Nutrition Deficiency)
  - 080 Metabolic Disease (Cystic Fibrosis, Sprue, Unspecified)
  - 081 Metabolic Disease (Obesity, Malnutrition, Unspecified)
- 16: Diseases of the Blood and Blood Forming Organs
  - 082 Mediterranean Anemia, Hemophilia without Surgery without Secondary Diagnosis or with Minor Secondary Diagnosis with Age less than 11
  - 083 Mediterranean Anemia, Hemophilia without Surgery without Secondary Diagnosis or with Minor Secondary Diagnosis with Age greater than 10
  - 084 Disease of Blood Hemoglobin without Surgery without Secondary Diagnosis or with Minor Secondary Diagnosis
  - 085 Disease of the Blood (Anemias), Blood Forming Organs (Spleen) without Surgery with Major Secondary Diagnosis
  - 086 Disease of the Blood (Anemias), Blood Forming Organs with Surgery with Age 2-52
  - 087 Disease of the Blood (Anemias), Blood Forming Organs with Surgery with Age less than 1 or greater than 53
- 17: Psychoses Not Attributed to Physical Conditions
  - 088 Schizophrenia (Paranoid, Catatonic, Unspecified) Involutional Melancholia with Psychiatric Service
  - 089 Schizophrenia (Paranoid, Catatonic, Unspecified) Involutional Melancholia without Psychiatric Service
  - 090 Schizophrenia (Affective, Acute Episode), Manic - Depressive Psychosis

1: Neuroses	091 Neurosis (Anxiety, Hysterical, Phobic, Hypochondriacal Unspecified)
	092 Neurosis (Obsessive-Compulsive, Depressive), Personality Disorders
2: Alcoholic Mental Disorder and Addiction	093 Alcoholism without Secondary Diagnosis or with Minor Secondary Diagnosis
	094 Alcoholism with Major Secondary Diagnosis (Liver Cirrhosis, Delirium Tremens, Other)
3: Other Mental Disorders	095 Drug Dependence, Physical Disorder (Probably Psychiatric Origin), Cephalgia
	096 Psychosis, Non-Psychosis Related Brain Condition
4: Diseases of the Central Nervous System	097 Epilepsy, Migraine, Brain Disorder (Unspecified) without Surgery without Secondary Diagnosis
	098 Epilepsy, Migraine, Brain Disorder (Unspecified) without Surgery with Secondary Diagnosis
	099 Multiple Sclerosis, Paralysis Agitans, Meningitis, Hemiplegia without Surgery
	100 Disease of the Central Nervous System with Surgical Procedure (Nerve Block, Other)
	101 Disease of the Central Nervous System with Surgery (Laminectomy, Spinal Fusion, Ventricular Shunt)
5: Diseases of the Peripheral Nervous System	102 Facial Paralysis, Neuralgia (Trigeminal, Other Unspecified) without Surgery
	103 Sciatica, Polyneuritis without Surgery
	104 Disease of the Median Nerve with Surgery
	105 Disease of the Peripheral Nerves except Median with Surgical Procedure (Nerve Block, Other Unspecified)
	106 Disease of the Peripheral Nerves except Median with Surgery (Spinal Cord, Nerve Roots)
6: Diseases of the Eye	107 Cross Eyedness, Cataract, Cyst of the Eyelid without Surgery
	108 Glaucoma, Corneal Inflammation/Ulceration, Disease of the Iris, Retina without Surgery
	109 Disease of the Eye with Surgical Procedure (Muscle Repair of Eyelid, Other)
	110 Disease of the Eye with Surgical Procedure (Removal of Lens, Incision into Sclera)
	111 Disease of the Eye with Surgical Procedure (Reattachment of Retina, Repair of Cornea)
7: Disease of the Ear and Mastoid Process	112 Disease of the Middle Ear (Inflammation, Chronic Mastoid Bone Inflammation) without Surgery
	113 Disease of the Inner Ear (Inflammation, Menieres Disease) without Surgery
	114 Disease of the Ear with Surgical Procedure (Incision of Membrane, Removal of Adenoids, Other)
	115 Disease of the Middle Ear with Surgery (Removal of Bone, Repair of Membrane)
	116 Disease of the Ear with Surgery (Removal of Mastoid Bone, Excision of Middle Ear, Other)
8: Hypertensive Heart Diseases	117 Hypertensive Heart Disease without Surgery without Secondary Diagnosis or with Minor Secondary Diagnosis
	118 Hypertensive Heart Disease without Surgery with Major Secondary Diagnosis
	119 Hypertensive Heart Disease (Fatal) with Kidney Involvement without Surgery with Major Secondary Diagnosis
	120 Hypertensive Heart Disease with Surgery

