

REPORT TO CONGRESS
HOSPITAL PROSPECTIVE PAYMENT
FOR MEDICARE

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EXECUTIVE SUMMARY OF THE REPORT TO CONGRESS ON HOSPITAL PROSPECTIVE PAYMENT FOR MEDICARE

Introduction

This report describes an approach to reforming the hospital reimbursement system under Medicare. The report is issued pursuant to section 101 (b) (3) of P.L. 97-248, the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA) which requires the Secretary of Health and Human Services to develop, in consultation with the Senate Committee on Finance and the Committee on Ways and Means of the House of Representatives, a legislative proposal for Medicare payment to hospitals, skilled nursing facilities, and to the extent feasible, other providers, on a prospective basis. A separate report on prospective payment for skilled nursing facilities will be issued in the near future.

In preparing this report the Department has benefited from discussions with members of Congress, Congressional staff members and representatives from the health care industry. A wide diversity of options was explored. The Department believes that the prospective payment system proposed here will provide hospitals an incentive to improve efficiency, will establish Medicare as a prudent buyer of hospital services, will reduce the administrative burden on hospitals, and will assure beneficiary access to quality health care.

Background

Currently Medicare reimburses hospitals under a cost-based system. In cost-based reimbursement, hospitals are paid essentially whatever they spend. There is no incentive for hospitals to operate more efficiently since all allowable costs are fully reimbursed. In fact, cost-based reimbursement encourages just the opposite behavior. The larger a hospital's costs, the larger will be its Medicare reimbursement. Thus, there exists an incentive to spend because the current system provides no incentive to save.

It is not surprising, therefore, that hospital expenditures are increasing. During 1982, inflation in the hospital sector increased three times faster than the overall rate of inflation. Medicare expenditures for hospital care have increased 19 percent per year during the last three years. These rapid increases in the costs of hospital care have serious implications for the federal government and Medicare beneficiaries.

Increasing Medicare expenditures constrain the ability of the federal government to fund other health programs. For example, the annual increase in Medicare expenditures for hospitals is nearly as large as the total budget for the National Institutes for Health. The rapid increases are also endangering the Medicare hospital insurance trust funds since 70 percent of Medicare expenditures are for hospitals.

Another problem is that the cost-based reimbursement system can lead to different payments for the same services. Cost-based reimbursement requires Medicare to pay whatever hospitals legitimately claim as costs for a particular service. An examination of Medicare records shows that payments for treating a heart attack average \$1500 at one hospital and \$9000 at another hospital with no apparent difference in quality. Likewise Medicare payments for hip replacements can vary from \$2100 to \$8200 and payments for cataract removal vary from \$450 to \$2800. If Medicare is to become a prudent buyer of hospital services, it should pay the same price for comparable services.

Cost-based reimbursement also requires the use of a reporting system which has evolved into one of the most burdensome regulatory requirements in the entire government. Reasonable cost reimbursement requires detailed documentation and reporting of the specific costs associated with care for Medicare beneficiaries. Hospital administrators complain of the excessive paperwork and costs associated with it.

In recognition of the inflationary aspects of the present cost-based retrospective hospital reimbursement system, Congress recently approved interim changes to the Medicare reimbursement system and directed the Secretary to propose a major reform of the system which Medicare uses to pay hospitals. Section 101 of the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA) includes some logical first steps towards that major reform of the hospital reimbursement system. The major hospital reimbursement changes in TEFRA are:

- (1) Limits on total hospital inpatient costs per discharge that are adjusted to reflect each hospital's case mix of patients;
- (2) A limit on the annual rate of increase of total costs per discharge; and
- (3) A small incentive payment for hospitals which are below both of the limits.

The first limit is a modification of a methodology the Department has been using for ten years. The program, commonly known as Section 223, was initiated by Congress in 1972 and has gradually been refined. In 1982, as part of TEFRA, Congress revised the methodology and placed a limit on the amount Medicare would pay for a hospital discharge. The most significant changes were the incorporation of a case mix measure into the formula, a per discharge limit instead of a per day limit, and a limit which covers all of the hospital's costs except for medical education and capital. The underlying incentives in the section 223 program remain. If a hospital's costs are less than the limits, the hospital is paid its costs, except for the small incentive amounts described below. Therefore, while the program penalizes high cost hospitals, well-run hospitals are not rewarded for their more efficient behavior.

The second provision constrains the annual rate of growth in hospital expenditures per discharge. It contains limited incentives for hospital efficiency. Existing differences between hospitals are perpetuated. The rate-of-increase limit freezes the differences in hospital costs from year to year. In fact, a higher cost hospital is actually rewarded. All hospitals have the same rate of increase but since the cost per discharge is higher in the more expensive hospital, it receives a larger increase in actual dollars.

TEFRA provides for the first time an incentive payment for hospitals to operate efficiently; however, the incentives to operate below the limits are small. At most, hospitals can receive half of the difference between the limit and their actual costs. The total incentive payment is capped at five percent of the allowable cost per discharge. Moreover, there is nothing to discourage the hospital from going up to the limit and retaining the full amount.

These interim reimbursement reforms were accompanied by a provision which directed the Secretary for Health and Human Services to propose a plan for the prospective payment of hospitals by Medicare which will provide long range reimbursement reforms with built-in incentives for hospital management efficiency.

Proposed Plan for Prospective Payment of Hospitals

Under this plan, hospital payment will be related to the treatment provided to each patient. Since patients have different diagnoses, require different treatments, are of different ages, and differ in other ways, it is important to develop a payment system which explicitly adjusts for these differences. Prospective payment systems which do not recognize differences in case mix will severely harm the tertiary care hospitals, which treat more complex illnesses, as well as rural

hospitals, which have a volatile case mix. The lack of a case mix adjustor would also make the severely ill patient a financial liability to all hospitals and encourage some hospitals to admit only less severely ill patients. This is an outcome the Department does not want to encourage.

Therefore, it is necessary to aggregate the costs of treating patients who have different types of conditions. Since 1969, a team of researchers at Yale University has been developing a method for categorizing patients into diagnosis related groups (DRGs). The DRGs were developed from 1.4 million records at 325 hospitals. They have been used in the hospital reimbursement system in New Jersey, Maryland, and other states and to adjust for case mix in the current Medicare limits established by TEFRA.

The researchers at Yale found that all patients can be categorized into one of 467 different groups. The DRGs take into account the primary diagnosis of the patient, the secondary diagnosis of the patient, the primary procedure utilized (if there is surgery), the age of the patient, and the patient's discharge status. Under the prospective payment system, rates will be set for each of the 467 different DRGs and hospitals will be paid based upon the DRG of the patient. More complex cases such as kidney transplants (DRG 302) will receive a much higher payment than simpler cases such as hernia repair (DRG 161). Certain types of cases with complications will receive a higher payment than cases without complications. For example, a heart attack with complications (DRG 121) will receive a higher payment than an uncomplicated heart attack (DRG 122).

The prospective payment system will make additional adjustments. The system will recognize that wage levels paid to hospital workers are different in various sections of the country, and rates will be adjusted so that hospitals located in high wage areas will receive a larger payment than hospitals in low wage areas. However, every hospital in the same geographic area will receive the same payment for similar cases.

Capital and medical education costs will be excluded from the calculations of the basic payment rate and will be reimbursed separately. In this way teaching hospitals will be reimbursed separately for their teaching costs and hospitals which have recently invested in capital construction will be compensated for their actual capital costs.

Cases with extraordinary lengths of stay will also be handled separately. This adjustment will aid the teaching, tertiary care, or public hospital which has a large number of severely ill patients. It will also assist the small hospital which has one patient who has an exceptionally long stay.

For each DRG, the rate will reflect the total payment for providing inpatient hospital services. In future years, the prospective payment will be updated by the Secretary who may take into account factors such as the increase in the cost of goods and services purchased by hospitals, improved industry productivity, and technological changes. In addition, the Department will review advances in medical technology and their applicability to specific DRGs.

The rates will be payment in full to the hospital with no beneficiary cost-sharing except for any deductibles and coinsurance mandated by law. Hospitals would be precluded from charging beneficiaries any amount which exceeds the deductible and coinsurance amounts specified by Congress.

In implementing the system, the Department intends to address two issues that have been raised about a DRG based system. The Department will guard against the artificial inflating of diagnoses ("DRG creep") by verifying DRGs on a sample basis. The purpose of DRG verification is to validate the accuracy of the DRG assigned to individual cases and to assure that the reported DRG is consistent with the information in the medical charts. The Department will also monitor admission patterns of hospitals and physicians to detect any unusual changes in the volume of admissions, case mix, or quality of care provided to Medicare beneficiaries. If unusual patterns are detected, the appropriate medical review authority will be asked to investigate and intervention might be taken.

Several types of hospitals would be excluded from the prospective payment plan. These include: long-term care hospitals, psychiatric hospitals, and pediatric hospitals. The basis for this exclusion is that the DRG data were not developed, tested, or applied in these types of facilities, nor do the DRGs group the case types and associated resources expended by these types of institutions.

For Health Maintenance Organizations (HMOs) that elect to bill Medicare for each hospitalization, the HMO will be paid the DRG rate. Special provisions will be made for sole community providers to assure beneficiaries in rural areas continue to have access to hospital care.

The prospective payment plan will apply to the Medicare program only. The prospective payment rates will be publically available and any health insurer can use the same rates if it so desires.

The prospective payment system promotes efficiency in a simple effective way. Hospitals will be allowed to retain any surplus they can earn by operating efficiently. Likewise, they must absorb any losses.

A prospective payment system should improve quality of care in hospitals. It will encourage hospitals to specialize in providing the services which they do best. In general, services performed infrequently are associated with a lower quality of care. In addition, a national evaluation of state rate setting programs has shown no adverse impact of prospective payment on hospital accreditation status, fatality rates, readmission rates, or other measures of quality of care.

A more complete description of the prospective payment proposal is provided in the full report. The full report also discusses state experience with DRGs and prospective payment, the analytical development of DRGs, and the method for setting the price of each DRG.

This approach to prospective payments has the following advantages:

- o It is easy to understand and simple to administer.
- o It can be implemented quickly.
- o It ensures both hospitals and the federal government a predictable payment for services.
- o It establishes the federal government as the prudent buyer of services.
- o It reduces the administrative burden on hospitals and provides rewards to hospital administrators to operate efficiently.
- o It will result in improved quality of care as hospitals begin to specialize in what they do best.
- o Beneficiary liability will be limited to the coinsurance and deductible payments mandated by Congress.

A legislative proposal for reforming hospital reimbursement under Medicare is currently under review in the Administration.

The Department of Health and Human Services is prepared to implement the prospective payment system on October 1, 1983, given timely submission of the final legislative proposal and enactment.

I. THE ROLE OF PROSPECTIVE PAYMENT IN CONTAINING HOSPITAL COSTS

A. Purpose and Scope

This report on Prospective Payment for Hospitals Under Medicare is issued pursuant to Section 101(c) of P.L. 97-248, the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA). Under this section, the Secretary of Health and Human Services is required to develop, in consultation with the Senate Committee on Finance and the Committee on Ways and Means of the House of Representatives, proposals for legislation which would provide Medicare payment for hospitals, skilled nursing facilities, and to the extent feasible, other providers, on a prospective basis.

This report is the direct result of several months work and analysis but draws heavily from nearly a decade of research and demonstrations by the Health Care Financing Administration (HCFA), as well as other components of the Department of Health and Human Services. The Department has also benefitted by discussions with health care industry representatives as well as Congressional staff involved in health care.

Thus, it is with considerable deliberation and with a rich history of research and demonstrations that the Department submits a Hospital Prospective Payment Plan that is equitable for all hospitals, encourages efficiency of operations, simplifies the payment and reporting process and maintains accessibility and quality of care for Medicare beneficiaries.

This report presents the Department of Health and Human Services' recommendation for a Medicare prospective payment system for hospitals.

The Medicare program was established to reduce the burden of medical care for aged persons. As of late, this basic intent has been threatened by the continually increasing costs of providing care to Medicare beneficiaries. Of particular concern is the current status of the Medicare hospital insurance trust fund. Hospital payments account for over two-thirds of all Medicare dollars. Improving the solvency of the Medicare Part A trust fund rests to a large extent on slowing the rate of growth in Medicare expenditures. The tremendous increase in hospital costs over the past 16 years cannot be overemphasized. The data show vividly the results of this inflation:

- o In FY 1967 Medicare paid \$3.2 billion for hospital services, in FY 1983 Medicare will pay over \$37 billion.
- o Medicare expenditures for hospital services have increased annually 19.2 percent from 1979 - 1982.
- o This year when inflation was 5 percent hospital costs rose 15.5 percent.

- o The hospital insurance deductible, which by statute must be increased to correspond with the average cost of one day in a hospital, has risen from \$40 in FY 1967 to \$144 in 1978 to \$304 next year. Thus, all Medicare beneficiaries who are hospitalized must meet a deductible that has been rising and more than doubled over 5 years.

These economic facts are thought to be related in part to the way in which the Medicare program reimburses hospitals.

As a nation, we have had nearly two decades of experience with the existing Medicare reimbursement principles. It is evident that Medicare retrospective cost-based reimbursement principles do not encourage efficient production in the hospital in that they do not provide genuine incentives to constrain costs. To the extent that this is true, the Medicare program does not act as a prudent buyer in the hospital marketplace. This paper discusses the development and implementation of a prospective payment system (PPS) that the Department of Health and Human Services believes will provide incentives for the efficient production of the hospital services provided to Medicare beneficiaries. The ultimate objective of PPS is to set a reasonable price for a known product. This provides incentives for hospitals to produce that product more efficiently. When PPS is in place, health care providers will be confronted with strong, lasting incentives to restrain costs for the first time in Medicare history.

This chapter offers a brief discussion of the reasons why expenditures for hospital services have grown so rapidly, and the advantages and limitations of hospital prospective payment as a strategy for restraining future growth. In the first two sections, the problem of hospital expenditure growth is analyzed. First, hospital expenditure growth is separated into components. Those that can be influenced by hospital policy decisions are identified. Second, the medical care process is examined to identify the role that health care financing policies play in influencing key hospital resource use decisions. The third section gives a broad, generic definition of hospital prospective payment and a brief discussion of the economic incentives that it creates. The chapter concludes with a discussion of the limitations of hospital prospective payment as a solution to the expenditure growth problem.

B. Components of Hospital Expenditure Growth

At the most basic level, annual expenditures for inpatient hospital care are largely determined by the number of patients (cases) admitted for treatment per year, the quantities of individual services (X-rays, lab tests, bed days, etc.) provided per admission and the unit costs of the individual services. Changes in these components from year to year stem from a variety of factors that affect either the demand for hospital care, the supply of hospital services, or both.

Growth in the number of hospital admissions, for example, arises from changes in the size and composition of the population (in terms of age, sex, education, occupation, personal income, etc.), insurance coverage and benefits, and treatment technology through enhancement of hospital service capabilities or alternatives to hospitalization. Variation in the mix and volume of services per admission (called service intensity) arises primarily from changes in technology which create new services and variations in patterns of medical practice (including defensive medicine). Service intensity is also influenced by changes in the kinds of illnesses and conditions being treated. These changes reflect major shifts in the composition of the insured population such as those brought about by: 1) the aging of the population, 2) changes in fertility rates, and 3) the introduction of Medicare and Medicaid in 1966. Increases in the unit costs of individual services stem primarily from general inflation in the prices of the inputs that hospitals purchase to produce services, and from changes in technology that alter the economic efficiency of input use.

Some of these sources of expenditure growth are largely outside the control of the hospital while others are subject to influence by the hospital. This classification of sources is summarized for each expenditure component in Table 1.

TABLE 1

Sources of Hospital Expenditure Inflation

	<u>Uncontrollable</u>	<u>Controllable</u>
Admissions	Population growth and composition, demographic factors, development of new technology, income and insurance coverage	Physician staff composition, admission appropriateness, adoption of new technology
Services Per Admission (Service Intensity)	Development of new technology, mix of illnesses and conditions prevalent in the population	Changes in treatment protocols, adoption of new technology
Unit Costs	General inflation in the prices of goods and services that hospitals must purchase	Internal productivity and economic efficiency, cost effects of other outputs (medical education, research)

As this table indicates, population growth and composition, personal income, insurance coverage, the development of new technology and general price inflation are all largely outside the control of the hospital. These factors represent important characteristics of the economic environment to which the hospital can react in various ways, but cannot directly control.

The hospital can and will, however, respond to these influences. In the short term, these responses include internal decisions on which patients are admitted, what services are provided to individual patients, and how those services are produced. Longer term responses are determined through decisions involving its service capacity, its physician staff composition, and the adoption of new technology. Together, these sets of decisions comprise the controllable sources of expenditure growth.

Hospital decisions on controllable expenditures are influenced in two important ways. First, key resource use decisions involve patients and physicians, as well as hospital management. Second, all three are strongly influenced by the financial incentives embedded in current hospital insurance payment methods. Their roles and the influence of current insurance practices on their resource use decisions are described in the following section.

C. The Hospital Care Process and Incentives Under Public and Private Insurance

This section focuses on the influences that financial incentives, embedded in public and private health insurance programs, have on the hospital resource decisions of the key actors in the hospital care process. The effects of insurance on key decisions are briefly discussed below for patient, physician, and hospital. This discussion implicitly compares incentives under current payment methods with the incentives that would exist if no insurance were available. The purpose is to understand the incentive effects of current reimbursement practices, not to criticize health insurance.

The Patient: Hospital insurance reduces the out-of-pocket cost (private cost) to the insured patient for the use of covered inpatient services to a fraction (usually less than 20 percent) of the full hospital resource cost or charges of the services. This is, of course, the principal benefit of the Medicare program. However, in this situation, the patient has little financial incentive to avoid hospital admission. The reduction of private cost under insurance also affects the patient's willingness to stay additional days in the hospital and, perhaps to a lesser degree, to use additional services.

The Physician: Physicians are the key figure in the hospital care process. They are responsible for identifying the patient's problems, defining the alternative treatment strategies and ordering the necessary hospital services. The effect of insurance on the physicians' decisions to use services will be largely the same as for the patients. They will admit patients more readily and order more services than they would if their patients had to pay the full cost of care.

The weakness of the physician's incentives for restraint in using hospital services under insurance is compounded by current physician reimbursement practices and the threat of malpractice suits. Physicians are usually paid for their services on a fee-for-service basis, completely separate and independent of the payment for hospital services. Ordering a larger or smaller quantity of hospital

services does not affect physicians' fees for direct services (although longer stays or more service units may provide additional billing opportunities).

In addition, to the extent that physicians are at risk for malpractice claims, they have an incentive to minimize that risk by ordering additional tests and procedures. Finally, in the absence of any necessity to consider the cost of services, the range and technical quality of inpatient services available will be paramount in the physician's choice of hospital in which to practice and admit patients.

The Hospital: To understand the effects of insurance on hospital resource use decisions, it is useful to contrast the relationship between consumer demand and the price of a product in a conventional marketplace with price and demand in the hospital industry under current insurance practices. In a typical competitive market, the principal fact of economic life for a firm is that the quantity of its product demanded by consumers will decline with an increase in the price of the product. Given this relationship, the economic survival of the firm depends critically on the management's ability to keep costs (and prices) low.

This relationship, and the strong incentives that it creates for management to control resource use, are fundamentally altered in the hospital industry by current hospital insurance practices. First,

the demand for hospital admissions and associated inpatient services is mediated by the physician, who has little incentive to consider the cost or price of hospital inpatient treatment for insured patients and who may not be fully aware of hospital costs. Second, hospitals are generally either reimbursed incurred costs or paid their service charges for the treatment of insured patients.

Since most patients are insured and do not pay for hospital care directly, the quantity of inpatient care demanded from any hospital is not very sensitive to the cost or price of treatment. As a consequence, the incentive for the hospital to control costs and lower prices tends to be weak, and the higher the proportion of insured patients, the weaker the incentive. In addition, as long as insurance programs continue to pay each hospital's charges or incurred costs, hospitals will have no economic incentive to restrain the quantity of services used in treating patients.

Under these circumstances, the economic survival of the hospital depends on its ability to attract physicians who will admit patients. Hospitals do this by providing the quantity and quality of services that physicians desire through investment in specialized facilities and services. Although hospitals may have some incentive to adopt new technology that is cost-decreasing, current insurance practices neither prevent nor discourage the adoption of new technology that is cost-increasing. If the hospital is reimbursed costs, the capital cost and the operating costs are shared by the

various insurance programs. If it is paid charges, even if the new facility or equipment is underutilized, charges for other services can be set to subsidize these costs. Either way, the hospital can cover its costs and may earn some surplus.

Thus, an important part of the problem is a result of the distortion of incentives under prevailing Medicare hospital reimbursement practices. The consequence of these distortions is also clear: a greater quantity of hospital services is produced than would be the case if incentives to control resource use were in force.

A more careful look at Medicare Reimbursement Principles is illustrative. The present system of hospital reimbursement under the Medicare program is retrospective cost reimbursement. That is, hospitals are reimbursed by Medicare for whatever reasonable costs they incur in providing care to Medicare patients. Inpatient hospital expenditures amount to 66 percent of Medicare outlays and have been increasing at the rate of about 19 percent per year.