- 6: Acute Myocardial Infarction 121 Disease of the Heart - Acute Myocardial Infarction
- 7: Ischemic Heart Diseases Except AMI
  - 122 Disease of the Heart, Ischemia (Blood Deficiency) except AMI without Surgery without Secondary Diagnosis
  - 123 Disease of the Heart, Ischemia (Blood Deficiency) except AMI without Surgery with Minor Secondary Diagnosis
  - 124 Disease of the Heart, Ischemia (Blood Deficiency) except AMI without Surgery with Major Secondary Diagnosis
  - 125 Disease of the Heart, Ischemia (Blood Deficiency) except AMI with Cardiac Catheterization
  - 126 Disease of the Heart, Ischemia (Blood Deficiency) except AMI with Surgical Procedure (Endoscopy, Insertion of Electronic Device)
  - 127 Disease of the Heart, Ischemia (Blood Deficiency) except AMI with Surgery (Shunt, Other Major)
- 8: Arrhythmia and Slowed Conduction
  - 128 Disease of the Heart, Irregular Heart Rhythm, Slowed Conduction without Surgery without Secondary Diagnosis or with Minor Secondary Diagnosis
  - 129 Disease of the Heart, Irregular Heart Rhythm, Slowed Conduction without Surgery with Major Secondary Diagnosis
  - 130 Disease of the Heart, Irregular Heart Rhythm, Slowed Conduction with Replacement of Heart Device or Cardiac Catheterization
  - 131 Disease of the Heart, Irregular Heart Rhythm, Slowed Conduction with Insertion of Electronic Heart Device
- 9: Heart Failure
  - 132 Disease of the Heart, Failure (Poor Function) without Surgery
  - 133 Disease of the Heart, Failure (Poor Function) with Surgery
- 10: Carditis, Valvular and Other Diseases
  - 134 Disease of the Heart, Inflammation, Valve Problem without Surgery without Secondary Diagnosis or with Minor Secondary Diagnosis
  - 135 Disease of the Heart, Inflammation, Valve Problem without Surgery with Major Secondary Diagnosis
  - 136 Disease of the Heart, Inflammation, Valve Problem with Cardiac Catheterization without Secondary Diagnosis or with Minor Secondary Diagnosis
  - 137 Disease of the Heart, Inflammation, Valve Problem with Cardiac Catheterization with Major Secondary Diagnosis
  - 138 Disease of the Heart, Inflammation, Valve Problem with Surgery (Valve Replacement, Other Major)
- 11: Cerebrovascular Diseases
  - 139 Circulatory Disorder of the Brain, Occasional Blood Deficiency without Surgery without Secondary Diagnosis or with Minor Secondary Diagnosis
  - 140 Circulatory Disorder of the Brain, Occasional Blood Deficiency without Surgery with Major Secondary Diagnosis
  - 141 Blood Clot in Brain Obstructing Circulation without Surgery without Secondary Diagnosis or with Minor Secondary Diagnosis
  - 142 Blood Clot in Brain Obstructing Circulation without Surgery with Major Secondary Diagnosis
  - 143 Brain Hemorrhage (Stroke) without Surgery without Secondary Diagnosis or with Minor Secondary Diagnosis
  - 144 Brain Hemorrhage (Stroke) without Surgery with Major Secondary Diagnosis
  - 145 Circulatory Dysfunction in Brain with Surgery
- 12: Diseases of the Vascular System
  - 146 Disease of the Circulatory System, Inflammation of the Lymph Glands, Varicose Veins (Legs), Raynauds Disease without Surgery
  - 147 Disease of the Circulatory System (Hardening of Arterial Walls, Arterial Blood Clot) without Surgery without Secondary Diagnosis or with Minor Secondary Diagnosis
  - 148 Disease of the Circulatory System (Hardening of Arterial Walls, Arterial Blood Clot) without Surgery with Major Secondary Diagnosis
  - 149 Disease of the Circulatory System with Surgical Procedure (Excision of Varicose Veins, Other) with Age less than 51
  - 150 Disease of Vascular System with Surgery (Excision of Varicose Veins, Other) with Age greater than 50
  - 151 Disease of Vascular System with Surgery (Excision of Nerve, Vessel) without Secondary Diagnosis
  - 152 Disease of Vascular System with Surgery (Excision of Nerve, Vessel) with Secondary Diagnosis
  - 153 Disease of Vascular System with Surgery (Arterial Reconstruction, Amputation of Extremity)