Medicare's final payment to a hospital is determined only after a hospital itemizes its costs for a full year on a Medicare cost report. The method used to arrive at the Medicare payment amount consists of determining (1) what is the total of Medicare allowable kinds of costs of the hospital, (2) what share of the total of allowable kinds of costs is attributable to Medicare patients, and (3) whether the resultant amount is reasonable.

Medicare defines what costs are allowable and, therefore, can be claimed on the Medicare cost report. For example, Medicare principles prescribe whether purchases from a related organization can be claimed at the invoiced price and how depreciation is to be claimed for capital cost reimbursement.

Once total hospital allowable costs are determined, those costs are allocated to revenue-producing centers of the hospital, i.e., centers from which the hospitals bill patients for using services such as laboratory tests or x-rays. A ratio of Medicare charges to total charges (RCC) is then determined for each hospital revenue-producing center. This ratio is applied to the total allowable costs accumulated in the center during the past fiscal year to arrive at Medicare's share of the allowable cost from each center.

In the case of routine services (services typically identified with the daily room rate), the procedure is different. Total allowable routine costs are divided by total inpatient days of care. Medicare then reimburses the hospitals for the number of days used by Medicare beneficiaries.

Under the present system, Medicare reimburses for some portion of the costs associated with graduate medical education programs. Medicare also provides for a return on equity for proprietary hospitals. Medicare recognizes the bad debts of Medicare beneficiaries for coinsurance and deductibles for covered services as a reimbursable cost.

Until October 1, 1982, the major controls over Medicare hospital expenditures were the limits set on the costs of inpatient general routine services under the authority of Section 223 of P.L. 92-603. These routine limits applied only to the costs related to room and board type services. Ancillary services were unconstrained.

These limits did not slow hospital expenditures to any measurable extent nor did they reward facilities for being efficient. For example, if a hospital's costs were under the limit, it received its costs. This provided no incentive to keep a hospital from spending up to its limit rather than holding down its costs. In addition, this system provides an incentive to shift costs from routine to ancillary cost centers. TEFRA, enacted recently, includes provisions for new limits on total inpatient operating costs, plus a ceiling on the annual rate of increase of hospitals' inpatient operating costs per case. However, even under this system, Medicare reimbursement remains a retrospective cost-based limit system.

The new cost limit provisions differ in four major ways from the previous routine cost limits:

- . they apply to total inpatient operating costs;
- . the new limits will be applied on a per case rather than a per diem basis;
- . each hospital's limit is adjusted to reflect its own case mix, and
- . there is an overall rate of increase control on the growth of total costs per discharge.

This new system gives hospital incentives not to spend up to the rate of increase target rate limit. There is an incentive payment for

hospitals that keep their costs below the specified target rate. The incentive payment is capped, however, at five percent of the target rate.

The present system of cost-based retrospective reimbursement of hospitals for services provided to Medicare beneficiaries has been one of the major contributors to high rates of inflation. By reimbursing essentially incurred costs at any level, this system does not provide incentives for hospitals to manage their operations in a cost-effective manner. The greater a hospital's costs, the larger its Medicare reimbursement. Thus, well-intentioned hospital managers face pressure to spend more. This system contributes to depletion of the Hospital Insurance Trust Fund, a situation which threatens the security of present and future beneficiaries. It defies control and makes predictability of payments uncertain, at best. Clearly, reform is required.

The solution to this problem depends upon changing the incentives for hospitals. Prospective payment is intended to alter substantially the financial incentives facing the hospital in its resource use and investment decisionmaking. In the next section the concept of prospective payment is defined and its effect on hospital incentives is described.

D. Hospital Prospective Payment

Prospective payment methods provide hospitals with an explicit set of

payment rates (per service, per diem, or per case^{*}) or, in budget review systems, with implicit rates for the same units. For purposes of this report, these payment rates are taken to have four essential characteristics. First, they are determined in advance and fixed for the fiscal period to which they apply. Second, the payment rates for any individual hospital are not automatically determined by the level, or the pattern, of its present or past incurred costs or charges for services. Third, prospective rates are payment in full for the specified unit of service. Finally, the hospital keeps the difference between the payment rate and its cost of providing the service and is at risk for exceeding the payment rates.

From the hospital's point of view, prospective rates represent a set of prices with similar characteristics to the prices it would face in a more conventional market. The hospital knows the amount it will be paid per unit of service and that the payment rate will remain unchanged regardless of its own cost experience. Thus, like firms in other markets, the hospital bears the risk that the prospective payment rate will not cover its cost per unit of care.

In general, this risk generates strong financial incentives for hospitals to control resource use. The specific incentives created by prospective reimbursement with respect to particular resource use

^{*}Per case payments would usually be based on the number of patients discharged by the hospital.

and investment decisions, however, depend upon the unit of payment (per service, per diem or per case) and the methods of rate calculation. These issues are discussed in more detail in Chapter III.

E. Hospital Prospective Payment as a Solution to the Problem

The earlier discussions of the sources of hospital expenditure growth and the definition of hospital prospective payment have important implications for the strategy of prospective payment as a complete solution to the growth of expenditures for hospital care. First, prospective payment creates direct financial incentives only for hospitals. It does not directly affect either patients or physicians. Therefore, it can attack only the sources of growth that are controllable by hospitals. That is, the payment system may create incentives for economical responses to outside influences (e.g., increases in the prices of supplies), but it cannot eliminate their effects. Thus, some expenditure growth is likely to persist even if the payment reform is fully successful.

Second, the burden of responding to the incentives created by the payment system falls primarily on the hospital administrator. Administrators can respond fairly readily to incentives to control unit service costs (for laboratory tests, meals, etc.) because they have significant direct influence on decisions that affect the availability of specific hospital services and the methods and

resources used in their production. However, incentives to control the admitting or service utilization behavior of the hospital's medical staff are not direct.

The decision to admit an individual, and any decisions regarding the services provided during the inpatient stay, are made by the attending physician. Therefore, the ability of a hospital to respond to prospective payment incentives depends on the ability of the hospital administrator to transmit these incentives to the attending physician staff. Since the physician staff generally is not integrated into the administrative hierarchy of the organization, the administrator must exercise influence through the medical staff organization and the organization and management of the hospital's clinical departments (e.g., adult medicine, cardiology, etc.).

It is also worth noting that prospective payment is one of a number of possible alternatives. For example, recently, a number of reforms have been suggested that would affect the growth of expenditures for hospital services by changing the incentives facing consumers when they make decisions. One type of reform would modify patient behavior in the purchase of health services by making the patient bear a larger share of the financial consequences of his service use decisions. Attempts to reimburse providers on an indemnity basis, or to increase coinsurance and deductibles, would fall into this category. Other concepts would influence the behavior of both

consumers and providers by fundamentally restructuring the market for insurance. Prospective payment is not incompatible with these other structural reforms which may be pursued in the future.

F. Report Organization

The remainder of this report is presented in six sections. Chapter II contains discussion of HCFA demonstrations that have tested a variety of concepts related to prospective payment in real world settings. This discussion indicates that many of these concepts are successful in holding down the rate of increase in hospitals costs. Chapter III outlines the Department's proposed prospective payment plan. The plan is presented in terms of objectives, the selection of component parts and a description of important design features. Chapter IV presents the rationale for Diagnosis Related Groups (DRGs) in terms of purpose, development, validation and refinement. Chapter V indicates in some detail how prospective payment prices will be developed. Chapter VI then provides an examination of how the construction of DRG case categories and prospective payment prices are affected by available Medicare diagnostic and surgical procedure data. The report concludes with Chapter VII, which is an analysis of the incentives that result from the design of the recommended Medicare prospective payment system.

II. EXPERIENCE WITH HOSPITAL PROSPECTIVE PAYMENT DEMONSTRATIONS

A. Introduction

In 1972, Congress expressed an interest in paying for hospital care on a prospective basis by permitting the Department to undertake State prospective payment (rate-setting) demonstrations. Since then, the Department has funded numerous developmental efforts and provided Medicare and Medicaid waivers to a number of States in order to demonstrate a wide variety of payment systems. The Department also has funded broad evaluations of these demonstrations. This chapter first discusses individual State attempts at rate control. The chapter concludes with a summary of the lessons learned from these State experiences. Demonstration findings provide a background for the prospective payment system developed in this report. It is important to know that many of the concepts proposed have in fact been demonstrated in real life settings.

There have been numerous attempts to develop and test hospital prospective payment systems. Some systems have been mandatory, others have been voluntary. The discussion which follows concentrates on the former since mandatory systems have thus far appeared to be much more effective in terms of holding down rates of increase in hospital expenditures than have voluntary ones. Tables 2 and 3 indicate that per capita and per admission rates of increase in hospital costs have been lower in status with demonstrated systems than in the United States overall (see Coelen and Sullivan, 1981 for a more complete discussion).

TABLE 2

PROSPECTIVE PAYMENT EXPERIENCE:
ANNUAL PERCENT INCREASE IN INPATIENT HOSPITAL COSTS
DEMONSTRATION STATES VS UNITED STATES

Community Hospitals: Annual Percent Increase
Inpatient Cost Per Capita

States with

Demonstrated Programs

	1977	1978	1979	1980	1981
Connecticut	10.6	9.4	9.0	12.6	14.1
Maryland	11.3	11.8	15.1	14.5	16.0
Massachusetts	11.9	7.3	8.2	13.9	14.4
New Jersey	11.7	8.8	10.6	15.8	11.5
New York	11.5	7.5	10.0	11.5	15.2
Rhode Island	10.0	6.7	12.9	14.0	15.0
Washington	11.9	7.0	9.1	11.3	21.8
Wisconsin	10.2	11.5	10.8	14.7	16.9

United States	12.8	11.1	12.0	14.9	17.7
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TABLE 3

PROSPECTIVE PAYMENT EXPERIENCE:
ANNUAL PERCENT INCREASE IN INPATIENT HOSPITAL COSTS
DEMONSTRATION STATES VS UNITED STATES

Community Hospitals: Annual Percent Increase
Cost Per Adjusted Admission

States with

Demonstrated Programs

	1977	1978	1979	1980	1981
Connecticut	11.1	9.5	8.1	11.4	15.9
Maryland	8.9	9.2	12.1	9.8	15.6
Massachusetts	13.8	8.1	7.6	14.1	14.1
New Jersey	10.8	8.8	11.2	10.7	11.4
New York	7.0	8.5	8.5	10.8	14.1
Rhode Island	9.5	6.1	10.9	12.4	16.3
Washington	12.9	10.5	11.2	10.9	18.9
Wisconsin	12.5	12.7	10.7	12.6	17.6

United States	12.4	11.5	11.3	12.7	17.3
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Prospective payment can be categorized in terms of the basis of control: The "Global" type, which refers to systems which directly attempt to control total hospital costs and the "Unit of Payment" type which refers to systems which control payment of service.

Conceptually, the most extreme global approach would be a national, or regional budget, for all hospital care. Our live experiences with global approaches include a Statewide system in Rhode Island, areawide approaches in Rochester and the Finger Lakes Areas of New York, and hospital-specific approaches in Washington, Connecticut, Massachusetts and Maryland. Unit of payment approaches include the New York system, which pays on a per day basis; the Georgia system, which pays on a per admission basis; and the New Jersey system, which pays a fixed amount for different types of cases.

B. Global Systems

1. Statewide Budget Control - Rhode Island: A statewide budget system has been used in Rhode Island since the early 1970's. Medicare and Medicaid participated in the program for three years and Medicaid continues to participate as an alternate State plan. With only 16 hospitals, Rhode Island is small enough to use such a system. Rhode Island's budget is set for all hospital care and an overall rate of increase is determined in negotiations between the State Budget Office, the Hospital Association and Blue Cross. Each hospital prepares an annual budget which is then subjected to a detailed budget review and negotiated with Blue Cross.

2. Areawide Budget Control - RAHC and FLAHC: There are two prospective payment systems operating under contract with HCFA that test an areawide budget: The nine hospital Rochester Area Hospitals' Corporation Project (RAHC) and the eight Hospital Finger Lakes Area Hospitals' Corporation Project (FLAHC).

RAHC is the test of an areawide budget in a metropolitan area, whereas FLAHC is the test of a virtually identical system in a rural environment. The systems operate under an areawide pool of dollars with a split between the individual hospitals and the areawide Hospital Corporation. The pool is determined by bringing forward a base year of total hospital costs in the region for inflation plus 2 percent. The individual hospitals are guaranteed the majority of the pool by a fixed formula, which is essentially their original budget plus inflation. However, the Hospital Corporation retains a "kitty" of 2 percent from which it makes payment to hospitals for volume changes, the cost of additional approved capital projects, and any case mix adjustments granted to individuals.

Although these areawide budget demonstrations have been operating relatively smoothly, small rural hospitals are having some trouble with the system since a hospital budget is not automatically adjusted for items such as case mix changes caused by the loss or addition of physicians in the area. Also, hospitals are reluctant to shift part of their revenue base to another hospital when there has been a shift in mix or volume at another institution.

Hospital-Specific Budget Control

There are a number of prospective systems which control total hospital costs that HCFA has supported or in which HCFA has participated.

Examples are the statewide rate setting systems in Washington, Connecticut, Massachusetts and Maryland.

3. Washington State Hospital Commission: The Washington system is a standard accounting approach which employs an annual detailed review of a hospital's total budget. A State Rate-Setting Commission operates an exceptions review process which singles out potentially high cost operations for detailed scrutiny and automatically approves lower cost hospitals. Capital costs and financial ratios are reviewed in detail.

To demonstrate and test the impact of payer participation in a rate setting system, hospitals were divided into three groups. During the demonstration, major third-party payers guaranteed their respective shares of a hospital's prospective total budget to one-third of the hospitals in the State. Another one-third of the hospitals were reimbursed a prescribed percentage of charges, and the final one-third of the hospitals were not paid any differently by third-party payers than under normal circumstances. Nevertheless, all hospitals had to stay within the overall budget cap.

Tentative results indicate that all three payment methods worked well in terms of limiting cost increases. In general, the Commission and the hospitals believed that the percentage of approved charges system was

simpler to administer and more easily understood by the hospitals. For small rural hospitals, however, the total approved budget system was not sufficiently flexible since changes in case-mix and volume occur frequently in rural areas. Also, it appears that the hospitals requested more amended budgets under the total budget system than under a system which adjusts partially for volume.

A fixed budget system was found to be difficult to administer within a dynamic economic environment and a growing population, necessitating an active hearing and budget exceptions process.

4. Connecticut: The Connecticut system relies on a rate-setting commission which initially established a base for each hospital through a detailed budget review. Each year the Commission determines an overall test of reasonableness for increases in budgets based primarily on inflation factors, and hospitals submit detailed annual budgets. If a hospital's budget passes the overall test of reasonableness, it is automatically approved. If it fails, it is subjected to a detailed budget review.

Although Connecticut has experienced administrative difficulties, the stringent methodology that its system uses has been effective in holding down the increase in hospital costs. Nevertheless, the State has experienced constant legal action by hospitals, partially because legislative/regulatory authority was never fully developed for this detailed budget review system.

5. Rate to Rate Review - Massachusetts: HCFA's new demonstration project in Massachusetts establishes a hospital-specific rate of increase limit from the 1981 base year costs. In subsequent years, a rate to rate limit is set based upon a market basket inflation factor. Allowable costs will be reduced by two percent per year for the next three years in recognition of anticipated productivity gains. The year-end settlement process will apportion aggregate hospital financial requirements to payers based upon the respective payers' proportionate share of total patient care activity. The Maximum Allowable Cost (MAC) Exceptions Review Board, comprised of seven payers, providers and independent representatives, will review costs at the request of a given hospital. All payers, including Medicare, are participating in this system.

The Massachusetts program is expected to simplify the hospital budget process in the State by eliminating the fragmented reimbursement system, since payment for all payers is based on the Blue Cross system. Medicare's liability is limited to 1.5 percent below the national rate of increase in hospital costs. As with other such systems, the Massachusetts plan will pay different rates for every hospital in the State because the system is based on each hospital's cost structure.

6. Maryland: Maryland has a Health Services Review Commission which begins with a detailed budget analysis of each hospital, establishes a cost-base and trends each hospital's specific base forward using a market-basket approach. If a hospital accepts the announced rate of increase, the Commission will not review the hospital, but if the

hospital desires a higher increase, it can request a budget review. The system adjusts for volume, inflation and case mix, using the Diagnosis Related Groups system developed by Yale (see Chapter IV).

Initially, it took approximately three years to establish the hospital-by-hospital budgets. The Commission planned to recompute the base for each hospital every third year, because it soon became evident that re-basing each year was not feasible administratively.

Nevertheless, the Commission ultimately adopted a management by exceptions policy, trending all hospitals each subsequent year unless they specifically requested to be re-based, because hospitals preferred this approach.

Because of the rigor and completeness of the full budget review system, hospitals prefer not to be reviewed in depth, but rather to accept the inflation factor as their annual rate of increase. Hospitals appear to be better off financially than they were before the project. Maryland also found that the automatic rate increase system was not adequate for rural hospitals since it does not allow for growth or change in case mix. Those hospitals must use the full budget review in order to expand. Finally, since the original Maryland system was relatively neutral toward changes in volume, ancillary use was stimulated. To correct this, Maryland instituted a system that restricted the total payment per case and used a fixed variable cost ratio to control future volume increases.

C. Unit of Payment Systems

Unit of payment systems tend to be used by States when they lack the authority to control total hospital revenue or when the State desires to limit or set a reasonable level for a particular payer, such as for Medicaid or Blue Cross. The three units of payment systems that HCFA has tested are per day, per admission and per case.

1. Per Day - New York: New York State is the best example of a per day payment system. The system, which has been administered very stringently, is primarily a compilation of positive and negative incentives.

The New York method is complicated, relying on strict formulas which regulate the system closely. The average historical routine cost per day for each hospital is compared to the cost per day limit for similar hospitals. The hospital is given the lower amount as its base routine cost per day after adjusting for occupancy, length of stay and case mix. The average historical ancillary cost per admission for each hospital is compared to an ancillary cost per admission limit for similar hospitals after adjusting for case mix. The hospital is given the lower amount, which is converted to an amount per day. The hospitals' allowable routine and ancillary costs are combined to form a total inpatient cost, from which a flat rate per day is calculated. The hospitals' base is allowed to increase for both inflation (using a nationwide hospital figure market basket figure) and volume, but volume increases are discouraged by strict variable/fixed cost formulas.

Medicare will participate in the system beginning in 1983 and, under this new demonstration project, each hospital will have added to its per diem rate an allowance for one-half its bad debt and charity needs. New York also controls the rate of increase in charges to private pay patients.

The New York State system has had the best record for holding costs down even though the program did not cover all payers. However, the State did control over 50 percent of the hospital's total revenue which may account for its effectiveness. New York's system was tightly controlled because the State's costs had been among the highest in the nation. And due to the per-day orientation of its system, which has natural incentives to increase length of stay, it needs strong regulation to counter these incentives.

2. Per Admission Payment - Georgia: The Georgia Department of Medical Assistance has implemented a per admission limit/payment system. Grouped by case-mix and facility characteristics, each hospital has its own reimbursement target rate per admission based on its historical costs and its relative cost compared to the group average cost. The group rate is based on cost each year and brought forward. The hospital keeps the difference between its costs and the target. Total hospital payments are adjusted for case-mix changes.

A payment mechanism, which pays a set average amount per admission, provides hospitals with natural incentives to encourage inexpensive cases and to discourage expensive cases. Thus, Georgia instituted a retrospective case-mix adjuster in order to neutralize the above undesirable incentives.

3. Per Case Payment - New Jersey: New Jersey establishes prospective payment rates based on diagnosis related groups (DRGs). The system can be characterized by an attempt to develop a standard payment for each type of case for all payers across all hospitals in the State. Per case costs are classified into those that are fixed and those that are variable. Fixed costs are the institution's overhead that is not related to patient care, such as maintenance and capital costs. Variable costs are those related to inpatient care, such as nursing, drugs and ancillaries. Adjustments are made for local and regional wage variation.

Preliminary results indicate that the program has had a positive effect upon hospital resource management. Hospitals now have a financial incentive to control both routine and ancillary costs as well as a standard with which to compare itemized costs for similar cases at other institutions. Many hospitals have actively undertaken formal programs to identify and eliminate unnecessary costs in specific departments. To date, there is no real evidence that "DRG creep" exists; that is, gaming the system by coding cases into a higher cost category than is warranted. In 1982, the system was refined to correct some problems including the potential gaming problems.

On the whole, hospitals seem to believe that the system is equitable for large payers, because the more expensive cases are balanced by the inexpensive one. However, paying an average amount per case type has been a problem for private paying persons because individuals have felt that it is unfair for them to pay more when their actual charges are less than the DRG standard rate. Individual private paying persons have a problem that large insurers do not have, because one individual cannot average out the longer, more costly stays with the shorter less costly stays. New Jersey has addressed this concern by being more liberal in the definition of those private pay cases that fall outside the system.

Finally, preliminary data indicate that although the incentives would seem to foster an atypical increase in admissions, this has not been New Jersey's experience.* Nevertheless, due to the potential for increased volume in admissions, New Jersey has recently moved to institute a variable/fixed cost payment formula which is intended to neutralize such incentives. Thus, in New Jersey, if a hospital increases admissions beyond a fairly narrow range, it will only receive the additional (i.e., marginal) cost of providing that care, rather than the full cost which would include overhead as well.

D. Lessons Learned

There are a number of generalizations which one can make from the extensive experience of HCFA's prospective payment demonstration.

* Abt Associates, National Hospital Rate-Setting Study Briefing Materials, March 24, 1982, P. 11 (Unpublished) and October 13, 1982 Remarks to HCFA by Dr. Bruce Vladeck.

1. Prospectivity itself seems to be effective in holding down rates of increase of hospital costs (See Appendix A). Mandatory statewide systems are believed to have slowed increases in cost by 2 to 6 percentage points.
2. All systems require consideration of a hospital's case-mix. Some accomplish this by trending forward a hospital's own base, which implicitly recognizes the uniqueness of the hospital. Others group like hospitals for the purpose of setting rates. And, finally, one State, New Jersey, pays hospitals on a case basis, thus explicitly recognizing each hospital's unique case-mix.
3. When a system does not recognize case-mix adequately an active appeals process has been required.
4. Most budget control systems develop a "management by exceptions" process so that every hospital does not go through a complete budget review each year.
5. Small, rural hospitals require exceptions frequently unless case-mix is explicitly recognized in the payment process. This is because these hospitals tend to change their case-mix and/or volume rapidly with relatively small shifts in population.
6. In order to establish payment rates, most systems begin with a base year cost report that recognizes Medicare reimbursement principles.
7. Successful systems require a firm legal basis, strict enforcement and a lack of escape mechanisms (e.g., control of volume, gaming).
8. Individual hospital budget review systems are complex to administer and are generally not applicable to single payer systems.

9. All systems have inherent undesirable incentives which necessitate some counter measures to be built into the system. For example per diem systems encourage long length of stays and per admission unadjusted for case-mix systems encourage "skimming" inexpensive cases. However, no prospective payment system contains as many intractable undesirable incentives as does the present cost-based system.

These findings are encouraging. They support the contention that there are feasible alternatives to retrospective cost-based reimbursement that can contain increases in hospital expenditures, yet are acceptable and equitable to hospital, health professionals and patients. However, as noted in Chapter III, not all systems that HCFA has tested are applicable to a Medicare-only system, and other systems do not meet the criteria set forth by the Department for a prospective payment system.

III. THE MEDICARE PROSPECTIVE PAYMENT SYSTEM PROPOSAL

This chapter describes the Department's plan to change the basis on which Medicare payments to hospitals are made. Under this plan the current Medicare payment system, based on retrospective reimbursement of reasonable costs per case, would be replaced by prospective payment by case type. Prospective rates will be set in advance and fixed for the fiscal period in which they apply. The rates are intended as payment in full. Other than the statutory deductible and co-insurance provisions, there will be no beneficiary cost sharing. Hospitals will keep the difference between the payment rates and their costs of treating Medicare patients. Hospitals will be at risk when treatment costs are greater than payment rates.

This chapter is divided into five sections. The first sets forth the goals and objectives of the prospective payment system (PPS). In the second section, various prospective payment system approaches are discussed in the context of two fundamental design issues: the choice of payment unit and the price-setting mechanism. Next, an abstract of PPS is given, along with a brief description of the patient classification system (Diagnosis Related Groups--DRGs) and the way HCFA will use Medicare data to compute a payment for each DRG. This is followed by a discussion of particular aspects of the PPS design. The chapter concludes with a summary of PPS's major characteristics. (DRGs and the price computation method are examined in depth in Chapters IV, V, and VI).

A. Goals of Prospective Payment

Prospective payment systems are intended to create financial incentives that encourage hospitals to restrain the use of resources in providing inpatient care. Therefore, the most important criterion in evaluating design choices will be their effect on the system's efficiency incentives. In addition, the Secretary of Health and Human Services has established specific goals for Medicare payment system reform. These goals, which reflect sixteen years of experience with the present system and ten years of extensive experimentation with payment alternatives, were the tests against which the various alternatives were reviewed. The system must:

- o Be easy to understand and simple to administer.
- o Be capable of being implemented in the near future.
- o Ensure predictability of government outlays.
- o Help hospitals gain predictability of their Medicare revenues.
- o Establish the Federal government as a prudent buyer of services.
- o Assure that Medicare expenditures for inpatient hospital services are no greater than those that would be incurred if the present system of retrospective cost reimbursement with limitations were continued.
- o Provide incentives for hospital management flexibility, innovation, planning and control.
- o Reduce the cost reporting burden on hospitals.
- o Continue to assure beneficiary access to quality care.
- o Prohibit hospitals from charging beneficiaries anything for covered services other than statutorily defined coinsurance and deductibles as applied to covered services.

B. Description of Various Payment System Approaches

An early step in the Department's efforts to develop a legislative proposal was to identify the possible approaches for payment system reform. These approaches to payment reform were analyzed within the framework of two common characteristics of any payment system: unit of payment and price-setting mechanism. These two characteristics are described next.

1. Units of Payment

There are five possible units of payment:

- o per service (e.g. per x-ray, per laboratory test)
- o per diem (e.g. per day of care)
- o per capita (e.g. an amount paid to other insurers per beneficiary)
- o per discharge (e.g. a flat rate for each discharge)
- o per case (e.g. a flat rate for each type of discharge).

As a general rule, incentives for efficient resource use will be created for all resources used in producing outputs as defined by the payment unit. Once a unit of payment is selected, however, incentives to produce more of these units (however defined) will also generally exist. For instance, setting rates for individual services not only gives hospitals incentives to produce these services efficiently, but also creates incentives to provide more services for each day or for each case. A per diem payment unit will provide incentives to control the use of services per day, but not length of stay or the number of admissions. Similarly, pricing discharges or individual case types provides incentives to produce services efficiently, to combine the services efficiently and to control length of stay, but not to control admissions.

Capitation systems include the strongest incentives to minimize resource use. However, a capitation system was rejected because it cannot be implemented quickly on a national basis. In order for such a system to work, there must be an entity (e.g., a State, an HMO or insurance company) that is willing to accept the risk of paying hospitals for care provided to Medicare beneficiaries for a specified sum of money. Even assuming that such an entity could be found for all areas of the country, it would likely be several years before the system could be in place everywhere. In addition, there are serious operational obstacles to implementing such a system. For instance, adjusting an individual's capitation rate to reflect chronic illness and tracking beneficiaries from one locale to another are both difficult. We would like to note, however, that capitation approaches remain something we wish to continue to examine and we have active research and demonstration projects in this area. Presently, for example, the entire state of Arizona receives Medicaid funds on a capitation basis.

A single flat rate per discharge was given serious consideration. This is the unit now used in the new total cost limit system. It has the strong advantage of establishing the government as a prudent buyer of services. By bundling all services, including per diem routine and ancillary services, into one overall price, the Medicare program is purchasing a total product per discharge instead of a series of component parts. From the hospital's point of view, it has the advantage that the

government will no longer be in the business of paying based on appropriate lengths of stay or optional mixes of ancillary services provided.

A flat rate per discharge does, however, have one very serious drawback. It does not recognize the different types of cases treated by a given hospital. The need for specific recognition of a hospital's case mix is one of the very clear lessons we have learned over the years from our experiments with alternative payment systems. If case mix is ignored, as it is in a simple flat rate per discharge system, a hospital receives the same amount of money whether it treats a heart attack victim or an influenza patient. Thus, under a flat rate per discharge a hospital would have a powerful incentive to treat less ill patients over time. Even if the system were designed in such a manner as to recognize the past case-mix experience of a hospital (as in the TEFRA total cost limit system), it is unlikely that a hospital's case mix will remain static into the future, making it increasingly more complicated to administer over time. This has serious, and clearly undesirable, implications for beneficiary access. Alternatively, a retrospective adjustment for case mix could be made; but retrospective adjustments are what we are trying to avoid, as the principles of simplicity and predictability would then be severely compromised.

Consequently, the case was identified as the best unit of payment for the prospective payment system. In this context "case" is really just another term for type of discharge. This payment unit has all of the

strengths of a flat rate per discharge and none of its weaknesses. It explicitly recognizes a hospital's case mix because the amount of payment will vary depending on the type of case that was discharged. (A more detailed discussion of type of discharge classification used is found in Section IV.)

2. Price-Setting Mechanisms

There are five types of price-setting mechanisms:

- o Cost finding: Individual review of the hospital's costs.
- o Usual, Customary and Reasonable payment limiting screens:
Payment limits for individual services.
- o Negotiation: Bargaining with hospital officials.
- o Competitive bidding: Sealed bids to provide specific outputs.
- o Formula: A base year cost per case figure is adjusted by a price index to the (future) year in which it will apply.

Cost-finding is the tool now used under the current retrospective system. It is also the method used by a number of States in their prospective budget reviews of individual hospitals. As our experience since 1966 has indicated, detailed hospital budget review is highly impractical for a national program with nearly seven thousand participating hospitals. Budget review is neither simple nor quickly implemented. It is also highly intrusive into the internal management of hospitals, a major flaw of the current system.

The Usual Customary and Reasonable Screens are now used to pay physicians under Part B of Medicare. They are neither simple to administer nor easy

to understand. Also, this is a charge-based system. Since Medicare has always paid hospitals on the basis of costs, it is compelling that data based on costs be used in developing a prospective system.

Negotiated rates have many of the same problems as budget review systems. Both can be highly intrusive into the internal management of hospitals. Both systems require a great deal of personnel resources to negotiate rates of review budgets. They are impractical for a national program because each hospital could receive a different rate based in part on the skill of its negotiator.

Competitive bidding is not an approach that can be implemented quickly nor does it ensure predictability of Federal expenditures. However, this price-setting mechanism also remains a long-range possibility.

Consequently, we have settled on a formula-type approach as the best price-setting mechanism. By a formula, we refer to two things: establishing base year costs for all hospitals and then adjusting that base in future years through the use of price indexes.

C. The Prospective Payment System Plan (PPS)

HCFA will establish payment for inpatient care to hospitals which participate in the Medicare program at a predetermined rate for each type of Medicare discharge in accordance with a Federal payment schedule for standard types of patient cases. These rates will be payment in full to the hospital with no beneficiary cost-sharing except for statutory

deductibles and coinsurance. Hospitals may keep any surplus earnings which result from a difference between their costs and the prospective payment rates. Likewise, they must absorb any losses.

Payment amounts, exceptions, adjustments, and rules to implement the prospective payment system would not be subject to any form of judicial review. Retroactive adjustment of the payment rates, as might result from judicial review, is inimical to the basic purpose of a prospective system. Moreover, the delays inherent in the judicial process, when coupled with the likelihood of annual revisions in the rates of payment, could lead to chaotic results, in which rates for a previous period may be overturned by a court, or remanded to the Department for further consideration, even though different rates had superseded the contested rates. The prospect of continuous litigation and re-opened administrative proceedings related to supposedly prospective rates for past periods can be prevented by a complete preclusion of judicial review. The omission of judicial review follows the current statutory provisions related to determinations under Medicare Part B, where judicial review is also prohibited. As with any service sold to the Government, the remedy for providers dissatisfied with the rate offered is to convince the purchasing agency that a higher rate is appropriate or, failing that, to refrain from offering services to the Government.

The prospective payment rates will be based initially on a national representative Medicare cost per discharge for each Medicare patient Diagnosis Related Group (DRG). These per case rates will be adjusted for

local variations in labor-related costs. Capital costs and medical education costs will also be excluded from the initial rate calculations and reimbursed separately on a reasonable cost basis. Outpatient department costs will be calculated separately from these rates. PPS includes a number of features which will smooth implementation, simplify administration and provide for responding to further developments in medical technology and treatment. In future years, the prospective Medicare rates will be updated by the Secretary, who will take into account such factors as inflation of hospital input costs (the hospital marketbasket index), improved industry productivity, and technology.

The remainder of this section surveys the patient classification system upon which the prospective payment rates are based, the method for computing the rates, and particular aspects of the PPS design.

1. The Diagnosis Related Groups (DRG) Patient Classification System

Discharges will be classified by use of the 1981 version of the Diagnosis Related Group (DRG) classification methodology developed at Yale University. This type of classification system methodology has been extensively tested through actual use over the last 7 years. In addition, New Jersey used the original DRG classification system as the basis for hospital payment for several years, and now uses the 1981 version of DRGs.

The original DRG patient classification system was developed at Yale University in the early 1970s. It groups patients into 383 categories (old DRGs) based on information from the discharge abstract such as principal diagnosis, secondary diagnoses, age, and surgical procedures.

This system has been superseded by an entirely new set of DRG definitions, designed for use with diagnosis and procedure information coded in the ICD-9-CM coding system (International Classification of Diseases, Ninth Revision-Clinical Modification). A version of this system was also developed to be compatible with the Medicare statistical system's 20 percent sample of hospital bills. In the new DRG system, patients are grouped into 467 categories derived from a multi-stage process applied in conjunction with a nationally representative sample of 1.4 million patient discharge records. First, a panel of physicians allocated all ICD-9 diagnosis codes to 23 major diagnostic categories (MDCs), based on the body system affected. In successive stages, the panel subdivided the cases within each MDC according to the specific principal diagnosis, type of surgery, presence of specific complicating or co-morbid conditions, and patient age. The panel did not adopt potential distinctions based on these characteristics at any stage unless the national data base showed that they were important in explaining resource use and the panel determined that the distinction was clinically sensible. Thus, the new DRGs have the following advantages. The category definitions cover virtually the entire patient population. They have been extensively reviewed by physicians throughout their development. They conform to the actual delivery of inpatient care in the hospital. They group those inpatient cases together which are generally quite similar in use of resources. Finally, inpatient records may be easily classified by an efficient computer program using widely available discharge abstract data.

2. Rate Computation Method

Hospitals will be paid a predetermined rate for each type of discharge in accordance with a Federal payment schedule for each DRG. The payment schedule would be calculated initially by using nationally collected data from a 20 percent sample of patient bills (called the MEDPAR file), Medicare hospital cost reports, and a wage index based upon hospital wage information collected by the Bureau of Labor Statistics (BLS) of the Department of Labor.

The MEDPAR data file contains charges, diagnosis and procedure codes, the patient's age, etc. This data file is used to create a DRG price index (a set of weights) that describe in relative terms the expected costliness of treating different types of Medicare cases compared to the average cost per Medicare case. For example, the relative DRG price for craniotomy cases (DRG 1) is 3.5, indicating that cases of this type are expected to be 3.5 times as expensive as the average Medicare case.

As is true for any sample data file, data from the MEDPAR file contain errors. The sources and consequences of these errors are discussed in detail in Chapter VI. Here we note only that the errors, while a concern, are not so serious as to make these data unsuitable for our purposes. MEDPAR data are only used to create the DRG price index. This minimizes the effect of these errors on the final price because data more reflective of actual costs and Medicare cost reports are used to set the actual price level.

The Medicare cost reports, the wage index from BLS, and the Medicare case mix index (see Appendix B) are used to create a national representative cost per discharge--that is the average cost per case--as if each hospital treated the average mix of patients, paid the national average wage rate, and had no teaching program. The national representative cost per discharge is one number that sets the overall DRG price level. The actual level of the prices initially will be determined by the constraint that the prospective payment system not increase Medicare outlays over the amount that would be spent were the present TEFRA system of limits continued. When the relative DRG price index is multiplied by the national representative cost per discharge, a set of national standard DRG prices is obtained. For example, if the national representative cost per discharge were \$3,000, then the price for DRG 1 (craniotomy) would be ($\$3,000 \times 3.5 = \$10,500$). In this way 467 different prices, one for each DRG, will be created.

This schedule of national standard DRG prices is then adjusted for area wage differences by the BLS wage index for about 300 areas. This creates hospital area price schedules. The wage adjustment thus provides a separate payment schedule for each separate area of the nation (each SMSA, each non-SMSA area of each state). Therefore, in a particular Standard Metropolitan Statistical Area (SMSA), payment will be the same for the same type of case, independent of the hospital in which the service was provided.

Thus, from a hospital's perspective, its Medicare revenue can be estimated in advance. Hospital per case revenues from Medicare are

obtained directly from the hospital area DRG-specific prices. When the total case revenues are added to capital and direct educational pass throughs and the lump-sum indirect teaching costs add-on (described below), total Medicare hospital revenues are obtained for an individual hospital.

Likewise, Medicare can better estimate its total expected outlays in advance. National standard DRG prices and pass throughs can be combined with estimates of total Medicare discharges to produce estimates of total Medicare hospital revenues. Thus, the outcome of PPS for an individual hospital or a group of hospitals is predictable both for the hospitals and Medicare actuaries.

D. Design Features

The remaining system design features are discussed under the general headings of "Exclusions from the Prospective Rate," "Inclusions," and "Operations."

1. Exclusions from the Prospective Rate

Capital: Capital expenses are interest, rent and depreciation. These expenses are not directly related to patient care costs. For example, interest expenses are determined, not only by the dollar amount of a loan, but by how recently the loan terms were negotiated. This is important because interest rates are highly variable. In a similar vein, the variation in building and equipment prices means that depreciation expenses will vary with the age of a hospital's buildings and equipment. No State with a prospective payment system has been able to establish

controls on hospital capital costs that are entirely independent of a hospital's individual capital situation. They have tended to treat capital separately. The trade-offs between inclusion or exclusion of capital from the prospective rate methodology are difficult to measure, but it appears problematic to include payment for these expense categories directly in the DRG price. Therefore, at least in the near term, capital expenses will be passed through and Medicare's share will be reimbursed in full at the level of incurred costs.

Medical Education - Direct and Indirect Costs: Teaching hospitals incur costs which are directly related to conducting graduate medical education programs, such as the salaries of interns and residents. Such costs are currently identified in Medicare hospital cost reports. Although graduate medical education is not directly related to delivery of patient care to Medicare beneficiaries these costs have always been paid by the Medicare program. This is not required by law although the legislative history of Medicare indicates congressional intent that medical education costs be reimbursed by Medicare until the community undertakes to bear these costs in some other way. The old Section 223 limits and the new TEFRA Section 101 limits do not apply to the direct costs of approved medical education programs. Direct medical education costs (salaries of interns and residents, blackboards, classrooms, etc.) will be passed through by PPS.

The Department believes that the direct costs of approved medical education programs should be excluded from the rate and be reimbursed as per the present system. This approach will assure that the base rate is

related to a patient care outcome and not significantly influenced by factors whose existence is really based on objectives quite apart from the care of particular patients in a particular hospital. This approach will allow for continued Federal support of medical education through the Medicare program while clearly identifying that support as separate from patient care.

The indirect costs of graduate medical education are higher patient care costs incurred by hospitals with medical education programs. Although it is not known precisely what part of these higher costs are due to teaching (more tests, more procedures, etc.), and what part is due to other factors (the particular types of patients which a teaching hospital may attract), the Medicare cost reports clearly demonstrate that costs per case are higher in teaching hospitals.

It is also clear that the mere presence of interns and residents in an institution puts extra demands on other staff and leads to the existence of higher staffing levels. The process of graduate medical education results in very intensive treatment regimens. Again, the relative importance of the various reasons for the higher costs observed in teaching hospitals is difficult to identify precisely. However, there is no question that hospitals with teaching programs have higher patient care costs than hospitals without.

Thus, not wanting to penalize these hospitals, an adjustment methodology has been developed which permits Medicare to pay teaching hospitals the same standard prices as other hospitals, while passing through the higher patient care costs associated with teaching hospitals.

The Department believes that recognition of these indirect costs should be accomplished through a lump-sum payment, separate and distinct from the base rate. This adjustment will be computed using methods that are similar to the methods currently used to adjust the old routine and new total cost limits for the indirect costs of graduate medical education. The hospital's cash flow will be preserved by some sort of periodic payment.

Outpatient Care: The future relationship of inpatient to outpatient costs is also important. Since outpatient care will continue to be reimbursed on an incurred cost basis, some shifting of inpatient service costs to the outpatient setting is a clear possibility. HCFA must assure that duplicate payments are not made. In the longer run, HCFA will develop a method to pay outpatient care on a prospective basis as well.

Part B Services: Some kinds of inpatient hospital ancillary services and costs present a different problem. Since Medicare law has traditionally permitted separate supplier and hospital reimbursement, some non-physician services that are usually thought to be hospital items or services (radiology, laboratory, physical therapy, prosthetics, braces, etc.) could be contracted or arranged and separately billed as "medical and other supplies" under Part B by outside firms. Since separate billing is permitted, hospitals have an incentive to contract out for such services in order to reduce their cost of inpatient care. The present TEFRA cost limits expressly provide for adjustments to take into account a decrease in inpatient services that a hospital and similar

hospitals customarily furnish. This potentially serious problem will be carefully monitored. The Department intends that the DRG rate will be all-inclusive, and that Medicare will not pay for the same service twice.

Special Classes of Hospitals: A major consideration is whether the overall DRG prospective payment system will be more supportable if it applies to special classes of hospitals (psychiatric, long term care, and pediatric) or if it excludes them. Excluding these hospitals may establish a precedent for special treatment of other classes of hospitals based on their "unique" types of outputs. Including these hospitals will result in criticism that since the DRGs were developed for short-term general hospitals, their application to these hospitals would be inaccurate and unfair. Even if we could develop a DRG adjustment, for example, using differences in average length of stay between psychiatric hospitals and psychiatric units of short-term hospitals, it would result in special rates for the psychiatric hospitals which would have an effect similar to excluding them.