- 33: Pulmonary Embolism 154 Blood Clot of the Lung without Secondary Diagnosis or with Minor Secondary Diagnosis  
155 Blood Clot of the Lung with Major Secondary Diagnosis
- 34: Phlebitis and 156 Inflammation of the Veins, Blood Clot without Secondary Diagnosis or with  
Thrombophlebitis 157 Inflammation of the Veins, Blood Clot with Major Secondary Diagnosis
- 35: Hemorrhoids 158 Hemorrhoids
- 36: Hypertrophy of Tonsil 159 Enlargement of the Tonsils/Adenoids  
and Adenoid
- 37: Acute Upper Respiratory 160 Acute Upper Respiratory Tract Infection, Influenza with Age less than 45  
Tract Infection and 161 Acute Upper Respiratory Tract Infection, Influenza with Age greater than 44  
Influenza
- 38: Other Diseases of the 162 Disease of the Upper Respiratory Tract except Acute Upper Respiratory Infection  
Upper Respiratory Tract 163 Disease of the Upper Respiratory Tract with Surgical Procedure (Biopsy,  
Visualization of the Nasal Septum)  
164 Disease of the Upper Respiratory Tract with Surgery (Nose Reconstruction,  
Incision and Drainage of Sinus)
- 39: Pneumonia 165 Pneumonia with Age less than 31  
166 Pneumonia without Surgery without Secondary Diagnosis with Age greater than 30  
167 Pneumonia without Surgery with Secondary Diagnosis with Age greater than 30  
168 Pneumonia with Surgery
- 40: Bronchitis 169 Bronchitis with Age less than 46  
170 Bronchitis without Secondary Diagnosis or with Minor Secondary Diagnosis with  
Age greater than 45  
171 Bronchitis with Major Secondary Diagnosis with Age greater than 45
- 41: Asthma 172 Asthma with Age less than 31  
173 Asthma without Secondary Diagnosis with Age greater than 30  
174 Asthma with Secondary Diagnosis with Age greater than 30
- 42: Other Lung and 175 Lung Collapse, Pleurisy, Pulmonary Congestion without Surgery  
Pleural Diseases 176 Emphysema, Embyema, Abscess, Acute Swelling without Surgery without Secondary Diagnosis  
or with Minor Secondary Diagnosis  
177 Emphysema, Emyema, Abscess, Acute Swelling without Surgery with Major  
Secondary Diagnosis  
178 Disease of the Lung and Pleura with Surgical Procedure (Bronchoscopy,  
Chest Incision, Other) without Secondary Diagnosis  
179 Disease of the Lung and Pleura with Surgical Procedure (Bronchoscopy,  
Chest Incision, Other) with Secondary Diagnosis  
180 Disease of the Lung and Pleura with Surgery (Removal of Lobe, Other Major)
- 43: Diseases of the Oral 181 Minor Problems of the Teeth  
Cavity, Salivary Glands 182 Major Problems of the Teeth (Jaw, Salivary Glands, Other Oral Soft  
and Jaw Tissue)
- 44: Gastric and Peptic 183 Stomach Ulcer without Surgery without Secondary Diagnosis  
Ulcer 184 Stomach Ulcer without Surgery with Secondary Diagnosis  
185 Stomach Ulcer with Surgical Procedure (Biopsy, Visualization, Other)  
186 Stomach Ulcer with Surgery (Removal of Portion of Stomach, Other Major)  
without Secondary Diagnosis  
187 Stomach Ulcer with Surgery (Removal of Portion of Stomach, Other Major)  
with Secondary Diagnosis

- 45: Upper Gastro-Intestinal Diseases except Gastric and Peptic Ulcer
- 188 Upper GI Disease Except Stomach Ulcer without Surgery without Secondary Diagnosis  
189 Upper GI Disease Except Stomach Ulcer without Surgery with Secondary Diagnosis  
190 Upper GI Disease Except Stomach Ulcer with Surgical Procedure (Visualization, Other Minor) without Secondary Diagnosis  
191 Upper GI Disease Except Stomach Ulcer with Surgical Procedure (Visualization, Other Minor) with Secondary Diagnosis  
192 Upper GI Disease Except Stomach Ulcer with Surgery
- 46: Appendicitis
- 193 Appendicitis (without Peritonitis) without Secondary Diagnosis  
194 Appendicitis (without Peritonitis) with Secondary Diagnosis  
195 Appendicitis (with Peritonitis, Other) without Secondary Diagnosis  
196 Appendicitis (with Peritonitis, Other) with Secondary Diagnosis
- 47: Hernia of the Abdominal Cavity
- 197 Abdominal Hernia with Age less than 15  
198 Inguinal Hernia (without Obstruction) with Age greater than 14 and less than 65 without Secondary Diagnosis  
199 Inguinal Hernia (without Obstruction) with Age greater than 14 and less than 65 with Secondary Diagnosis  
200 Abdominal Hernia Except Simple Inguinal with Age greater than 14 and less than 65 without Surgery  
201 Abdominal Hernia Except Simple Inguinal with Age greater than 14 and less than 65 with Minor Surgery  
202 Abdominal Hernia Except Simple Inguinal with Age greater than 14 and less than 65 with Major Surgery  
203 Abdominal Hernia with Age greater than 64 without Surgery  
204 Abdominal Hernia with Age greater than 64 with Minor Surgery  
205 Abdominal Hernia with Age greater than 64 with Major Surgery
- 48: Enteritis, Diverticula, and Functional Disorders of the Intestine
- 206 Functional Disorder of the Intestine without Surgery  
207 Intestinal Pouching, Regional Enteritis, Ulcerative Colitis without Surgery  
208 Intestinal Pouching (Functional Disorder) with Minor Surgery without Secondary Diagnosis  
209 Intestinal Pouching (Functional Disorder) with Minor Surgery with Secondary Diagnosis  
210 Intestinal Pouching (Functional Disorder) with Major Surgery (Resection, Other)
- 49: Diseases of the Anus
- 211 Disease of the Anus without Secondary Diagnosis  
212 Disease of the Anus with Secondary Diagnosis
- 50: Miscellaneous Diseases of the Intestine and Peritoneum
- 213 Miscellaneous Disease of the Intestine and Abdominal Lining with Age less than 56 without Surgery  
214 Miscellaneous Disease of the Intestine and Abdominal Lining with Age greater than 55 without Surgery without Secondary Diagnosis  
215 Miscellaneous Disease of the Intestine and Abdominal Lining with Age greater than 55 without Surgery with Secondary Diagnosis  
216 Miscellaneous Disease of the Intestine and Abdominal Lining with Surgical Procedure (Local Incision, Excision)  
217 Miscellaneous Disease of the Intestine and Abdominal Lining with Visualization of the Intestine without Secondary Diagnosis  
218 Miscellaneous Disease of the Intestine and Abdominal Lining with Visualization of the Intestine with Secondary Diagnosis  
219 Miscellaneous Disease of the Intestine and Abdominal Lining with Major Surgery without Secondary Diagnosis  
220 Miscellaneous Disease of the Intestine and Abdominal Lining with Major Surgery with Secondary Diagnosis
- 51: Diseases of the Liver
- 221 Hepatitis, (Infectious, Serum) Subacute Necrosis of the Liver with Age less than 41



- 222 Hepatitis (Infectious, Serum) Subacute Necrosis of the Liver with Age greater than 40
- 223 Liver Cirrhosis without Secondary Diagnosis or with Minor Secondary Diagnosis
- 224 Liver Cirrhosis with Major Secondary Diagnosis
- 52: Diseases of the Gall-Bladder and Bile Duct 225 Disease of the Gallbladder and Bile Duct without Surgery with Age less than 51
- 226 Disease of the Gallbladder and Bile Duct without Surgery with Age greater than 50
- 227 Disease of the Gallbladder and Bile Duct with Surgery without Secondary Diagnosis
- 228 Disease of the Gallbladder and Bile Duct with Surgery with Secondary Diagnosis with Age less than 65
- 229 Disease of the Gallbladder and Bile Duct with Surgery with Secondary Diagnosis with Age greater than 64
- 53: Diseases of the Pancreas 230 Disease of the Pancreas without Surgery
- 231 Disease of the Pancreas with Surgery
- 54: Diseases of the Kidney and Ureter 232 Disease of the Kidney and Bladder without Surgery without Secondary Diagnosis
- 233 Kidney Inflammation without Surgery with Secondary Diagnosis
- 234 Nephrotic Syndrome, Nephritis (Chronic) Uremia without Surgery with Secondary Diagnosis with Age less than 65
- 235 Nephrotic Syndrome, Nephritis (Chronic) Uremia without Surgery with Secondary Diagnosis with Age greater than 64
- 236 Disease of the Ureter, Nephrotic Syndrome, with Surgical Procedure (Cystoscopy, Biopsy, Other Minor)
- 237 Kidney Inflammation and Degenerative Disease (Including Kidney Pelvis) with Surgical Procedure
- 238 Disease of the Kidney and Ureter with Surgery (Kidney Removal, Kidney Transplant, Other Major)
- 55: Urinary Calculus 239 Urinary Stone without Surgery without Secondary Diagnosis
- 240 Urinary Stone without Surgery with Secondary Diagnosis
- 241 Urinary Stone with Surgical Procedure (Visualization, Catheter to Kidney Other)
- 242 Urinary Stone with Surgery (Incision and Drainage of Kidney, Bladder, Ureter and Other Major)
- 56: Cystitis and Other Urinary Diseases 243 Bladder Inflammation with Other Urinary Disease without Surgery without Secondary Diagnosis
- 244 Inflammation of the Bladder and Urethra with Narrowing of the Urethra without Surgery with Secondary Diagnosis
- 245 Bladder (Abnormal Passage, Pouching, Other Disease) without Surgery with Secondary Diagnosis with Age less than 46
- 246 Bladder (Abnormal Passage, Pouching, Other Disease) without Surgery with Secondary Diagnosis with Age greater than 45
- 247 Disease of the Bladder and Urethra with Surgical Procedure (Visualization, Opening
- 248 Disease of the Bladder and Urethra with Surgical Procedure (Visualization, Excision, Dilatation, Repair) with Age less than 15
- 249 Disease of the Bladder and Urethra with Surgical Procedure (Visualization, Excision, Dilatation, Repair) with Age greater than 14
- 250 Disease of the Bladder and Urethra with Surgery (Removal of Bladder, Removal of Prostate, Other Major)
- 57: Disease of the Prostate 251 Disease of the Prostate without Surgery
- 252 Disease of the Prostate with Surgical Procedure (Bladder Visualization, Dilatation of Urethra, Biopsy) without Secondary Diagnosis
- 253 Disease of the Prostate with Surgical Procedure (Bladder Visualization, Dilatation of Urethra, Biopsy) with Secondary Diagnosis
- 254 Disease of the Prostate with Surgery (Non-Incisional Removal of Prostate) without Secondary Diagnosis
- 255 Disease of the Prostate with Surgery (Non-Incisional Removal of Prostate) with Secondary Diagnosis
- 256 Disease of the Prostate with Surgery (Incisional Removal of the Prostate)