The Department's bill would exclude psychiatric hospitals from the initial DRG rates and to continue to pay for such care under the current system. We intend to begin research to develop DRGs based on treatment in psychiatric hospitals that could be used to bring these facilities into a prospective payment system in the future.

For similar reasons, the Department's bill also excludes long term care hospitals and pediatric hospitals from the system. Long term care

hospitals are currently defined in regulations as those with an average length of stay in excess of 25 days. Pediatric hospitals are defined under the Section 223 cost limits program as those hospitals which predominately treat patients under the age of 18. As in the case of psychiatric hospitals, the 467 DRGs were not designed to account for these types of treatment and new DRGs would have to be developed before they can be brought into the system.

Atypical Cases: Atypical cases or "outliers" are cases which, although classifiable into a specific DRG, have an extremely short or extremely long length of stay relative to most cases in the same DRG.

The Medicare program data indicate that each DRG contains a few atypical cases. Atypical cases occur for a variety of reasons. Although the reasons themselves are not important for payment purposes the cost consequences of these unusual cases is very important. If the payment system ignored the possibility that a particular case could be unusually expensive to treat, one of two consequences would occur.

First, if hospitals could not identify potential "outlier" cases on admission, they would have to absorb a large loss for treating a particular case. Cases of this kind could threaten the financial

viability of small hospitals. Large hospitals with relatively few Medicare admissions might be unwilling to accept the risk that aberrant cases would be admitted. Hospitals can respond to this risk in two ways other than simply accepting the loss. They could purchase re-insurance against this risk, or they could drop out of the Medicare program altogether.

Alternatively, hospitals might be able to identify (at least some) aberrant cases before admission. If no special payment provisions for atypical cases were available, hospitals would have incentives to refuse to admit these patients. Also, beneficiaries may feel that their Medicare coverage has been reduced. Thus, not having a special outlier policy could affect beneficiary access to care.

The medical profession may complain that unalterable limits will unduly discourage the practice of "heroic" medicine. Consequently, HCFA's greater concern will be with the definition of the high side outlier cutoff point.

Since the Department does not wish to reduce beneficiary access to care or to encourage hospitals to withdraw from the program, the Department's plan includes a policy for outliers which provides equity to providers and to beneficiaries, but does not undermine the integrity of the prospective payment system. First of all, it will pay the full DRG rate for all cases including unusually inexpensive cases, which will allow the

policy on unusually expensive cases to be as restrictive as possible. For unusually expensive cases, the full DRG rate will be paid plus an additional payment will be made for the added services provided.

The number of extremely long stay cases which receive additional payments should be minimal (e.g., only approximately 1/2 of 1 percent of cases will receive additional payments). The actual percentage to be identified as outliers will be determined after careful review of the available data.

Payments for the outliers which are identified will be made in a manner which is designed to cover the additional cost of providing care without encouraging prolonged inpatient stays. In order to avoid creating a reporting burden on hospitals, this payment might be a percentage of charges for each day beyond the outlier cutoff point. The actual percentage will be established after a careful review of available data.

Finally, the calculation of the rates for outliers will be balanced with the DRG rates in such a way as to be budget neutral. That is, neither the payment method for outliers, nor the particular definition of the outlier cutoff points will have any effect on the overall budget.

Severity of Illness and System Design

The atypical case (outlier) payment provision protects hospitals from the adverse financial consequences of treating a small number of unusually high cost cases. A related issue concerns the extent to which the design features of PPS protect hospitals from the consequences of treating a disproportionate concentration of patients with above average severity of illness.

In any hospital, some patients in some DRGs may be more severely ill than other patients in the same DRGs. However, the degree of severity of illness is not uniformly associated with treatment cost per case. For example, a severe cataract is apt to be no more costly to treat than a simple one. Costs of treating terminal cancer cases may be lower than costs of treating earlier stage cases. Moreover, in DRGs where severity of illness is strongly associated with treatment cost, most hospitals will have patients that exhibit a range of severity levels. Thus, it is unlikely on balance that differences in the average level of severity across all DRGs for Medicare patients will cause any significant financial advantage or disadvantage to most general hospitals.

In a prospective payment system, hospitals are protected from undue financial risk by the process of averaging -- the law of large numbers. In addition, PPS includes two features that augment this protection: the separate payment for atypically high cost patients and the adjustment for the indirect costs of graduate medical education programs. Since the

adequacy of this protection is critical to the equity of the PPS proposal, a discussion of the ways that PPS protects hospitals from the consequences of cost variations within a DRG is worthwhile. The protection afforded by the law of large numbers requires (1) that the hospital have a sufficient volume of Medicare cases for the process of averaging to work, and (2) that relatively high and low cost cases are distributed across hospitals at random. These requirements are discussed in turn.

First, research at HCFA indicates that approximately fifty Medicare cases are needed in order for the averaging process to work reasonably well. However, a few unusually high cost cases could place a substantial financial burden on a small hospital. Protecting such hospitals is the purpose of the special payment provision (described above) for atypically high cost Medicare cases.

Second, some hospitals might admit a disproportionate concentration of more severely ill patients. This could occur (1) if patients in the immediate vicinity of the hospital (its service area) tend to be more expensive to treat for the same conditions than patients in other areas or (2) if the hospital attracted more severely ill patients from other areas. Some contend that the first case may be illustrated by a public general hospital in a low-income urban area; the second by a large medical center that attracts patients to its highly specialized services and treatment programs.

The extent to which this phenomenon occurs may be settled empirically. If, after adjusting for case mix and other factors that affect costs, average costs per case for these hospitals were greater than the average cost of otherwise similar hospitals, this would indicate that some reason (perhaps more seriously ill patients) for higher costs was omitted from the adjustments. Preliminary evidence from the Medicare statistical system, however, indicates that once case mix and other factors (e.g. wage levels, teaching activity, bed-size, location) thought to affect costs are taken into account, urban public hospitals are no more expensive than other hospitals.

In contrast, teaching hospitals do have higher costs per case. There are two reasons for these higher costs. First, they may attract and treat more seriously ill patients. Second, interns and residents order large numbers of tests and procedures. The adjustment for the indirect costs of graduate medical education includes the higher costs attributed to both sources, since the high costs due to more tests and procedures cannot be separated from high costs due to severity of illness.

Therefore, to the extent that severity of illness is associated with teaching intensity, teaching hospitals are protected from the financial consequences of variation in illness severity within DRGs.

Finally, both public and teaching hospitals are offered protection from the financial consequences of highly atypical cases by higher payments for outlier cases.

2. Inclusions

Health Maintenance Organizations (HMOs): Health maintenance organizations provide hospital and other services to approximately 10 percent of the population including nearly 3 percent of the Medicare population on a pre-paid capitated basis. Therefore, HMOs have a strong interest in keeping people well and out of the hospital.

Section 114 of TEFRA allows payment to be made on behalf of Medicare beneficiaries on a per capita basis for those HMOs under a risk sharing contract. The statute requires the per capita rate to be 95 percent of the expected cost in the current fee for services system, and many believe that the majority of HMOs will enter such agreements. PPS will not change this arrangement for HMOs which choose risk sharing contracts. However, the statute also allows HMOs to be paid on a reasonable cost basis. In PPS, the Department believes that these HMOs should be paid the same prospective rate as would be paid to other hospitals. Thus, the non-risk sharing HMO would be paid what otherwise would have been paid to any hospital.

Sole Community Providers: There are currently about 250 hospitals classified as sole community providers. They are generally less than 50 beds and located in rural areas in the Western States. The designation of sole community status is made by the HCFA regional office on the basis of the hospital's request and a recommendation by the local fiscal intermediary. The factors that are considered in making the judgement are: location in a rural area; existence and utilization of other

hospitals by beneficiary residence, including the admitting practices of area physicians; and the availability of transportation and local commuting patterns.

The Department intends to include these hospitals in PPS. However, these hospitals may have special costs - in particular, stand-by costs for emergency equipment. Since there is no intention of driving sole community providers out of business, the Secretary will need the authority to make appropriate exceptions and adjustments to the DRG rates for these hospitals.

3. Operations:

Administrative Procedure: Under the Department's proposal, the Secretary would by September 1 of each year (after following applicable rulemaking procedures) publish a final notice in the Federal Register establishing the payment amounts for the subsequent fiscal year. For the first year of operation, the bill allows a special procedure by which the Department may issue payment amounts by September 1, 1983, without prior opportunity for comment, and then may modify the payment amounts on the basis of comments received. Any modification resulting in a reduction of payments would be effective prospectively.

Recalibration of the DRG Prices: The prospective payment system proposal requires the Secretary to make decisions regarding the timing and specific content of changes to the DRG payment rates. The DRG payment rates reflect the level of the National Standard Cost per Case, and the relative structure of cost per case across DRGs as represented by the DRG Relative Price Index. Thus, the Department will have to deal with two

types of recalibration: changes in the level of DRG prices and changes in the structure of relative prices across DRGs. Changes in DRG prices may be needed perhaps as often as annually to respond to changes in hospital market basket inflation rates. Recalibration of the DRG Relative Price Index also may be needed at various times to account for such matters as significant changes in specific diagnostic or treatment technologies, changes in the proportion of costs attributable to wages, significant improvements in the accuracy and completeness of the clinical data on the HCFA bills, or major changes in clinical coding systems (the anticipated 10th revision of the International Classification of Diseases, ICD-10) or in DRG definitions.

There are two basic choices for an effective date of implementation of a prospective payment system as it applies to any individual hospital. The first option is for all hospitals to begin on the same date (e.g. October 1, 1983). The second option is to phase in the system as hospitals begin their own particular cost reporting period, on or after the effective date of the system.

The same date approach allows immediate implementation of the prospective payment system for all participating providers. This is the clearest in a theoretical sense (since it eliminates the need to maintain separate and overlapping reimbursement systems for inpatient hospital services). However, to require hospitals to file a cost report through the end of September 1983, regardless of when their actual fiscal year ends, is a

significant additional reporting burden for hospitals. In addition, we estimate that intermediary funding for settling/auditing cost reports would need to be increased by \$9 million because of the large number of additional cost reports filed.

The alternative is to phase in prospective payment system by cost reporting period beginning on or after the effective date. Providers would be required to use the cost reporting periods they currently use. This approach does not require additional intermediary costs and is consistent with the congressionally selected method for implementing section 101 of TEFRA. It also allows for better workload management for intermediaries in the cost report settlement process since the work can be done on a flow basis.

After consideration of both alternatives, the Department has decided that the prospective payment system will be phased in by hospitals' own cost reporting periods. This option is less disruptive to the industry and does not increase reporting burden or intermediary costs and is administratively more simple.

The Department proposes to make the prospective rates fully effective promptly after enactment. All hospitals would begin immediately to be reimbursed under the prospective system during the hospital's first fiscal year after September 1980. Since the prospective rates are fully effective at the earliest possible date, incentives for cost effective hospital behavior begin sooner. In addition, this is the simplest and

least costly approach for fiscal intermediaries. In future periods, rates would be established by administrative procedures including Federal Register publication for public comment.

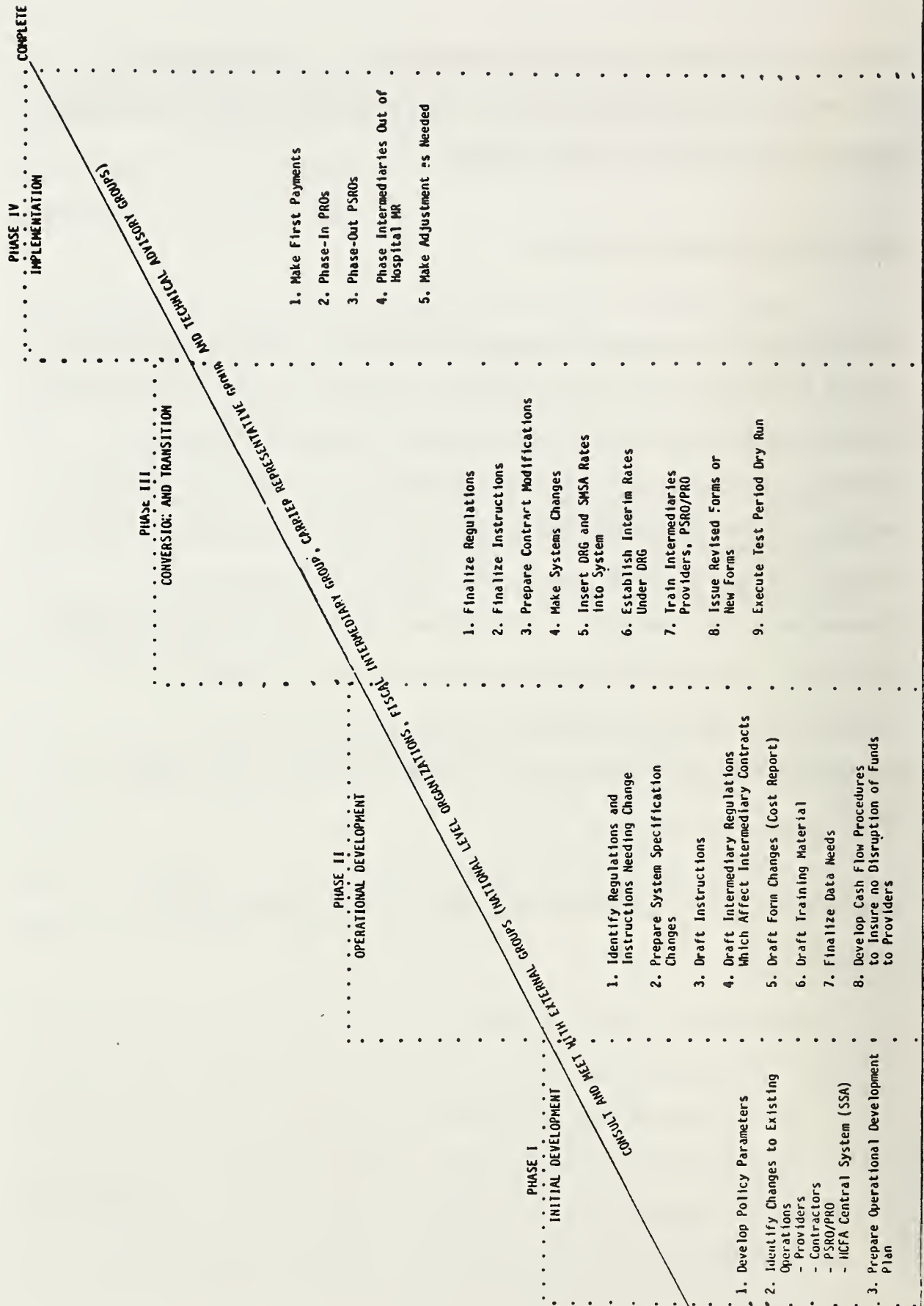
Operational Implementation Plan:

Implementation of a prospective payment system will require that certain changes be effected to current operating procedures, and that new program safeguard strategies be fully developed and in place between the enactment and effective dates of the legislation. Necessary activities include revision of current regulations and instructions, modification of current billing and claims processing systems, training of fiscal intermediaries and providers, and amendments to Peer Review Organization contracts. Throughout this period, HCFA will meet and consult with intermediaries, providers and beneficiary groups to obtain recommendations and suggestions for a smooth transition to prospective payment.

Chart 1 outlines the activities necessary to an October 1, 1983 implementation.

Chart 1

OPERATIONAL IMPLEMENTATION PLAN SUMMARY



E. Summary - The Medicare Prospective Payment System

The Medicare Prospective Payment system was designed to best meet the objectives listed above. The important features of this proposal are:

- o The unit of payment will be the case (discharge).
- o Patients will be classified using the diagnostic related group (DRG) classification system (see Chapter IV).
- o Hospitals will be paid a predetermined rate for each case within a given DRG (see Chapter V).
- o DRG prices will be payment in full and are not negotiable.
- o The DRG prices will be based on a national base year cost per case, trended forward by a hospital marketbasket price index.
- o DRG payment rates will be based on information currently available to HCFA, specifically a 20 percent sample of patient bills and cost reports from each hospital.
- o Rates determined for each DRG will be adjusted to account for variation in local wage levels. All hospitals in a given wage level area will be confronted with identical payments for each case within a DRG. These payment rates include operating costs.
- o Direct capital costs (depreciation and interest on capital debt) will be initially passed through and reimbursed on a reasonable cost basis. In the future a factor for capital will be included in the rate.
- o Direct medical education costs will similarly be passed through.
- o Indirect medical education costs will be estimated and paid on a "lump sum" basis. The hospitals' cash flow will be preserved by some form of periodic payment.

- o Outpatient care will be reimbursed on a reasonable cost basis until methods are developed to pay for this prospectively.
- o Psychiatric, long term care, tuberculosis and pediatric hospitals will be excluded from PPS.
- o Short-stay cases will be reimbursed at the DRG price.
- o For less than one percent of all cases to be identified as atypical long stays, additional payment will be provided.
- o Rural hospital providers and Health Maintenance Organizations will be included in PPS.
- o DRG prices will be updated annually by the Secretary to account for such factors as inflation, improved industry productivity and changes in technology.
- o Relative DRG payment rates will be reviewed by the Secretary to account for changes in medical technology that affect selected DRGs or necessitate the development of a new DRG (e.g., an expensive new transplant procedure).
- o Hospitals will be phased in by their own fiscal years wherein prospective rates will be effective immediately.
- o Efficient hospitals that incur costs less than the payment rate will be allowed to keep the savings. This provides incentives for efficiency currently lacking in retrospective cost-based reimbursement.
- o Beneficiary cost sharing will be limited to current deductible and copayment provisions.

We believe this system offers the following significant advantages:

- o The Medicare program, on behalf of its beneficiaries, adopts an active role in determining payment it will make for services. It will establish the Federal government as a prudent buyer of services.
- o Payment based upon the type of discharge will identify, more accurately than the present system, the product being purchased on behalf of its beneficiaries. We believe this approach over time will have desirable effects regarding hospital decisions on which services they provide. In addition, this approach will facilitate future changes by other payers as well to make health care delivery more competitive. Also, the clear identification of a price for a service in an area will enable other payers, including industrial and business coalitions, to evaluate the price they are paying for like services.
- o The financial consequences of major technological or treatment breakthroughs can better be evaluated in the context of fixed rates. Cost-increasing new technology will need to be proven to be cost effective in order to justify an increase in the price of the affected DRG categories.

- o Identification of the service in terms of diagnosis is more compatible with long term objectives of phasing in the outpatient setting. In the future it might be possible to pay a price for medical services regardless of the setting in which that service is delivered.
- o A strong link between payment and diagnosis, along with the ability for hospitals to retain any amounts below the prospective rate, will invite more active medical participation in the financial and operating routines of hospitals.
- o Providers will be able to identify, in terms of revenue to the institution, what services they deliver well and what services they do not provide efficiently.

IV. THE DEVELOPMENT OF DIAGNOSIS RELATED GROUPS (DRGs)

A. Overview

This chapter discusses the rationale for DRGs and outlines their development over the past decade. The presentation builds from Chapter III in that it is assumed that the unit of payment for Prospective Payment System (PPS) is the type of case. From this perspective, a patient classification system is required in order to distinguish different types of cases or products of inpatient care. This chapter begins with a discussion of the rationale, development and criticisms of the "Old DRGs" (Fetter, et al., 1980). This is followed by a discussion of the rationale for the development of the "New DRGs" (Fetter, et al., 1982) and the methods used to address the major criticisms of the "Old DRGs."

B. Old DRGs

1. Objectives. The search for measures of a hospital's output is not new with PPS. What is new is that a relatively satisfactory measure has been developed in the form of the DRG. The purpose of DRGs is to classify patients into groups (case types) that are clinically coherent and homogeneous with respect to resource use. Such a classification allows for equitable payment across hospitals in that comparable services can be reimbursed identically. Additionally, administrators can use such a patient classification scheme to link problems to their source (respective department or cost center within a hospital).

The DRGs were first designed by Yale University's Center for Health Studies in the late 1960s. DRGs were originally developed to create an effective framework to monitor the quality of care and perform the utilization review in the hospital. In 1975, the Health Care Financing Administration (HCFA) began working with Yale to develop, and then later to improve, a hospital inpatient payment system based on DRGs. From the beginning it was agreed that DRGs should be:

- o medically interpretable;
- o defined on variables that are commonly available from hospital patient abstracts;
- o limited to a manageable number; and
- o defined to distinguish patients who require different types and quantities of hospital resources.

2. The Data Base and Key Assumption.

A data base was constructed which had 500,000 records from 118 New Jersey hospitals, 150,000 records from a Connecticut hospital, and 52,000 records from 50 hospitals in a PSRO region. The data were adjusted for analysis in that records for patients who died were removed as were cases with invalid diagnosis and surgical procedure codes and outliers. International Classification of Diseases, Adapted, Eighth Revision (ICDA-8) diagnostic information was used as primary input data. As this information represents about 10,000 codes, it could not be used directly in PPS payment.

Length of stay (LOS) was selected as the proxy for resource use (cost) in part because the system was initially designed for PSRO reviews and in part because LOS had previously been closely linked to cost in hospital settings.