- 1: Disease of the Male Reproductive System
- 257 Excessive Foreskin over the Glans Penis with Surgery
  - 258 Disease of the Male Reproductive System Except Circumcision without Surgery
  - 259 Disease of the Male Reproductive System Except Circumcision with Surgery with Age less than 45
  - 260 Disease of the Male Reproductive System Except Circumcision with Surgery with Age greater than 44
- 2: Disease of the Female Reproductive System
- 261 Disorder of Menstruation without Surgery
  - 262 Disease of the Female Reproductive System Except Disorder of Menstruation without Secondary Diagnosis
  - 263 Disease of the Female Reproductive System Except Disorder of Menstruation with Secondary Diagnosis
  - 264 Disease of the Female Reproductive System with Surgical Procedures (D&C, Visualization, Removal Fallopian Tubes) without Secondary Diagnosis
  - 265 Disease of the Female Reproductive System with Surgical Procedure (D&C, Visualization, Other) with Secondary Diagnosis
  - 266 Disease of the Female Reproductive System with Surgery (Removal of Womb, Repair of Female Reproductive Organ, Other Major)
- 0: Diseases of the Breast
- 267 Benign Breast Tumor, Chronic Cystic Disease without Secondary Diagnosis
  - 268 Acute Inflammation of the Breast, Enlarged Breast without Secondary Diagnosis
  - 269 Disease of the Breast with Secondary Diagnosis with Age less than 56
  - 270 Disease of the Breast with Secondary Diagnosis with Age greater than 55
- 1: Abortion
- 271 Abortion without Secondary Diagnosis
  - 272 Abortion with Secondary Diagnosis
- 2: Obstetrical Diseases of the Antepartum and Puerperium
- 273 False Labor without Surgery
  - 274 Threatened Abortion Premature Separation of the Afterbirth, Other Hemorrhage During Pregnancy without Surgery
  - 275 Obstetrical Complications, Poisons in Blood, Excessive Vomiting, Blood Clot Vein-Extremity without Surgery
  - 276 Obstetrical Disease Before and After Delivery with Surgical Procedure (D&C, Repair of Neck of Womb)
  - 277 Obstetrical Disease Before and After Delivery with Surgery (Removal of Tubes and Ovaries, Other Major)
- 3: Normal Delivery
- 278 Delivery without Surgery or with Surgery Assisting Delivery
  - 279 Delivery with Tying of Tubes, Removal of Tubes
  - 280 Delivery with Cesarean Section
- 4: Delivery with Complications
- 281 Delivery with Complications without Surgery or with Surgery Assisting Delivery
  - 282 Delivery with Complications with Cesarean Section
- 5: Diseases of the Skin and Subcutaneous Tissue
- 283 Excessive Scar Tissue, Excessive Pigment, Fatty Cyst, Other Minor Skin Disease without Secondary Diagnosis
  - 284 Excessive Scar Tissue, Excessive Pigment, Fatty Cyst, Other Minor Skin Disease with Secondary Diagnosis
  - 285 Skin Inflammation, Abscess, Eczema, Chronic Ulcer without Surgery with Age less than 21
  - 286 Skin Inflammation, Abscess, Eczema, Chronic Ulcer without Surgery with Age greater than 20
  - 287 Skin Inflammation, Abscess, Eczema, Reddened Skin with Surgery without Secondary Diagnosis
  - 288 Skin Inflammation, Abscess, Eczema, Reddened Skin with Surgery with Secondary Diagnosis
  - 289 Psoriasis, Eruptive Skin Lesions, Chronic Skin Ulcer

- 66: Arthritis
- 290 Arthritis without Surgery with Age less than 65
  - 291 Arthritis without Surgery with Age greater than 64
  - 292 Arthritis with Surgery (Excision of Bone, Joint, Membrane Surgical Joint Fixation)
  - 293 Arthritis with Surgery (Joint Incision, Spinal Fusions, Excision of Tissue Between Vertebrae)
  - 294 Arthritis with Surgery (Repair and Restoration of Joint, Removal of Membrane between Vertebrae)
- 67: Derangement and Displacement of Intervertebral Disc
- 295 Disorder and Displacement of Disc Between Vertebrae without Surgery
  - 296 Disorder and Displacement of Disc Between Vertebrae with Surgery
- 68: Diseases of the Bone and Cartilage
- 297 Rheumatism and Inflammation Tissue Covering Bone, Other Minor Bone Disease without Surgery
  - 298 Disease of the Bone, Inflammation of Marrow (Acute, Chronic), Spongy Bone, Unaided Fracture without Surgery
  - 299 Disease of the Bone, and Bone Tissue Lining, with Surgery (Excision Bone Lining, Repair of Other Joint)
  - 300 Disease of the Bone and Bone Tissue Lining with Surgery (Joint Incision, Bone Excision, Bone Fusion)
  - 301 Disease of the Bone and Bone Tissue Lining with Surgery (Amputation, Hip Restoration, Other Major)
- 69: Other Disease of the Musculo-Skeletal System
- 302 Inflammation of the Component Parts of the Joints, Curvature of the Spine, Deformed Foot without Surgery
  - 303 Backache, Diffuse Disease of Connective Tissue, Inflammation of Muscle without Surgery without Secondary Diagnosis
  - 304 Backache, Diffuse Disease of Connective Tissue, Inflammation of Muscle without Surgery with Secondary Diagnosis
  - 305 Inflammation of the Component Parts of Joints with Deformity (Palm, Finger, Toe) with Surgery
  - 306 Other Disease of the Muscle and Bone (Major) with Surgical Procedure
  - 307 Other Disease of the Muscle and Bone (Major) with Surgery (Removal, Repair of the Small Joint, Bone)
  - 308 Other Disease of the Muscle and Bone (Major) with Surgery (Joining Vertebrae, Other)
- 70: Congenital Anomalies
- 309 Birth Defect (Bone, Stomach, Testicle) without Surgery
  - 310 Birth Defect (Heart, Kidney, Other Major) without Surgery
  - 311 Birth Defect (Testicle, Skin, Stomach, Other Minor) with Surgery
  - 312 Birth Defect (Heart Valve, Other Unspecified Heart Site) with Surgical Procedure (Cardiac Catheterization)
  - 313 Birth Defect (Palate, Lip, Hip or Other Extremity) with Surgery (Repair of Mouth, Fixation of Hip)
  - 314 Birth Defect (Heart Valve, Other Unspecified Site) with Surgery (Heart Valve, Septal Repair)
  - 315 Congenital Diseases (Tetralogy of Fallot, Atrial Septal Defect, Hypospadias, Other) with Surgical Procedure (Catheterization, Repair of Urethra)
  - 316 Congenital Diseases (Tetralogy of Fallot, Atrial Septal Defect, Other) with Surgery (Valve, Septum, Shunt)
  - 317 Birth Defect (Spine, Gullet, Large Bowel) with Surgery
- 71: Normal Mature Newborn
- 318 Normal Full Term Newborn
- 72: Certain Diseases and Conditions Peculiar to Newborn Infants
- 319 Well Baby Care (Pregnancy greater than 9 months), Other Minor Disease or Condition of the Newborn Infant
  - 320 Immaturity, Hyaline Membrane Disease, Other Major Disease or Condition of the Infant without Secondary Diagnosis
  - 321 Immaturity, Hyaline Membrane Disease, Other Major Disease or Condition of the Infant with Secondary Diagnosis

- 73: Signs and Symptoms Pertaining to the Nervous, Respiratory, and Circulatory Systems
- 74: Signs and Symptoms Pertaining to the Gastro-Intestinal and Urinary Systems
- 75: Miscellaneous Signs, Symptoms, and Ill-Defined Conditions
- 76: Fractures
- 77: Dislocations and Other Musculo-Skeletal Injuries
- 322 Indications of Nervous, Respiratory, Circulatory System Disease without Surgery without Secondary Diagnosis
- 323 Convulsions, Fainting, Nosebleed, Chest Pain without Surgery with Secondary Diagnosis
- 324 Brain Disorder of Dizziness, Shortness of Breath, Coughing up Blood without Surgery with Secondary Diagnosis
- 325 Indications of Nervous, Respiratory, Circulatory System Disease with Surgical Procedure
- 326 Indications of Nervous, Respiratory, Circulatory System Disease with Major Surgery
- 327 Indications of Gastro-Intestinal, Urinary System Disease without Surgery without Secondary Diagnosis
- 328 Indications of Gastro-Intestinal, Urinary System Disease without Surgery with Secondary Diagnosis
- 329 Indications of Gastro-Intestinal, Urinary System Disease with Surgical Procedure (Visual Inspection, Other)
- 330 Indications of Gastro-Intestinal, Urinary System Disease with Surgery (Abdominal, Other Major)
- 331 Sterility (Male, Female), Admission for Observation without Surgery
- 332 Chemical Imbalance, Headache, Fever, Other Ill-Defined Indication of Disease without Surgery with Age less than 15
- 333 Chemical Imbalance, Headache, Fever, Other Ill-Defined Indication of Disease without Surgery with Age greater than 14
- 334 Miscellaneous Indication of Disease with Surgical Procedure (Visual Inspection, Other)
- 335 Miscellaneous Indication of Disease with Surgery (Abdominal Surgery, Removal of Uterus, Other Major)
- 336 Fracture (Skull, Face, Forearm, Leg, Foot, Hand) without Surgery with Age less than 30
- 337 Fracture (Skull, Face, Forearm, Leg, Foot, Hand) without Surgery with Age greater than 29
- 338 Fracture (Spine, Ribs, Bone of the Upper Arm) without Surgery with Age less than 65
- 339 Fracture (Spine, Ribs, Bone of the Upper Arm) without Surgery with Age greater than 64
- 340 Fracture (Thigh Bone, Pelvis, Multiple) without Surgery
- 341 Fracture (Nose, Forearm, Hand, Lower Leg, Foot) with Surgical Procedure (Closed Reduction) without Secondary Diagnosis
- 342 Fracture (Nose, Forearm, Hand, Lower Leg, Foot) with Surgical Procedure (Closed Reduction) with Secondary Diagnosis
- 343 Fracture (Lower Jaw, Upper Arm, Ankle) with Surgical Procedure (Closed Reduction, Open Reduction of Face) without Secondary Diagnosis
- 344 Fracture (Lower Jaw, Upper Arm, Ankle) with Surgical Procedure (Closed Reduction, Open Reduction of Face) with Secondary Diagnosis
- 345 Fracture (Arm, Hand, Foot, Shoulder Blade) with Surgery (Open Reduction, External Fixation, Other)
- 346 Fracture (Ankle, Leg Bones) with Surgery (Open Reduction, External Fixation, Other)
- 347 Fracture (Thigh Bone, Pelvis) with Surgery (Open Reduction, External Fixation, Other)
- 348 Fracture with Major Surgery (Amputation, Restoration of Hip Joint, Other Major)
- 349 Dislocation (Shoulder, Elbow, Wrist, Knee), Sprains (Ankle, Foot, Hand) without Surgery
- 350 Dislocation (Jaw, Hip), Sprains (Knee, Sacroiliac, Other Unspecified) without Surgery
- 351 Dislocation (Shoulder, Elbow, Hand), Sprains (Elbow, Wrist, Hand) with Surgery
- 352 Dislocation (Knee, Ankle), Sprains (Shoulder, Knee, Ankle) with Surgery
- 353 Dislocation (Hip, Multiple), Sprains (Hip, Sacroiliac, Other Unspecified) with Surgery