3. Developing DRGs.

In constructing DRGs, the ICDA-8 codes were grouped into Major Diagnostic Categories (MDCs). Eighty-three MDCs were designed to facilitate analyses over the wide range of disease conditions and to assure eventual clinical similarity within DRGs. MDCs were clinically determined in order to provide:

- o consistency in anatomic classification, or in the manner in which patients are clinically managed;
- o a sufficient number of patients within each MDC, and
- o coverage over the complete range of codes (patients) without overlap.

DRGs are subsets of MDCs. They were developed through a blending of statistical analysis and clinical judgment which was intended to produce medically meaningful case types that contain patients with similar costs. DRGs were meant to be descriptive of the patient, his disease conditions, and his treatment process.

The statistical analysis of cases (patients) within each MDC was intended to help identify patient, illness and treatment characteristics that explain variations in LOS across cases.

Diagnoses and surgical procedures, age, sex and clinical service information were used to analyze LOS. The statistical procedure used indicates which variable represents the most important cause of variation in LOS and which group within given variables are the most important. For example, for the age variable, the subgroups 0-69 and 70+ turned out to be the best explanatory groups for many MDCs.

Clinicians reviewed the subgroups suggested by the statistical analysis in order to make patient categories more clinically coherent. The clinicians could accept, reject or modify the ordering of these variables (which variable is most important, second most important, etc.) suggested by the statistical analysis if they felt that a different order had more clinical significance. Once a variable was determined to be important in explaining variations of LOS, clinicians could also modify the number of subgroups within the variable. Clinicians could also modify which particular diagnoses or procedures were in a group. These clinical adjustments gave clinicians a great deal of flexibility in the determination of which patients (cases) should be placed in specific DRGs.

The number of DRGs per MDC was dependent on the number of cases within a given MDC, and the degree to which variables tested explained variation in LOS. The eventual number of DRGs had to be sufficiently small so that there would be enough cases for reliable analysis. Eventually, 383 DRGs were developed from the 83 MDCs. These DRGs were based on primary diagnosis, secondary diagnosis, primary surgical procedure, secondary surgical procedure, age, and in several cases, clinical service area. An explanatory variable was used within an MDC in two circumstances: 1) when a significant relationship could be found between that variable and LOS, and 2) when the clinicians determined that there was a clinical basis for doing so. Accordingly, some MDCs have only one DRG (e.g., hemorrhoids) while other MDCs have numerous DRGs (e.g., fractures have 13 DRGs).

The research team felt that they had met their objectives in that DRGs were based on existing data, limited in number (383), clinically interpretable, and contained cases that were similar in terms of resource use as measured by LOS. The 383 DRGs were the basis for the beginning of the New Jersey hospital payment demonstration in late 1976.

4. Criticisms of Old DRGs. After DRGs were used for some time, critics argued that old DRGs were:

- o Regionally biased in development -- They were developed with regional data (New Jersey), and therefore reflective of regional practice patterns.
- o Not replicable -- Different data bases and/or different development teams might produce different patient classifications.
- o Not clinically coherent -- Too much reliance was placed on statistical analysis. Resulting DRGs were seen as difficult to use by doctors and hospital administrators.
- o Not homogeneous in resource use -- DRGs were based on LOS rather than on direct measures of cost. LOS was questioned as a good proxy for resource use. In addition, DRGs still had wide variability of LOS within individual DRG categories.
- o Easily gamed -- Because the presence of any secondary diagnosis placed patients in a higher cost DRG, patient assignments to the DRGs could be easily manipulated. Similarly, assignment of patients to DRGs was affected by the order in which surgical procedures were listed. Old DRGs used the first procedure listed which was not necessarily the most important one from a resource use perspective.
- o Contained too many "other" groups -- Each of the 83 MDCs had an "other" group.
- o Not sensitive to differences in severity of illness within a DRG -- No direct measurement of severity was included in the development of DRGs.

C. New DRGs

1. Intent and Project Organization. In September of 1979, HCFA awarded a grant to Yale University to create a new system of DRGs

which would use the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes adopted on January 1, 1979 and respond to criticisms of the Old DRGs. (Yale researchers did not necessarily concede that all criticisms of DRGs were indeed valid.) In addition, the development of new DRGs was required to eventually support the New Jersey DRG based reimbursement demonstration program.

In terms of objectives, the new DRGs were supposed to be:

- o medically interpretable;
- o based on information available in existing medical record abstracts (e.g., Uniform Hospital Discharge Data Set);
- o limited in numbers (fewer than 500);
- o compatible with Medicare data for eventual HCFA use;
- o limited in the variation of LOS within DRG;
- o based on explicit rules on how to subdivide a MDC;
- o of sufficient size to permit comparative analysis across hospitals; and
- o representative of the entire range of hospital patients.

A large project team was developed to meet this extensive set of objectives. The Yale University School of Organization and Management subcontracted with the Commission on Professional and Hospital Activities (CPHA) to provide a nationally representative discharge data set and to arrange for a review of the DRG definitions by the Clinical Council on Classification. The eventual work group was composed of researchers, clinical consultants, a management/review committee (representatives of HCFA, Public Health Service (PHS), CPHA, New Jersey State Department of Health, Yale, Johns Hopkins, including physicians, health economists, health service researchers, and medical records experts) and a separate review structure composed of New Jersey clinical consultants (the Commissioner's Physician Advisory Committee), and the Clinical Council on Classification.

2. Summary of New DRG Characteristics*

Twenty-three MDCs (rather than 83) were developed based on an organ system approach because medicine is practiced primarily according to specialties based on body systems. The first major subdivision within most MDCs is now based on the presence, or absence, of an operating room procedure. This was done because of the cost and staff implications associated with operating room (OR) procedures.

The selection of complications and comorbidities is now based on DRG-specific lists of "substantial" complications and comorbidities developed through clinical judgments. This differs from the old DRGs, in which the presence of any secondary diagnosis would automatically place the patient in a complicated DRG. Similarly, in each MDC the OR procedures are ranked from the most to the least resource intensive. The most resource intensive OR procedure on the patient's record is used to assign the patient to a surgical DRG. The variables used to define DRGs now include a variable that identifies patients who are over age 69 and/or have significant complicating conditions. This variable is useful in the classifying of elderly Medicare patients since 67 percent of them are over age 69. In addition, patient discharge status (discharged to another acute care facility, dead or alive, etc.) is used as a variable.

* See Appendix G for a list of the 23 MDCs, Appendix H for an example illustrating the process of defining those DRGs based on one MDC, and Appendix I for the frequency distribution for costs by DRGs.

There are now 467 DRGs. These "new" DRGs are based on much more clinical input applied in a more structured fashion than the old DRGs. Explicit protocols were developed to support the construction of new DRGs. All of this represented an attempt to increase usefulness and reliability.

3. Summary of Methods Used to Address Criticisms of Old DRGs

Regional bias. A national data base was used by the development, team and much heavier emphasis was placed on the role of clinical judgment. Rather than using New Jersey data as they had in developing the "old" DRGs, the Yale research team used 1.4 million cases from a sample of 325 hospitals which purchased discharge abstract services from the Commission on Professional and Hospital Activities. Approximately 250,000 cases were used to actually develop the new DRGs with the remaining cases used to test the DRGs that were produced. Below, five categories of allegations concerning DRGs are underscored, then discussed and refuted.

Not replicable: The development of the new DRGs was guided by a set of explicit rules. This should make it easier to repeat the development of DRGs on a different data base. In addition, Yale compared the DRG definitions produced by three different teams and found that the results were quite similar.

Lack of clinical coherence within DRGs: The 23 MDCs were defined by organ system. These MDCs correspond to specialties and therefore to the way in which hospital care is delivered. In addition, clinical

judgment played a much more extensive role in the development of the new DRGs. Extensive and careful physician review of results was explicitly incorporated into the development process.

The relationship of LOS to costs: Variation in LOS was found to represent dollar expenditures rather well. This contention was tested with a New Jersey cost data base and later with Medicare data. In addition, the process of DRG definition was repeated using the New Jersey cost data base. The results were highly similar to the national results based on LOS. There were, however, a few instances in which the New Jersey data suggested that a DRG should be subdivided further. When this occurred, the more detailed definition was adopted.

DRGs easily gamed: Under the new DRG system, only significant (and specific) secondary diagnoses (complications and comorbidities) can lead to a case being included in a higher cost DRG. The ordering of secondary diagnoses and procedures no longer has any effect in that all codes are examined. Furthermore, a surgical procedure hierarchy is used to assign patients who had surgery to DRG categories. The physician has no direct incentive to tamper with diagnoses that he records on the medical record. Although the possibility of fraud exists, the constant threat of malpractice suits should prevent physicians from replacing the principal diagnosis with a more costly secondary diagnosis. There is no evidence from New Jersey that this problem occurs.

DRGs do not account for severity: The DRGs cover a wide range, from very expensive cases (e.g., heart transplant, kidney transplant, coronary by-pass, and severe burn) to very inexpensive kinds of cases. Thus, the DRGs account for the major variations in severity of illness across patients.

While accounting for all the variation in severity is still a potential problem with DRGs, much of the variation in LOS and cost within a DRG is probably due more to differences in treatment/practice patterns than to variation in severity of illness. Severity within DRG is primarily a concern if certain hospitals tend to have more severe cases within DRGs compared to other hospitals, and if severity is positively associated with costs.

HCFA is planning to examine the extent to which certain groups of hospitals treat more costly cases within DRGs. However, no widely applicable method currently exists to make valid severity distinctions. In addition, data sets which could reflect severity are not universally available. These could take 5 to 10 years to develop to the point where they could support a national Medicare payment system. DRGs have the distinct advantage of being based on available data. Nevertheless, severity is one dimension that may warrant further study.

In brief, new DRGs are more homogeneous in resource use, more clinically coherent, and much more widely accepted than old DRGs. Yet they can still be developed from existing hospital abstracts and from HCFA's Medicare data. Four hundred and sixty seven DRGs represent a manageable number of categories from a payment prospective. All in all, the new DRGs provide HCFA with a measure of output that is superior to any other existing alternative that can be used to support a prospective payment system.

V. SETTING PPS PRICES AND PREDICTING MEDICARE HOSPITAL REVENUES

A. Overview

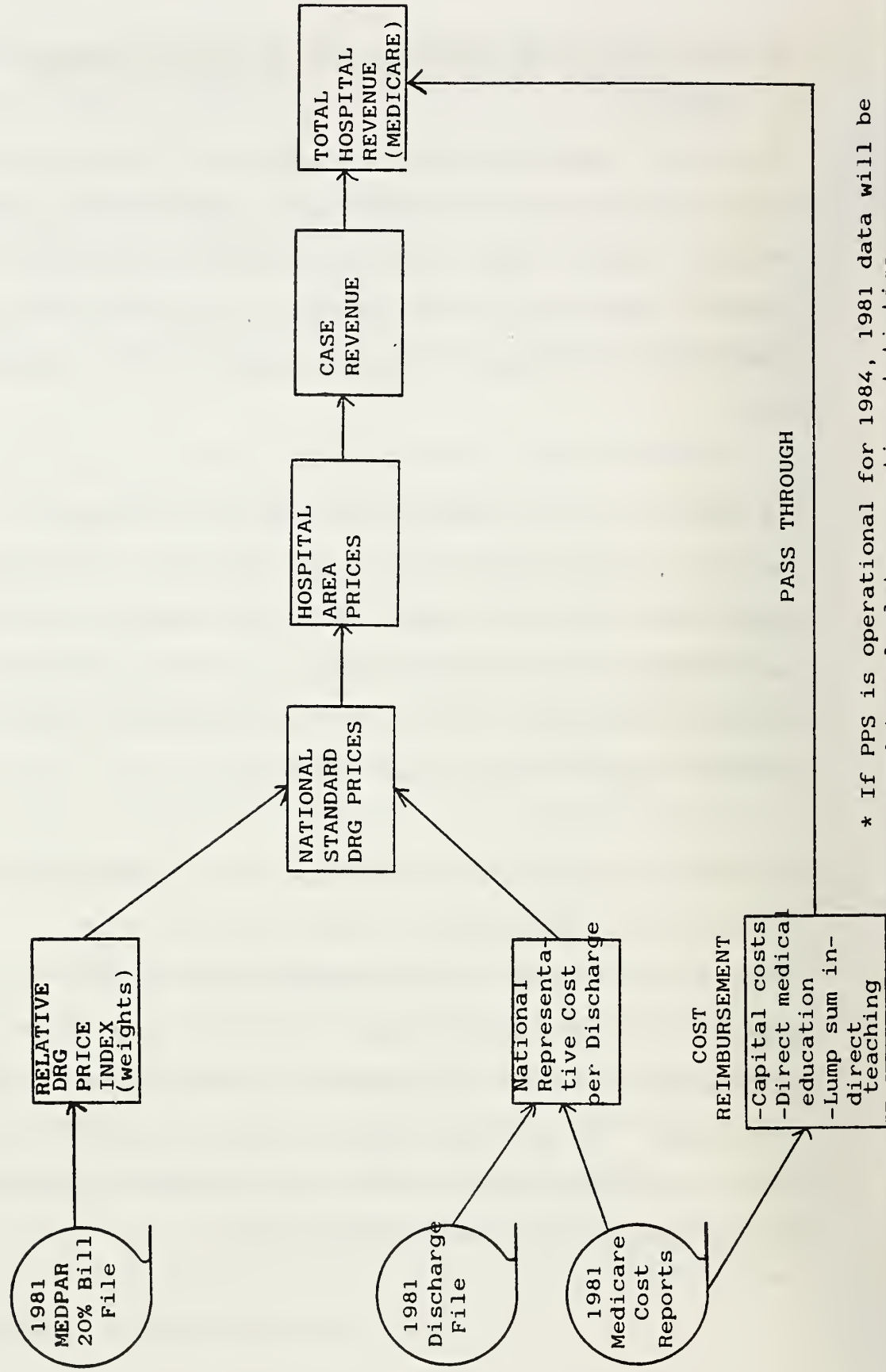
This chapter shows how prospective payment prices are set and how these prices are used to calculate various measures of hospital revenues. Figure 1 summarizes price setting and revenue calculation methods. Three sources of data are used in setting PPS prices: the MEDPAR File, the Medicare Cost Reports and the Medicare discharge file.

The MEDPAR file is a 20 percent sample of bills for Medicare beneficiaries discharged from short-stay hospitals. This annual sample is derived by selecting bills for those beneficiaries whose health insurance claim numbers end with zero or five. The file contains billed charge data and clinical characteristics such as principal diagnosis and principal procedure.

The Medicare Cost Report, an audited source of cost data, contains information that institutional providers submit to fiscal intermediaries in order to receive reimbursement for services provided to Medicare beneficiaries. It provides the basis for settling the amount of final payment for the institution for its fiscal year. The cost report contains detailed information on direct capital and medical education costs, operating costs, and aggregate cost to charge ratios for each revenue center.

FIGURE 1

Overview of PPS Price and Revenue Setting Process*



* If PPS is operational for 1984, 1981 data will be used to calculate operating statistics.

The discharge file is a source of the number of Medicare cases treated by a hospital during a given calendar year. It is a more complete source of Medicare inpatient discharges than the Medicare Cost Report.

The MEDPAR data file is used to create a DRG relative price index (a set of weights) that describes the relative costliness of treating different types of Medicare cases (compared to the average cost per Medicare case). For example, craniotomy cases are 3.5 times as expensive as the average Medicare case. The discharge file and the cost report file are used to create a national representative cost per discharge as if each hospital treated the average mix of patients, paid the national average wage rate, and had no teaching programs. The price index is a series of relative prices while the national representative cost per discharge is one number that sets the overall PPS payment level. When the relative DRG price index is multiplied by the national representative cost per discharge, a set of national standard DRG prices is obtained. After these standard DRG prices are adjusted for area wage differences to create hospital area prices there is a specific payment price for each DRG (467 different prices will be created). Hospital case revenues are obtained when all hospital cases are paid for using hospital area DRG-specific prices. When case revenues are added to capital and direct educational pass throughs and lump sum indirect teaching costs, total Medicare hospital revenues are obtained for an individual hospital. Summing across all Medicare hospitals produces total Medicare hospital revenues.

Once national standard DRG prices are known and pass throughs are estimated, these can be combined with estimates of discharges to produce estimates of total Medicare hospital revenues. Thus, the outcome of PPS for an individual hospital or a group of hospitals is predictable both for the hospitals and the Medicare actuaries. The remainder of this section describes these calculations in greater detail.

B. Calculating the DRG Price Index

Figures 2 and 3 contain the specifics of DRG price index and national representative cost per discharge (case) calculations. The calculation of the DRG price index is accomplished with patient (case) specific data. In particular, the process begins by inspecting the MEDPAR data file (see Chapter VI below). This data file contains a 20 percent sample of hospital bills, including clinical and patient characteristics, length of stay (LOS) information, and ancillary billed charges. As described in Chapter VI, clinical data from the MEDPAR file can be used to classify patients into DRGs. Step 1 (figure 2) classifies each patient (discharge/case) into the appropriate DRG category.

FIGURE 2

Calculating the DRG Price Index and a Nationally Representative Cost Per Discharge

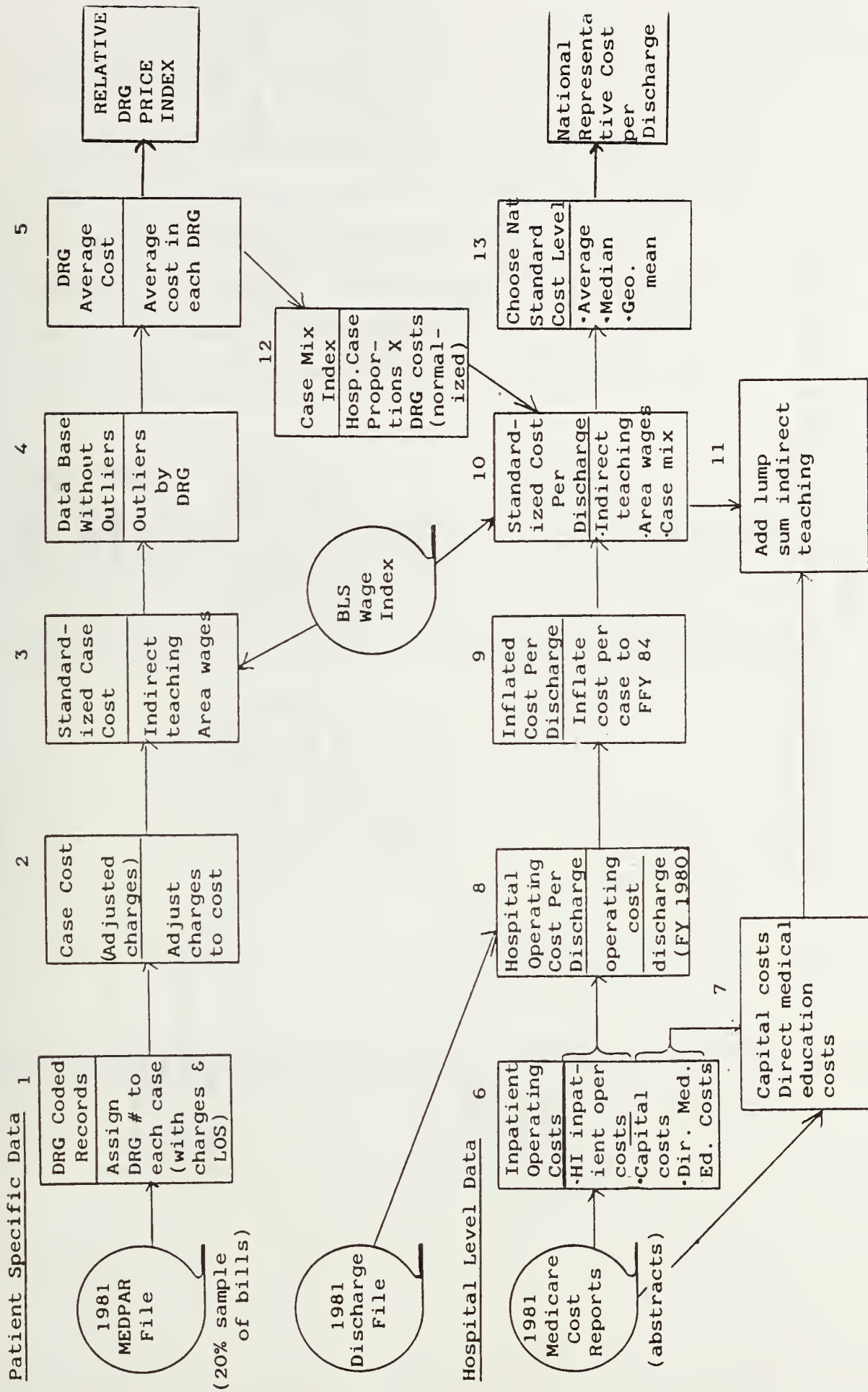
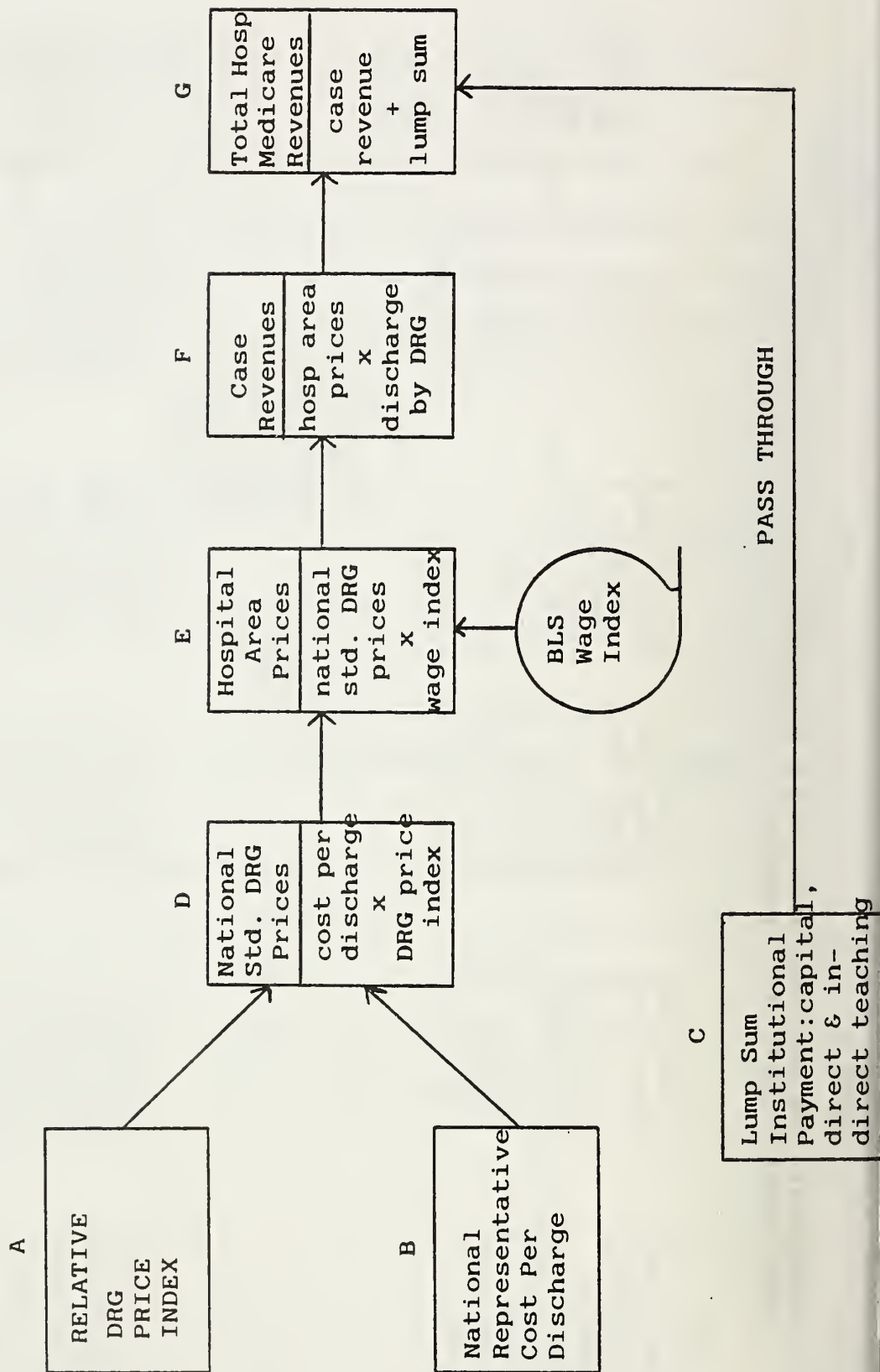


FIGURE 3
Calculating National Standard DRG Prices and
Total Hospital Medicare Revenues



The MEDPAR file contains charge information as opposed to cost information. The charge information is adjusted to provide a more accurate reflection of production costs in Step 2: estimates of case costs. This is accomplished by estimating routine cost, special care cost and ancillary cost per case using Medicare cost reports and MEDPAR information as follows:

<u>Medicare Cost Report</u>		<u>MedPar</u>		<u>Results</u>
Routine per diem	x	Routine LOS	=	Routine Cost/Case
Special care per diem	x	Special Care (LOS)	=	Special Care Cost/Case
Ancillary Dept. cost to charge ratio ¹ /	x	Ancillary Charge	=	Ancillary Cost/Case

When case specific routine, special care and ancillary costs are summed, costs per case (as opposed to charges per case) are obtained.

¹/Seven ancillary cost departments are used: Operating room, laboratory, radiology, drugs, medical supplies, anesthesia, and other.

The case costs produced by Step 2 reflect hospital indirect teaching costs and varying wage levels. True cost relationships across case types (DRGs) are not apparent until these influences are removed (standardized).^{1/} Step 3 thus standardizes case costs for differences in indirect teaching costs and wages across hospitals. The BLS wage index (see Appendix J.) is used to estimate wage differences across about 300 labor market areas. Indirect teaching costs are estimated by relating variations in hospital teaching intensity, measured by an "interns and residents to beds" ratio, to variations in operating costs across hospitals (similar to the teaching adjustment currently employed under Section 223).

Thus far standardized case costs within DRGs have been produced. Some of these may be atypical so "outlier" cases within each DRG are removed in such a fashion that as many cases as possible are retained (in order to maximize the use of data) yet the influence of outliers is minimized.^{2/} About 1/2 of 1 percent of the cases are removed from each DRG in step 4. This

^{1/}For example, if DRG₁ cases were mostly from teaching hospitals and DRG₂ cases were mostly from non-teaching hospitals we would think the production costs of DRG₁ cases were much higher than those of DRG₂ cases if we did not first take out the influence of teaching on DRG₁'s costs of production. While there still may be a difference, the result of this adjustment will reflect differences undistorted by teaching costs. Similar arguments pertain to wage adjustments.

^{2/}This process should not be confused with the identification of payment outliers where certain cases may be exempted from the PPS payment process. Step 4 is a computational activity as opposed to a payment process.

produces a data base devoid of both very short and very long stays. This procedure avoids distortion in the calculation of average DRG costs produced in Step 5. Average DRG costs are now used to create the DRG price index (Box A). The DRG price index indicates the relative costliness of treating cases in different DRGs compared to the national representative (average) cost per case. An individual DRG price (weight) is calculated by dividing the specific DRG average cost by the national representative cost per case.^{1/}

The DRG relative price index will contain relative prices (weights) for all DRGs for which adequate MEDPAR data are available. Prices for the remaining DRGs, which in the aggregate account for less than 1/2 of 1 percent of all cases, will be set according to methods described in Chapter VI below.

It is important to note that average DRG costs could be used for prospective payment. The decision to use a DRG price index and a national representative cost per discharge to create national standard DRG prices (as opposed to merely using average DRG costs) is based on two factors. First, DRG average costs are based on adjusted costs derived from charge data (Step 2). This is not as accurate a reflection of production cost levels as is the standardized cost per discharge, which is based on cost

^{1/}Note that this type of index does not have an average value of one because the index is calculated relative to case average costs, not the average of DRG costs.

report data. Second, it is computationally simpler to create a relative DRG price index which is then applied to one price level (the national representative cost per discharge).

C. Calculating the National Representative Cost Per Discharge

This process is illustrated in the bottom half of Figure 2. The data files used are the 100 percent Medicare Discharge file and the Medicare Cost Report file. This analysis begins at the hospital level. Starting with an abstract of the hospital's cost report, various cost components are broken out. In particular, Step 6 isolates operating expenses from capital costs and direct medical education costs. The capital costs and direct medical education costs are set aside as pass throughs (Step 7). In step 8, operating costs are used to calculate hospital operating costs per discharge (case) because PPS is a case based system. The hospital's operating costs per discharge are obtained by dividing its Health Insurance (HI) operating costs by its number of Medicare discharges.

If prospective payments were to start in FY 1984, all costs per discharge would be inflated to FY 1984 price levels (April 1, 1984). This might be accomplished by using the actual rate of increase until mid 1983 and using market basket + 1 percent to get to the mid point of 1984. This process would be consistent with existing Section 223 case mix limit activities. The result of Step 9 is inflated costs per discharge.

Ultimately, case costs per discharge should represent a national standard. To accomplish this, the effects of indirect teaching costs, case mix and area wages need to be removed from hospital data.

Standardizing costs per discharge for these effects produces case costs as if each hospital treated the average mix of patients, paid the national average wage rate and had no teaching programs. Step 10, then, results in standardized cost per discharge. Indirect teaching costs are removed from the data and set aside as a pass through (Step 11). BLS wage index values and hospital case mix values (Box 12) are directly adjusted for (see Appendix B for the casemix definition and calculation procedure).

The final step (Step 13) is to produce the desired cost per discharge payment level. National average, median or geometric mean cost per discharge levels (or proportions thereof) could be used.^{1/} The national average cost per discharge is affected by the fact that cost data are heavily skewed. The national median (geometric mean) cost per discharge value is about 7 percent less than the national average cost per discharge.

^{1/}See Appendix D for a graphic display of the relationship between the arithmetic mean, the geometric mean and the median.

The decision as to which payment level will eventually be selected is beyond the scope of this paper. Box A indicates that ultimately some decision will be made as to payment level and a national representative cost per discharge will be determined.

D. Using the DRG Price Index and the Nationally Representative Cost Per Discharge to Calculate Hospital Revenues

The DRG price index describes the relative costliness of different types of cases and the nationally representative cost per discharge sets the price level. The product of these two terms is a set of national standard DRG prices. (Box A, Box B and Box D respectively in Figure 3). These DRG prices represent a dollar reimbursement level for each DRG (467 of them). They are national standard prices in that they are calculated as if there were no teaching costs, no capital costs and all hospitals paid the national average wage rate. Because hospitals confront different wage levels national standard prices are adjusted for regional wage differences through the use of an area wage index (BLS wage index). Approximately 80 percent of hospital costs are labor related and thus are adjusted for regional wage differences. The result, hospital area prices, is depicted in Box E.

In order to calculate a single revenue number, hospital area prices are multiplied by discharges (coded by DRGs) to produce case revenues (Box F). This revenue figure is automatically adjusted for case mix because payment is based on DRG specific prices. It is also important to note that the bill is now a notice of a discharge coded by DRG. Thus, prospective payment will be based on 100 percent discharge data. There is no sampling effect on payment at this point (aside from the fact that relative DRG prices are based on a 20 percent sampling of billing records -- some two million bills).

Case revenues are predictable if we have a DRG price index and we can predict the number of discharges by DRG. Given a DRG price index, most hospitals could estimate their expected annual revenues. Similarly, Medicare actuaries can estimate total Medicare outlays. In this sense, prospective payment is "predictable."

This is the point where payment outliers (exceptions) would be added if applicable.

Case revenues reflect only operating costs. Total Medicare revenues (Box G) are equal to case revenues (Box F) plus lump sum pass throughs (Box C). These total revenues are the final product of the PPS payment process.

VI. IMPLICATIONS OF USING MEDPAR DATA TO SET DRG PRICES

The previous chapter indicated that the initial DRG national relative price index will be developed using historical data (1981) from the MEDPAR file. This chapter describes the characteristics of the MEDPAR data and the major implications for the initial set of DRG relative prices arising from current limitations in the data. It should be noted at the outset that the problems identified here could only affect the relativity in the initial sets of DRG prices.

Hospital payments will be made on the basis of the clinical information provided by the hospital at the time of discharge on the hospital bill. Moreover, extensive internal studies conducted by HCFA suggest that the net effect of these problems on the DRG prices is likely to be very small. We begin with the sources and contents of the MEDPAR file.

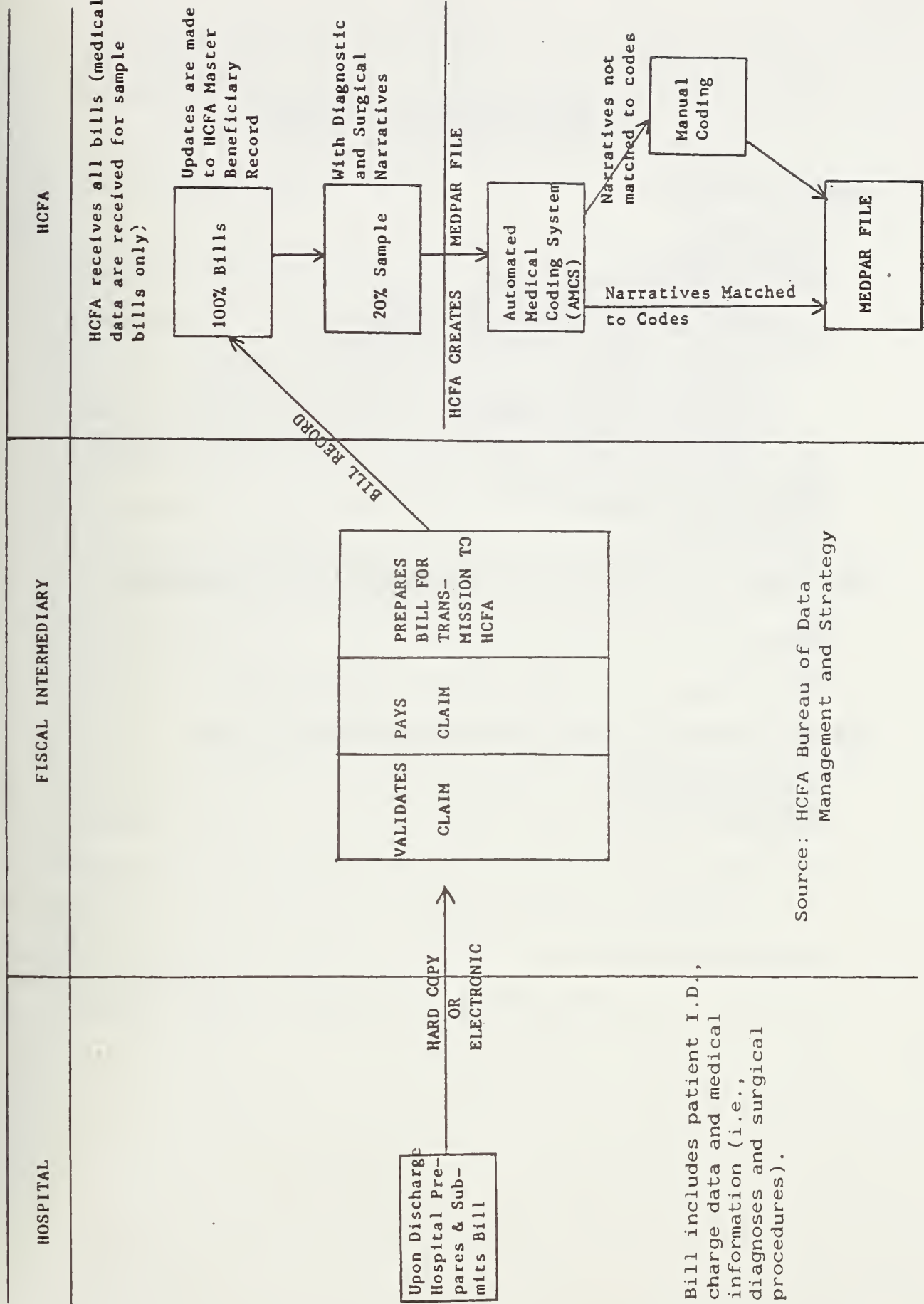
A. The MEDPAR Data File

The MEDPAR data file contains a 20 percent sample of hospital bills for Medicare beneficiaries discharged from short-stay hospitals during each calendar year. The sample is based on the terminal digit of the beneficiary's health insurance claim number (0 and 5). Figure 4 indicates how the bill data flows from the hospital through the intermediary to HCFA. Table 4 summarizes the MEDPAR data elements. (See Appendix E for a more complete listing.)

For the purpose of DRG classification, the key data elements are the diagnostic and surgical information reported on the sample bills. Since the beginning of the Medicare program, the hospital's medical

FIGURE 4

Data Flow to Generate the MEDPAR File



Source: HCFA Bureau of Data Management and Strategy

Table 4

A Summary of MEDPAR Data Elements

Hospital Bill Data

Claim Number
Provider Number
Admission and Discharge Dates
- Total length of hospital stay (days)
- Intensive care and coronary care days
Diagnostic and Surgical Data (ICD-9-CM Codes)
- Principal diagnosis
- Presence or absence (1, 0) of a secondary diagnosis
- Principal surgical procedure
- Presence or absence (1, 0) of an additional surgical procedure
Discharge Status - Alive or Dead
Individual Ancillary Charges
Accommodation Charges
Covered Charges

Beneficiary Characteristics from the HI Master Beneficiary Record,

Age
Race
Sex
State, County, and Zip Code of beneficiary residence

Provider Characteristics from the Provider of Services File

Type of control
Teaching Affiliation
Bed Size

records department or the billing office has provided a narrative description on each bill that summarizes the principal and secondary diagnoses and the principal and secondary surgical procedures (if any) performed during the stay.

This information is forwarded to the hospital's fiscal intermediary which prepares a bill record for transmission to HCFA. Although the hospital includes clinical information on all bills, only the diagnosis and procedure narratives contained on sample bills are included in the bill records sent to HCFA. In addition, the narrative description of the patient's diagnoses transmitted by the intermediary is limited to 45 characters and the surgical procedure narrative is limited to 42 characters. Thus, only a portion of the narrative description of any secondary diagnosis or procedure may be present on the bill record.

At HCFA central office the principal diagnosis and principal surgical procedure narratives are coded through the use of the Automated Medical Coding System (AMCS) or manual coding procedures (see Figure 4). If secondary diagnosis or secondary surgical procedure narratives are also present in the bill record, then the secondary indicators (shown in Table 3) are set accordingly.

Since August 1981, HCFA has allowed hospitals to submit this information in either narrative or coded form. Currently, about 20 percent of the sample bill records reported to HCFA by the fiscal intermediaries contain coded clinical data rather than narratives. Starting in January 1983, hospitals will be required to submit clinical codes on all bills (using ICD-9-CM codes) for the principal diagnosis and up to four additional diagnoses and for the principal of procedure and up to two additional surgical procedures. Additional information concerning the beneficiary's discharge status (e.g., left against medical advice, discharged to another acute care facility, etc.) also will be required later in 1983.

B. Limitations in the MEDPAR Data and Their Effects on DRG Prices

Given the characteristics of these data there are three potential problems that may affect our ability to set an accurate and reliable price for each DRG. First, the MEDPAR records do not contain all of the detailed information necessary to use the full set of NEW DRG definitions. Thus, the DRG definitions must be abridged to some degree. Second, even though the MEDPAR file contains approximately 2 million patient records per year, some relatively rare DRGs have too few sample cases to permit the calculation of a sufficiently accurate and reliable price. Third, the clinical information contained in the patient records is sometimes incomplete or inaccurate so that DRG assignment errors will occur. These errors may affect the development of the DRG prices to some degree.

Each of these potential problems is described and evaluated below in terms of the magnitude of the problem, its likely effects on the accuracy and reliability of the DRG prices and the solution that may be adopted.

1. DRG classification using MEDPAR data

As noted in Chapter IV above, the NEW DRGs require information about the patient's principal and secondary diagnoses, principal and secondary surgical procedures, age and discharge status. The MEDPAR records do not contain specific secondary diagnosis or surgical procedure codes. In addition, discharge status is limited to discharged alive or dead. As a result of these limitations, the DRG definitions have been abridged for use with MEDPAR data in two ways:

- . Nine pairs of new DRGs have been combined into 9 more general categories. This occurs, for example, where DRG assignment is based on the presence or absence of a specific secondary surgical procedure to distinguish sub-groups of patients with a specific principal procedure (e.g., coronary by-pass patients are distinguished by whether or not they also had catheterization during their inpatient stay). It also occurs, for example, where discharge status of "left against medical advice" is used to distinguish drug abuse patients.
- . Assignment of cases to the DRGs is also modified where the presence of specific secondary diagnoses, representing significant complications or comorbidities, is used to separate patients into "complicated" or "uncomplicated" DRGs. For these DRGs, the presence of any secondary diagnosis (based on the secondary diagnosis indicator) is used instead.

Where DRGs have been combined, the implication is that we will have a single price for two kinds of cases that differ in terms of resource use. This particular problem can be resolved by reference to the cost differential between the two DRGs that exists in some outside data base (for example, the cost differential between these DRGs in New Jersey).

Where the presence of any secondary diagnosis is used instead of specific complications, the implication is that some "uncomplicated" cases will be assigned to a "complicated" DRG.

If this occurred for a significant number of cases, it would have the effect of lowering the relative prices for the "complicated" categories, since uncomplicated cases tend to be less costly. However, as described more fully in (C) below, most Medicare patients (67 percent) are age 70 or older and would be assigned to "complicated" DRGs anyway. Only a small fraction of the remaining patients (under age 70 with a secondary diagnosis) would not have had a significant complicating condition. Thus, this modification of the DRG definitions is unlikely to have any significant overall impact on the DRG prices.

2. Sampling error

Because the MEDPAR data are derived from a sample of bills, the number of sample cases in some DRGs may be too small to set a reliable price for the category. This is the problem of sampling error.

The magnitude of this problem is illustrated by the results of applying the DRGs to the 1980 MEDPAR data:

- o Thirty-eight DRGs contained no cases (primarily pediatric and obstetrical DRGs);
- o Sixty-four DRGs had too few sample Medicare cases to provide a reasonably precise estimate of the average cost of treatment.