- 3: Internal Injuries of the Cranium, Chest, and Other Organs
- 354 Internal Injury of the Skull, Other Organ without Surgery without Secondary Diagnosis with Age less than 41
- 355 Internal Injury of the Skull, Other Organ without Surgery with Secondary Diagnosis with Age less than 41
- 356 Internal Injury of the Skull, Other Organ without Surgery with Age greater than 40
- 357 Internal Injury with Surgical Procedure (Suture of Skin, Nerve, Nerve Repair, Other)
- 358 Internal Injury with Surgery (Removal of Spleen, Drainage of Chest Cavity, Excision of Skin)
- 359 Internal Injury with Surgery (Opening of Skull, Exploration of Abdominal Cavity)
- 9: Open Wounds and Superficial Injuries
- 360 Open Wound (Uncomplicated), Superficial Injury, Foreign Body without Surgery
- 361 Open Wound (Complicated), Bruise, Multiple Injuries without Surgery without Secondary Diagnosis
- 362 Open Wound (Complicated), Bruise, Multiple Injuries without Surgery with Secondary Diagnosis
- 363 Open Wound (External), Foreign Body with Surgical Procedure (Visualization, Suturing, Other)
- 364 Open Wound (Complicated) of the Head, Multiple Sites with Surgical Procedure (Visualization, Suturing, Other)
- 365 Open Wound (External), Superficial Injury with Surgery (Excision, Other Major)
- 366 Open Wound (Complicated) of the Head, Multiple Sites with Surgery (Excision, Other Major)
- 30: Burns
- 367 Burn of the 1st Degree (Uncomplicated) Covering less than 20% of the Body
- 368 Burn of the 2nd Degree (Complicated), 3rd Degree Covering more than 20% of the Body
- 31: Complications of Medical and Surgical Care
- 369 Complications of Medical or Surgical Care without Surgery without Secondary Diagnosis
- 370 Complications of Medical or Surgical Care without Surgery with Secondary Diagnosis
- 371 Complications of Medical or Surgical Care with Surgical Procedure
- 372 Complications of Medical or Surgical Care with Surgery (Replacement of Heart Device, Repair of Stomach)
- 373 Complications of Medical or Surgical Care with Surgery (Revision of Shunt, Other Major)
- 32: Adverse Effects of Certain Substances
- 374 Adverse Effect of a Drug, Toxic Effect of Alcohol without Secondary Diagnosis
- 375 Adverse Effect of a Drug, Toxic Effect of Alcohol with Secondary Diagnosis
- 376 Toxic Effect (Lead, Acid, Alkali, Carbon Monoxide, Radiation) without Secondary Diagnosis
- 377 Toxic Effect (Lead, Acid, Alkali, Carbon Monoxide, Radiation) with Secondary Diagnosis
- 83: Special Admissions and Examinations without Reported Diagnoses
- 378 Prenatal Care, Medical and Surgical after Care (Dialysis) without Surgery
- 379 Admission for Sterilization, Chemotherapy, Radiation Therapy without Surgery
- 380 Follow up (Cancer) Surgery, Medical after Care (Colostomy, Orthopedic, Other) without Surgery
- 381 Special Admission with Surgery (Sterilization, D&C, Other)
- 382 Special Admission with Surgical Procedure (Bladder Visualization, Removal of Fixed Internal Device)
- 383 Special Admission with Surgery (Exploration of Abdominal Cavity, Removal of Uterus, Other Major)