It should be noted that this is not a serious problem because these DRGs contain so few cases (under 1 percent). Nevertheless, it is desirable to set prices for all DRGs. For the empty DRGs this may be accomplished by reference to an outside data source such as New Jersey data (as in the case of the combined DRGs above). Prices for the low volume DRGs may be obtained by combining the data from two years (e.g., 1980 and 1981 MEDPAR files) or by reference to an outside data source in which these DRGs are much more common.

3. The impact of MEDPAR data quality on DRG classification and DRG relative prices

DRG assignment errors can result from errors in principal diagnosis coding, under-reporting of secondary diagnosis indicators and from principal surgical procedure coding errors. The magnitude of this problem may be indicated by the results of the Institute of Medicine study (National Academy of Sciences, 1977) which indicated that 27 percent of the patient records had ICDA-8 principal diagnosis codes that were incorrect at the DRG level. This information is somewhat out of date because DRGs are now based on ICD-9-CM codes. It is also

somewhat misleading because the IOM study compared the principal diagnosis abstracted from the medical record with the primary diagnosis contained in the Medicare record at the time of the study (1974 data).*

Even if the IOM study results were entirely valid, however, the impact of miscoding on reimbursement might not be severe. The key issue here is whether, and to what extent, the DRG relative prices derived from the MEDPAR data may be distorted by errors in the clinical data. In the following sections each potential source of classification error is evaluated in terms of its likely impact on the DRG prices.

Principal diagnosis errors: These errors result from incorrect selection of the principal diagnosis from the list on the face sheet of the medical record at the hospital. They can also occur when narratives are developed and later coded. Miscoding of the principal diagnosis can result in the assignment of some fraction of cases to an incorrect DRG. This may affect the eventual construction of DRG relative prices.

The seriousness of these errors will depend on the difference in costliness between the correct DRG and the erroneous DRG categories. The magnitude of the difference in costliness, however, is probably limited for several reasons. First, a high proportion of cases with coding errors will probably be misassigned to a DRG within the same

*"Primary" diagnosis relates to reason for stay while "principal" diagnosis relates to reason for admission.

MDC. Since the relative costliness of the DRGs is more similar within an MDC than between MDCs, the differences in costliness will tend to be relatively small. The difference is also limited by the fact that records for patients that had surgery usually would be assigned to a surgical DRG (with similar costs) even though the principal diagnosis was miscoded. Further, if principal diagnosis errors are otherwise essentially random, the differences in costliness will be positive for some misclassified cases and negative for others. As a result, the net effect of these errors on the estimated cost (and the relative price) for each DRG should be very small.

Secondary diagnosis indicator: The most common limitation in the MEDPAR data is under-reporting of the presence of secondary diagnoses. The hospital narrative transmitted by the intermediary is currently limited to 45 characters on the bill record and some intermediaries transmit only one diagnosis in any event. As a result, the presence of secondary diagnoses is frequently under-reported. This under-reporting results in the assignment of some complicated cases to "uncomplicated" DRGs. Since cases involving secondary diagnoses tend to be more expensive than uncomplicated cases, this leads to overpricing of the uncomplicated DRGs because the expensive cases drive up the average cost for the DRG. This will increase prospective payments for uncomplicated cases but probably not affect payment for cases in complicated DRGs. The net result favors hospitals to the extent that systematic overpayment occurs.

The seriousness of the under-reporting of secondary diagnoses is limited by the way NEW DRGs are defined. In most MDCs, Medicare patients who are age 70 or over are automatically assigned to a "complicated" DRG. Because 67 percent of Medicare discharges are 70 years of age or older, only 23 percent of Medicare discharges could be affected by under-reporting of secondary diagnoses.

Of the 23 percent, about half already have reported secondary diagnoses. The result is that only about 12 percent of the MEDPAR records could be affected. It is unlikely that more than half of these patients actually had secondary diagnoses that were unreported. Thus, the impact of underreporting of secondary diagnoses is much less than it might at first seem, and the error will be to the hospital's advantage.

Principal Surgical Procedure Errors: These errors first occur when the principal surgical procedure is selected at the hospital. Sometimes procedures are listed in chronological order rather than the principal procedure being listed before the secondary procedure.* For instance, a D & C procedure might be listed first even though the patient had a hysterectomy which is considerably more costly. Errors also occur as narratives are developed and then coded. Another source of error stems from the procedure editing features of the bill processing systems employed by some intermediaries. In some intermediaries the surgical procedure code

*The principal surgical procedure is defined as that procedure most related to the principal diagnosis.

is eliminated unless the bill also contains operating room (OR) charges. For example, a heart catheterization procedure code, where the procedure was performed in a catheterization laboratory rather than in the OR, would be eliminated from the bill record transmitted by the intermediary (if no other surgical procedure was performed in the OR).

In combination, these errors may result in the assignment of some cases to less costly DRGs. Surgical cases could be assigned to less expensive medical DRGs or patients that had more expensive procedures could be assigned to a less expensive procedure category (a hysterectomy case could be assigned to a D & C category). The end result of these types of errors is to overvalue and to overpay lower cost DRGs. This would benefit hospitals with less complex cases without necessarily penalizing hospitals with more complex cases. The net result is likely to be some degree of overpayment. This effect is limited in that only a relatively small fraction of procedure coding errors have any effect on payment. (Many procedure code differences indicate differences in how a procedure was performed rather than differences in resource use.)

In summary, the overall impact of MEDPAR data errors is likely to be overpayment for some low cost DRGs. For the reasons stated, the level of this overpayment is likely to be small and will disappear in any event as the system is used and data quality is improved.

VII. SYSTEM INCENTIVES

A. Overview

The PPS is intended to be markedly different from the Medicare hospital payment system now in effect. When hospitals are paid in a different way, it is reasonable to expect that their behavior will change. Indeed, changing hospital behavior is the purpose of this initiative. This section is devoted to an analysis of the types of hospital behavior changes expected under PPS.

This chapter discusses PPS incentives in terms of cost control, quality of care, capital stock, Medicare admissions and other services not covered by PPS which might be substituted for inpatient care.

B. Cost Control

PPS allows each hospital to make its own production (cost reduction) adjustments given a known set of DRG rates. Because hospitals can keep any surpluses they achieve, hospitals will be encouraged to introduce technologies and management techniques which control costs. Administrators might question physician requests to procure more equipment and to provide services that extend beyond regional medical norms. Within each hospital, staff physicians can be expected to compete with each other for available resources as the hospital's budget is constrained. This competitive atmosphere will encourage recognition of the costs as well as the benefits of existing treatments and new technologies as they are developed. Peer pressure should influence physicians with relatively costly and cost ineffective practice patterns to modify their behavior.

Under retrospective cost-based reimbursement, when more services are provided, more income is generated. It is to a hospital's decided advantage to do more under these circumstances. Thus, despite the wide agreement that some services

provided to Medicare beneficiaries are marginally (if at all) necessary in the provision of good quality patient care, the current cost-based Medicare reimbursement program pays for these services because they are defined as allowable costs. It is impossible for a national program to administratively identify each instance of questionable expenditures and in turn to make timely decisions to accept or disallow them. If individual hospital administrators do not have clear incentives to reduce waste and improve efficiency, this task will not be done.

Under PPS, the hospital administration's incentives are markedly different. Hospitals would be confronted with a fixed price prospective payment for each type of case (DRG) they produce. No longer will expenses be reimbursed at any level. For each dollar spent hospitals will forgo a dollar's worth of maintenance for hospital plant, future expansion, purchase of equipment and the like. Thus, PPS fixed prices create a budget constraint for the hospital administrator. This constraint will encourage the administrator in consultation with the medical staff to consider the trade offs involved with any expenditure.

For the first time since the inception of the Medicare program there will be true incentives to match explicitly patient benefits with the costs of services provided to Medicare beneficiaries. Hospital managers will attempt to make their institutions produce patient care in all case types as efficiently as possible. Hospitals will seek to reduce both unnecessary lengths of stay and the quantity of unneeded routine and ancillary services, consistent with other institutional and social goals.

Hospitals may tend to expand in areas (DRGs) in which they can provide care more efficiently than other hospitals and to contract in those areas where they are relatively less efficient. The most obvious area of contraction will involve

highly specialized procedures where an individual hospital has an insufficient case load to bring down production costs by capturing the effects of economies of scale. Medical experts believe, and research has shown, that when hospitals and/or individual physicians perform complex medical and surgical procedures infrequently, their proficiency is low and patients suffer. In fact, many planning and utilization guidelines (which allocate specialized activities and services on a regional basis) were adopted in the past for precisely this reason: to regulate the perverse incentives of the present cost-based reimbursement system. Thus, PPS will provide the positive incentives to accomplish what now requires regulation. This response to the new incentives of PPS is expected to enhance quality of care.

From a management perspective, hospitals can be expected to act like any efficient firm. They should adopt accounting systems which allocate hospital costs to cases by DRG, and acquire other management information by DRG case type. This information will include routine and ancillary costs by DRG case type and by physician. Hospital departmental cost information will be useful for the hospital to examine the efficiency of operation of common activities, for example, laboratory tests, X-ray examinations, and radiology treatments.

After determining what allocation of resources within the hospital's existing framework and case mix will achieve the lowest cost for each DRG and the highest reimbursement for its total case mix, the hospital will deliberate on output decisions for each patient case type to make its overall case mix volume as productive as possible.

Thus, hospitals will tend to specialize more under PPS than they currently do. No longer will most hospitals be able to supply all forms of specialized

medicine. This does not imply that quality will suffer since specialization can be expected to increase quality of care. For example, community hospitals may reduce their provision of highly technical, and often costly, medical and surgical procedures to which they are ill-suited. This does not imply that every DRG in every hospital must generate a surplus. Hospitals have many community objectives: research, prestige, retention of staff, etc. Thus, hospitals may subsidize certain DRG cases with surpluses from other clinical areas in order to pursue special areas of interest. For instance, some services which are not necessarily highly technical, but which are costly if volume is low, will be provided by hospitals which desire to provide a complete range of services. In this way, hospitals will be acting like any other firm which subsidizes one area of operations from another in order to achieve varied organizational, community and social objectives. The PPS will be appropriately neutral to any of the ways that a hospital sees fit to expend its operating surplus from its more efficient areas of operations.

C. Quality of Care

Aside from encouraging efficiency of operations, perhaps the single most important issue related to the design of PPS is the question "How will PPS affect quality?". As noted in the previous section, one by-product of this system should be enhanced quality of care. PPS should discourage hospitals from performing medical and surgical procedures which require a high degree of proficiency, but that are currently provided inefficiently due to low volume.

HCFA demonstration results suggest that PPS will reduce unnecessary services without endangering patient care. Nevertheless, not all incentives are necessarily positive for all hospitals. For instance, payment under a DRG system might encourage some hospitals to want to release patients prematurely. Such

"premature releases" might result in otherwise unnecessary readmissions and a second DRG payment. Similarly, it is possible that PPS payments might encourage some hospitals to transfer unnecessarily a patient to another provider or to reduce the provision of important ancillary services in order to minimize costs. Additionally, as is true with the present cost-based reimbursement, there is still a potential incentive for unnecessary admissions.

The evaluation of HCFA's prospective payment demonstration projects (by Abt Associates, Inc.) specifically includes an evaluation of the impact of prospective payment on the quality of care being delivered. The study examines the extent to which prospective payment is associated with changes in the accreditation of hospitals as granted by the Joint Commission on Accreditation of Hospitals, and the extent of association of prospective payment with Medicare inpatient fatality, readmission, and post-discharge fatality rates for patients in a select group of 59 diagnostic categories. These measures, selected by an expert panel of physicians, provide evidence of any adverse effects on patients due to a failure to provide needed services. That is, the study of quality outcomes was designed to maximize the chance of detecting significant adverse patient outcomes.

Abt Associates presented its preliminary findings at the Annual Meeting of the American Public Health Association in November 1982. These results indicated that, for the 11 different prospective payment programs studied, there was no statistically significant adverse impact of prospective payment on quality of care. These preliminary results are very encouraging.

This finding is not surprising since the physician is still the first line of defense in terms of maintaining quality standards. In order to assist the physician, HCFA will focus its medical review mechanisms on quality related

issues. In implementing the total cost limits mandated by TEFRA, the current medical review performed by Professional Standards Review Organizations (PSROs) and fiscal intermediaries was augmented by adding an admissions pattern monitoring system to determine whether provider admission rates change under the new TEFRA limits. Under prospective reimbursement, HCFA would continue to be concerned with identifying underutilization of needed services, inaccurate or aberrant diagnostic codes and aberrant admission patterns by provider and physician.

Admission pattern monitoring will have three parts. First, HCFA, using its own data on providers and beneficiaries and data collected and developed by existing medical review mechanisms on physicians, would profile the admission patterns of providers and practitioners. Then, using aberrancy screens, providers showing unusual changes in volume of admissions, case-mix, total reimbursement, or discharge status of patients would be identified and referred to the appropriate medical review authority. Finally, the medical review authority would undertake further analysis to determine the cause of the aberrancy and whether an unacceptable practice was in fact occurring. If so, the review authority would take appropriate action to intervene. Such intervention could range from additional provider review to imposition of sanctions or preadmission review.

In addition to increased Admissions Pattern Monitoring, DRG verification will be implemented. The purpose of DRG verification is to validate the accuracy of the DRG assigned to individual cases and to assure that the reported DRG is consistent with the information in the medical charts and discharge summary. Under current procedures, PSROs will be reviewing approximately 14% of all Medicare admissions. The DRG verification review will be based partially on screens developed by HCFA and partially on studies or random samples.

An additional issue associated with quality is the degree to which PPS will inhibit cost-increasing but efficacious technology. Although this concern is legitimate, it is really the opposite side of another quality issue which faces us today. The present cost-reimbursement system encourages cost-increasing technologies to be adopted without adequate evidence of either their effectiveness or their cost-effectiveness. These expensive technologies tend to be adopted prematurely and used excessively. Unnecessary use of high technology, including medical and surgical procedures, can cause unnecessary deaths, infections and lengthy hospital stays. PPS, however, will encourage hospitals and physicians to develop convincing evidence that costly new technologies are both efficacious and cost-effective. The Secretary will determine how to update DRGs, thus allowing new or more costly patterns of care to be introduced in a more systematic and deliberative fashion.

D. Capital Stock

A possible consequence of PPS could be that some hospitals might have to reduce their operating reserves in order to continue to serve Medicare beneficiaries. While this charge has been leveled against some state rate setting demonstrations it has generally not been widely substantiated. The Medicare PPS has several mechanisms which temper these consequences. First, and most obviously, capital costs will be passed through in the early years of PPS operation. Second, and more importantly, PPS will provide operating surpluses to efficient hospitals. This will replenish reserves for those hospitals—not deplete them. Since the incentives of PPS are for more efficient hospital operation, costs should be reduced and therefore operating surpluses should be generated which can be used to bolster capital reserves allowances. In addition, the existence of capital reserves will make hospitals more competitive in the bond market. All things

considered, PPS, relative to the system which it replaces, should facilitate capital formation for reasonably efficient hospitals rather than the opposite.

E. Medicare Admissions

Because the case (discharge) is the unit of service, the hospital may have an incentive to increase admissions, in order to contribute to overhead, as long as the DRG payment rate is greater than the marginal cost of producing a case. As was noted in Chapter II, Abt Associates' review of evidence from the New Jersey demonstration indicates that admissions have not abnormally increased. Nevertheless, New Jersey State officials were still sufficiently concerned about inherent incentives of prospective payment by the case that they recently developed a mechanism to discourage potential increases in the volume of admissions. Likewise, under PPS, a non-intrusive Medicare admission and discharge monitoring system will be used to identify anomalies which may occur and to determine, for example, if hospitals are admitting marginally ill patients--patients that could be treated on an outpatient basis.

Whether total national Medicare hospital admissions will increase overall because of PPS is somewhat difficult to predict. The outcome depends on both the balance of incentives across all DRGs in all hospitals and the ability of the hospital management to react to those incentives in each hospital. The balance of incentives depends upon the magnitude of the prospective rate relative to production costs for each DRG in each hospital.

It should be noted here that the DRG relative prices are set in such a way that roughly half the Medicare cases in each DRG will have relative costs above the relative price, while the other half have relative costs below the relative price. Thus, it is highly likely that almost all hospitals will desire to expand admissions in some DRGs and to contract them in others.

If the hospital production of an additional case in a given DRG leads to more costs than revenues, the hospital will have a strong incentive to decrease the volume of admissions in that DRG unless there are broader community concerns involved. On the other hand, hospitals will desire to expand operations for cases in those DRGs where an additional case increases revenue by more than it increases costs. Most hospitals will have incentives to increase admissions in some DRGs and simultaneously to decrease admissions in other DRGs. Similarly, for every hospital that has an incentive to increase admissions in a particular DRG, there is another hospital that has an incentive to decrease admissions in the same DRG. Thus, it isn't clear that any net change in admission rates will occur.

The outcome of these mixed volume incentives, however, also depends upon the ability of hospital administrators to bring about targeted changes in the volume of admissions of specific kinds of patients. In this respect, it is clear that administrators do not have the capacity to increase admissions readily in profitable DRGs while decreasing admissions of unprofitable case types, at least in the short-run.

Therefore, whether certain types of Medicare admissions ultimately will be higher or lower is a matter that is not entirely predictable. In any event, as noted in subsection E above, admission pattern monitoring will be intensified under PPS in order to prevent any questionable expansion of admissions that might occur.

F. Increasing Use of Capital and Outpatient Services and Physician Services Not Covered by PPS

Another incentive issue relates to those aspects of the delivery system that are not explicitly included in the PPS. Key concerns here are expenditures on capital, equipment, and outpatient and other services (e.g., diagnostic testing in a physician's office) that can be substituted for inpatient services.

Since capital costs will be passed through initially, hospitals may attempt to substitute capital services for labor or other direct operating services. In this instance, inpatient labor costs might be reduced through the increased use of capital, allowing additional costs to be passed through the reimbursement system. However, the net results of such investment are not immediately clear. Since the present system has encouraged cost-increasing capital expenditures for the past decade and a half, an "era" of encouraging technologies which decrease operating costs would be refreshing. Nevertheless, allowing a capital pass-through does not encourage optimal decisions. Due to these concerns, HCFA is studying methods of prospectively paying for capital in order that payment for capital can be included in the prospective rate as soon as possible.

The future relationship of inpatient to outpatient costs is also of major concern. Because some shifting of inpatient services (costs) to the outpatient setting is clearly advantageous to the hospital under PPS, HCFA must assure that duplicate payments are not made. Nevertheless, it is widely believed that many tests and procedures are done in hospitals but optimally should be done on an outpatient basis. This problem is more of an accounting problem than it is an incentive problem.

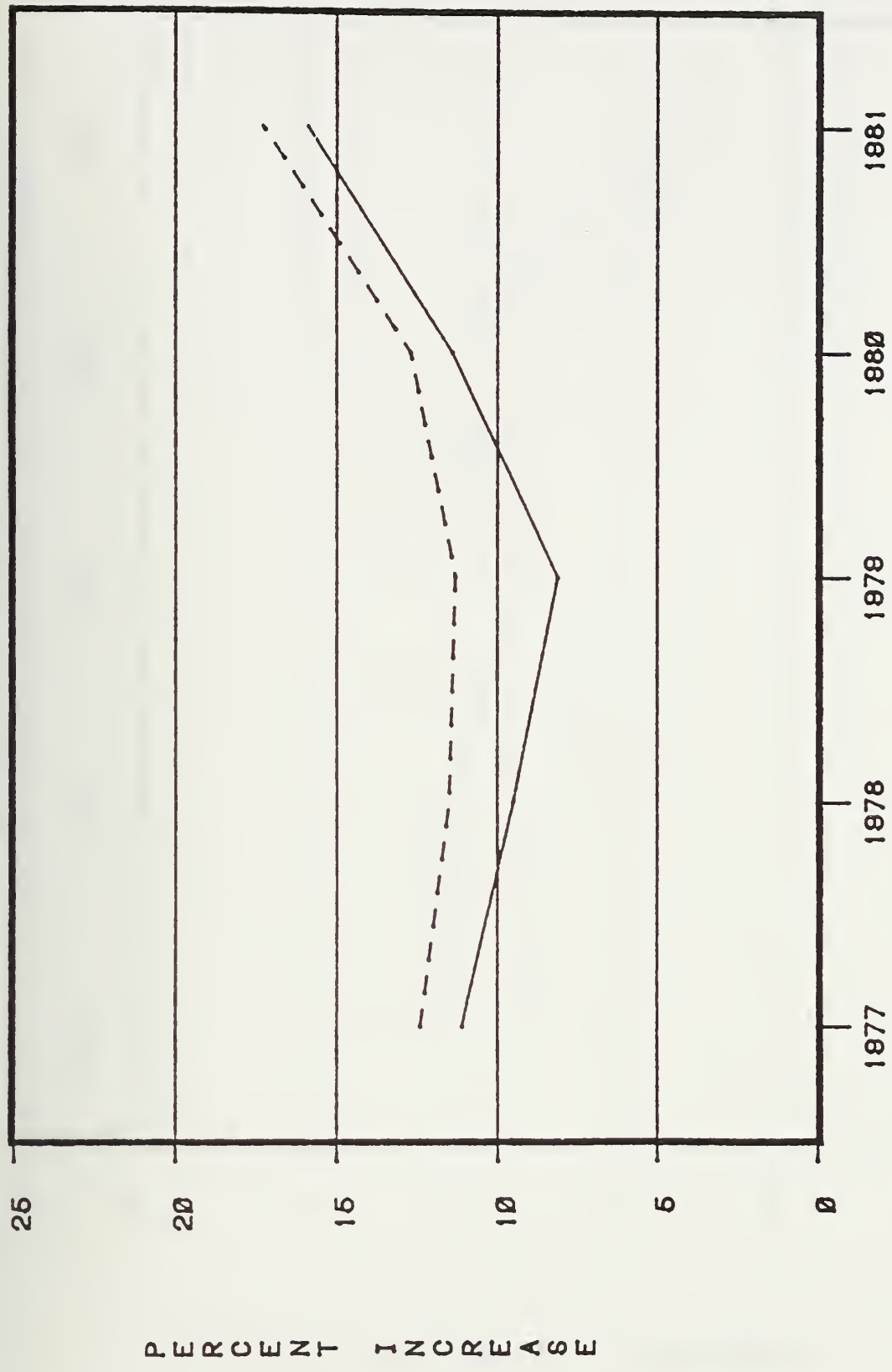
In summary, PPS will change hospital behavior. Hospitals can be expected to become more efficient, with a need to continually reassess their performance in terms of the new rules. Inefficiency becomes more costly under PPS since it deprives the hospital of surplus earnings which the hospital can use as it sees fit.