## CASE MIX SITE VISITS

Case Mix Measures

<u>Organization Visited</u>	<u>Persons Interviewed</u>	<u>Major Emphasis</u>
Yale University	Robert Fetter, Ph.D. John Thompson Richard Averill	Diagnosis Related Groups (DRGs)
Johns Hopkins University	Dale Schumacher, M.D. Susan Horn, Ph.D.	Complexity Index Isocost Groups Severity Index
Systemetrics	John J. McCord	Disease Staging
Veterans Administration	Karl Eurenus, M.D.	Multi-Level Care
National Center for Health Services Research	Mark Hornbrook, Ph.D.	Hospital Cost and Utilization Project Disease Staging
Jefferson Medical College	Joseph Gonnella, M.D.	Disease Staging
Blue Cross/Blue Shield of Western Pennsylvania	Wanda Young, Sc.D.	Patient Management Algorithms
Commission on Professional and Hospital Activities	Arnold Spellman Walter Wood	Resource Need Index Revision of DRGs

Case Mix Reimbursement Applications

Health Care Financing Administration, HEW	Judy Lave, Ph.D. Julian Pittengill Michael Fitzmaurice	Section 223 - Limits on Hospital Inpatient Costs
New Jersey Health Department	Michael Kalison Leo Lichtig	New Jersey Case Mix Reimbursement Experiment
New Jersey Hospital Association	Domenick J. Camisi	New Jersey Case Mix Reimbursement Experiment
Cooper Medical Center Camden, New Jersey	Robert Evans, M.D. Gerald Moreland Dorothy Belding Angelo Angelides, M.D.	Participant in New Jersey Case Mix Reimbursement Experiment

Case Mix Reimbursement Applications (Cont.)

<u>Organization Visited</u>	<u>Persons Interviewed</u>	<u>Major Emphasis</u>
Morristown Memorial Hospital	Donald Bradley James Carroll	Participant in New Jersey Case Mix Reimbursement Experiment
Muhlenberg Hospital	Edward Dailey	New Jersey Case Mix Reimbursement Experiment
Maryland Health Services Cost Review Commission	Jack Cook, Sc.D.	Maryland Guaranteed Inpatient Revenue System
New York State Office of Health Systems Management	Joann Quan Shlomo Appel	New York Case Mix Study
Hospital Association of New York State	John Bassett John Rossman John Shaw	New York Case Mix Study
New York Hospital	David D. Thompson, M.D.	New York Case Mix Study, Internal Management
Montefiore Hospital New York, New York	Irwin Birnbaum Alvin Goldberg	New York Case Mix Study
Jones Health Systems Management, New York, NY	Tom Jones	Data Processor for New York Case Mix Study
Georgia Department of Medical Assistance	Paul Bellows Thomas Olmer	Georgia Medicare/Medicaid Reimbursement Experiment
Crawford W. Long Memorial Hospital, Atlanta, GA	W. Daniel Barker John Henry David Bishop	Georgia Medicare/Medicaid Reimbursement Experiment
VA Medical Center Ann Arbor, Michigan	Sylvester Berki Marie Ashcraft, Ph.D.	DRG Allocation of VA District Budget

Case Mix Evaluation Studies

Health Research and Educational Trust of New Jersey	J. Joel May	Evaluation of New Jersey Case Mix Reimbursement Experiment
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Case Mix Evaluation Studies (Cont.)

<u>Organization Visited</u>	<u>Persons Interviewed</u>	<u>Major Emphasis</u>
Coopers and Lybrand	Sheldon Chizever Joel Krinsky	Evaluation of New Jersey Case Mix Reimbursement Experiment
Connecticut Hospital Association	John Lynch	Evaluation of Ancillary Service use by DRG
Yale-New Haven Hospital	Mark Tepping	Study of Medicare Cost Reports and DRG Data from Major Teaching Hospitals
University of Washington	Cindy Watts, Ph.D.	Case Mix Studies in Hospital Economics
American Hospital Association	Gerald Bisbee, Ph.D. Henry Bachofer	Evaluation of DRGs

Case Mix Management Information Systems

Illinois Hospital	Timothy Garton	Patient Care Units/ Diagnosis Related Groups Project
Ernst and Whinney Chicago, Illinois	David Shade George Whetsell	Patient Care Units/ Diagnosis Related Groups Project
Evanston Hospital	Martin Drebin	Participant in Patient Care Unit/ Diagnosis Related Groups Project
Children's Memorial Hospital, Chicago, IL	Earl Frederick	Chairman of Advisory Committee for Patient Care Units/Diagnosis Related Groups Project
Arthur Andersen Detroit, Michigan	Donald McCubbrey James Shryock	Care Monitoring System
Providence Hospital Southfield, Michigan	Joseph Rinaldo, M.D.	Participant in Development of Care Monitoring System



Case Mix Management Information Systems (Cont.)

<u>Organization Visited</u>	<u>Persons Interviewed</u>	<u>Major Emphasis</u>
Hospital of the University of Pennsylvania	John Eisenberg, M.D. Sankey Williams, M.D. Steven Finkler, Ph.D.	Improving Cost Allocation Methods for Case Mix Management Information
Beth Israel Hospital Boston, Massachusetts	Mitchell Rabkin, M.D. David Dolins Howard Bleich, M.D. Warner Slack, M.D. John Melski, M.D. Dan Geer	Internal Management Information System Using Diagnosis Related Groups

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