APPENDIX A

Cost Per Admission and
Cost Per Capita Experience
in States With Mandatory
Rate-Setting Systems

COST PER ADMISSION

COMMUNITY HOSPITALS

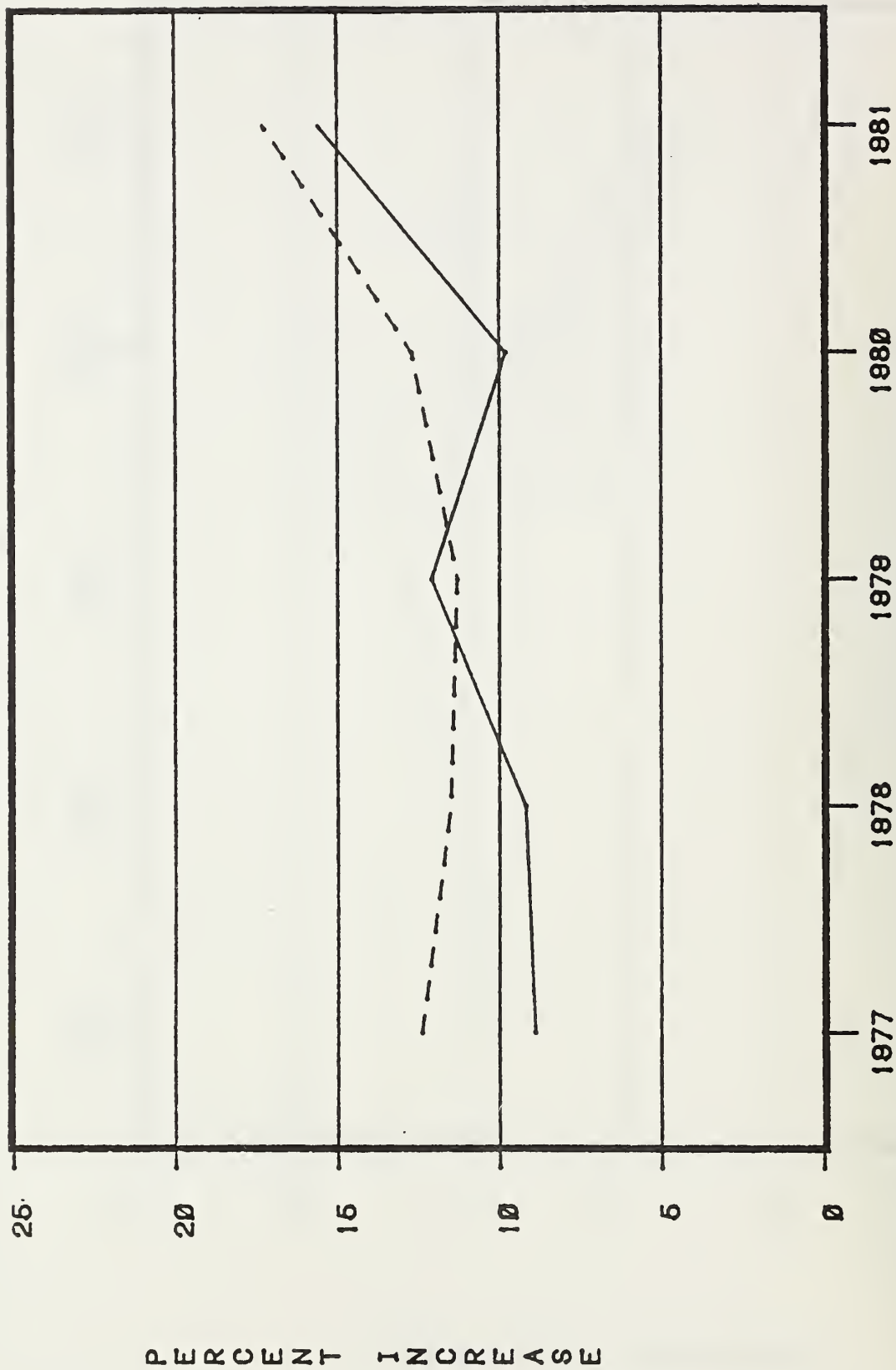


PERCENT INCREASE

YEAR

CONNECTICUT
UNITED STATES

COST PER ADMISSION
COMMUNITY HOSPITALS



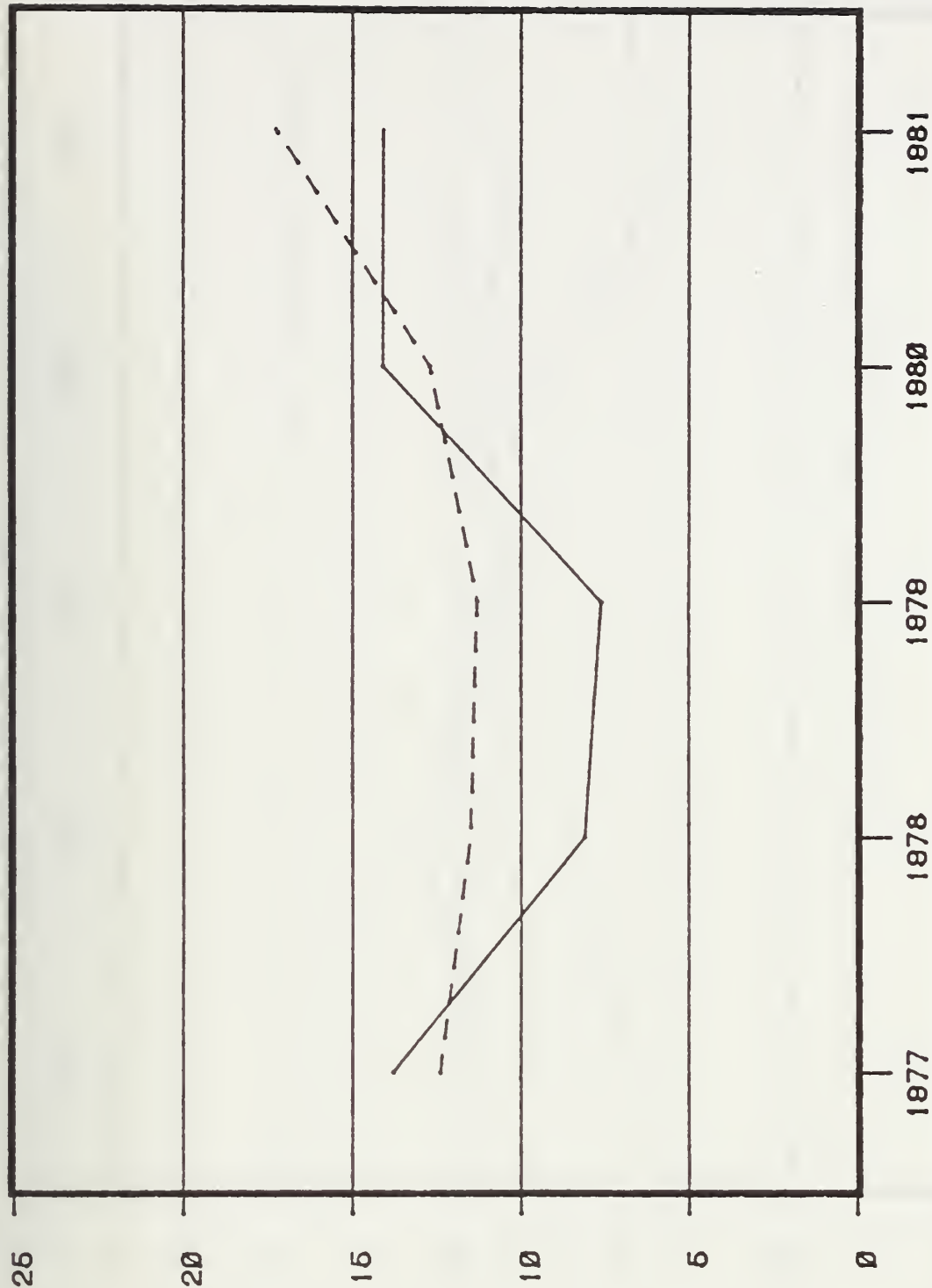
PERCENT INCREASE

YEAR

———— MARYLAND
----- UNITED STATES

COST PER ADMISSION

COMMUNITY HOSPITALS

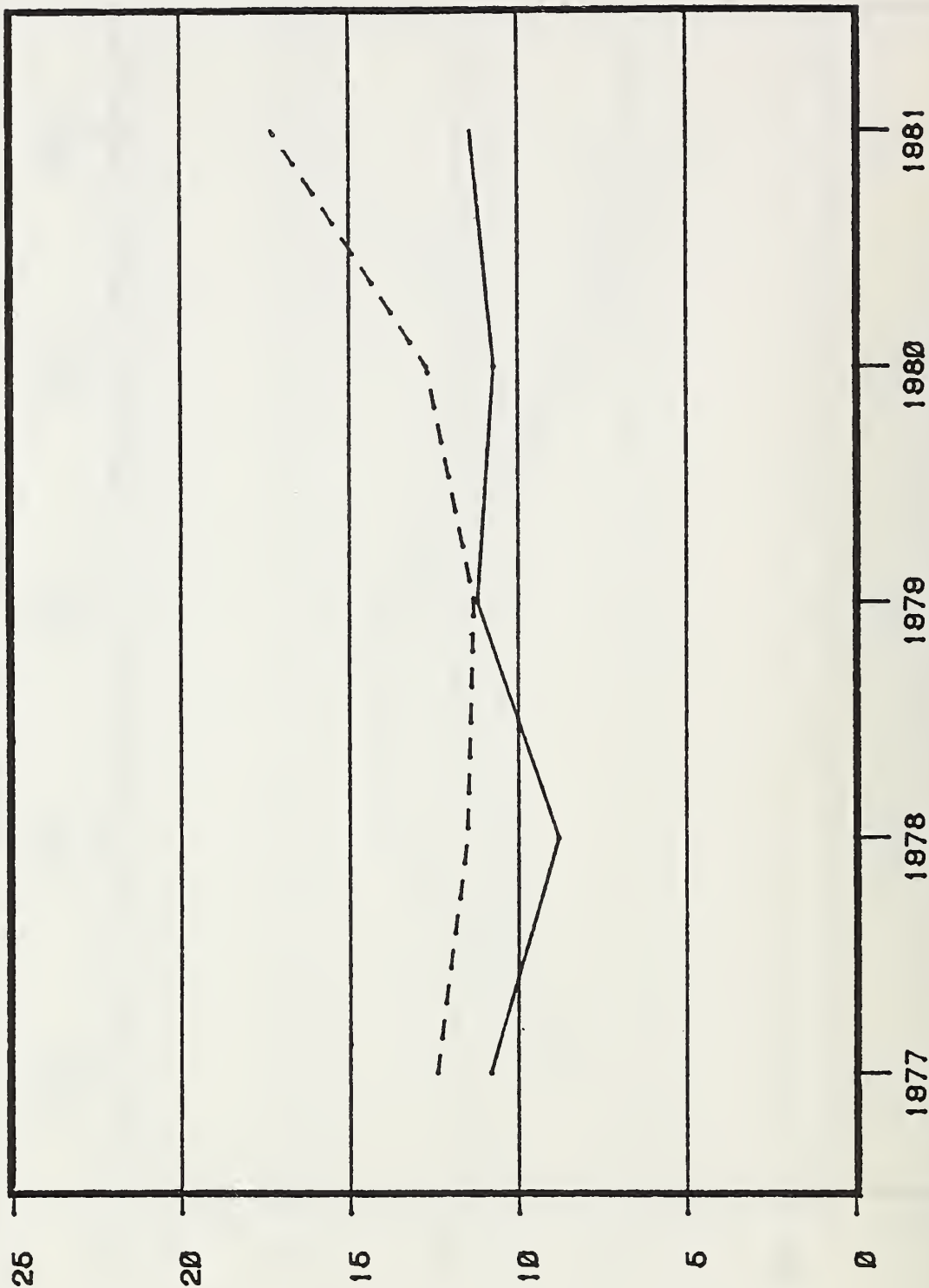


PERCENT INCREASE

YEAR

MASSACHUSETTS
UNITED STATES

COST PER ADMISSION
COMMUNITY HOSPITALS



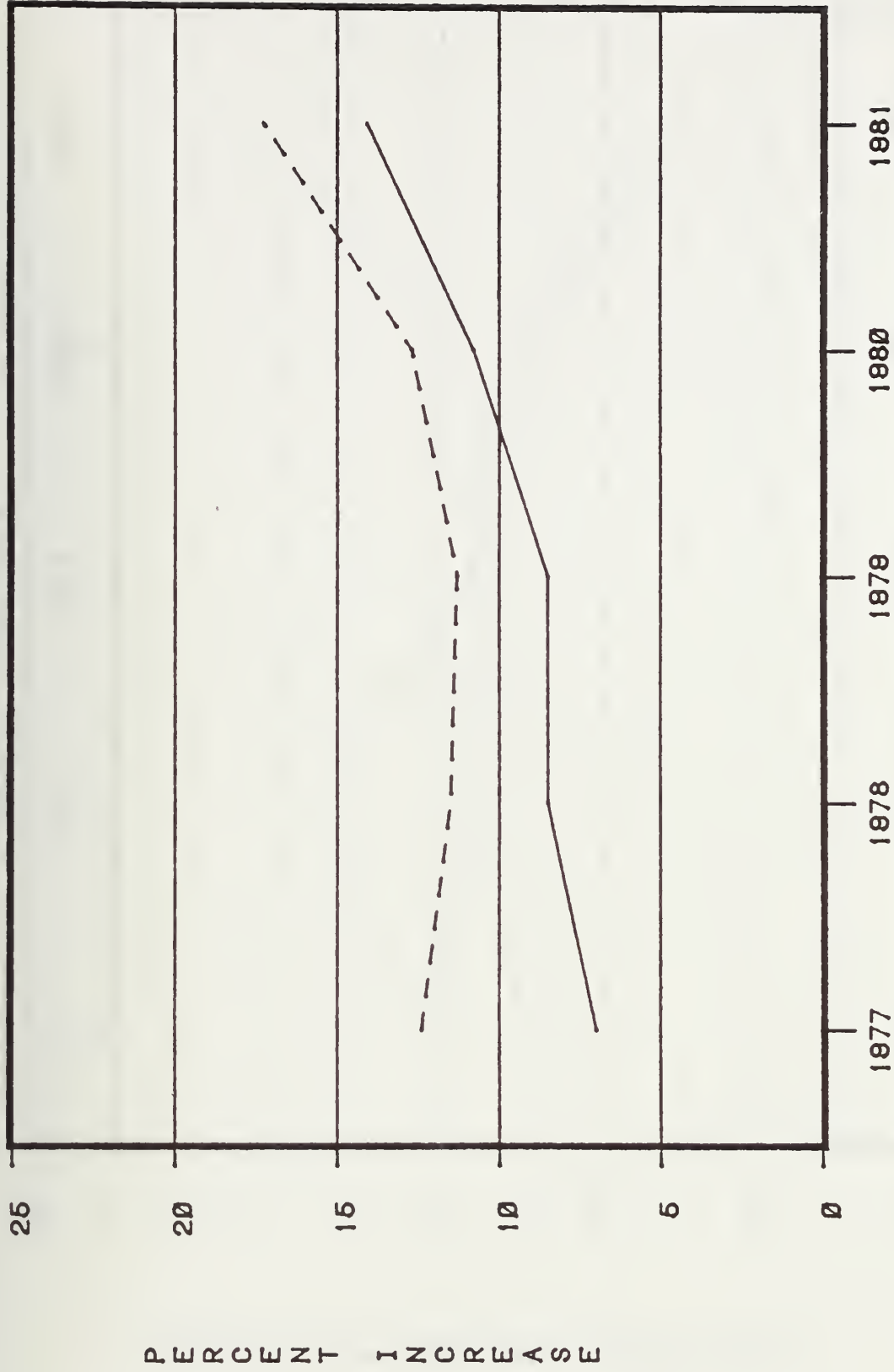
PERCENT INCREASE

NEW JERSEY

YEAR

COST PER ADMISSION

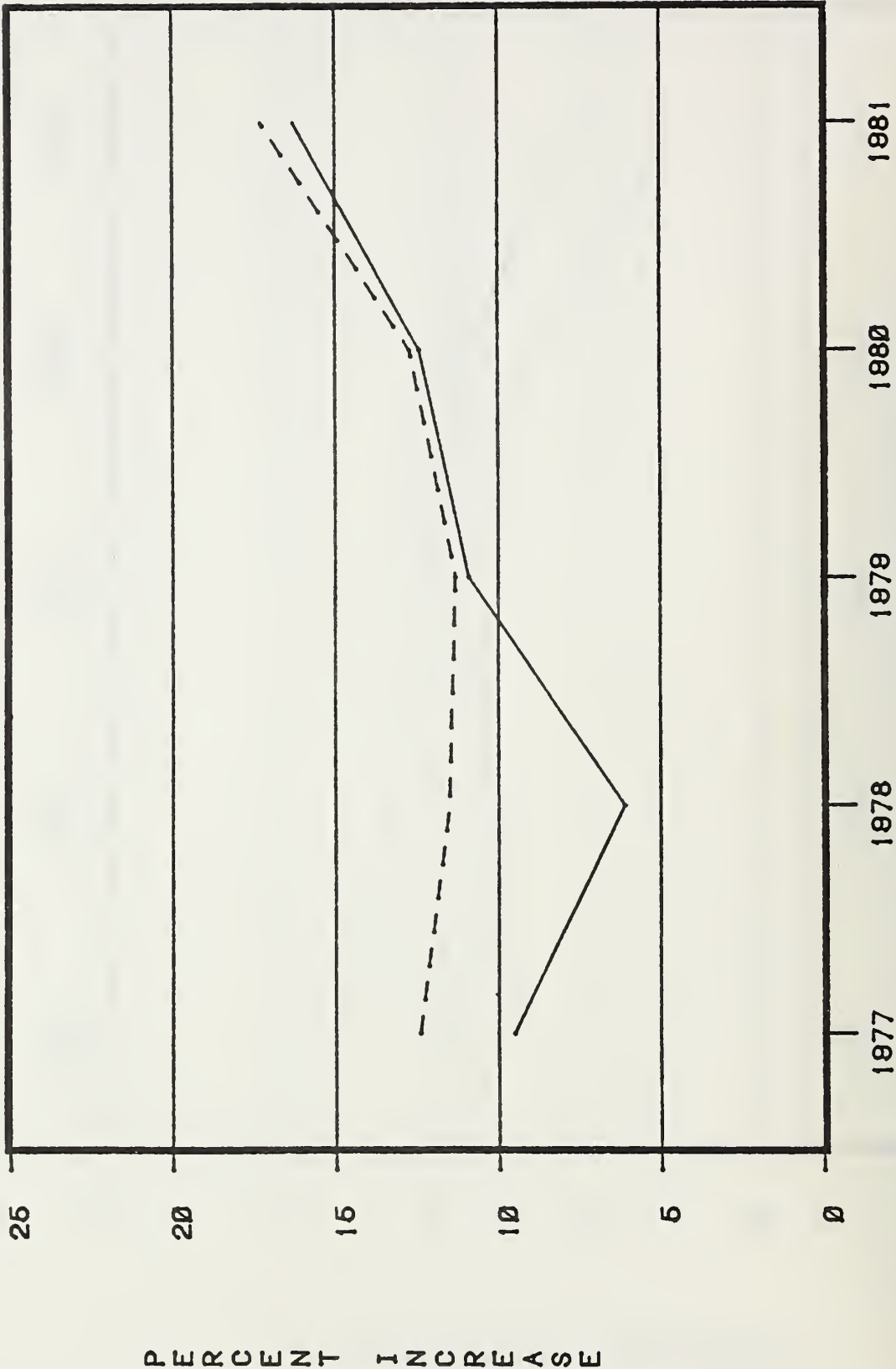
COMMUNITY HOSPITALS



YEAR

NEW YORK
UNITED STATES

COST PER ADMISSION COMMUNITY HOSPITALS



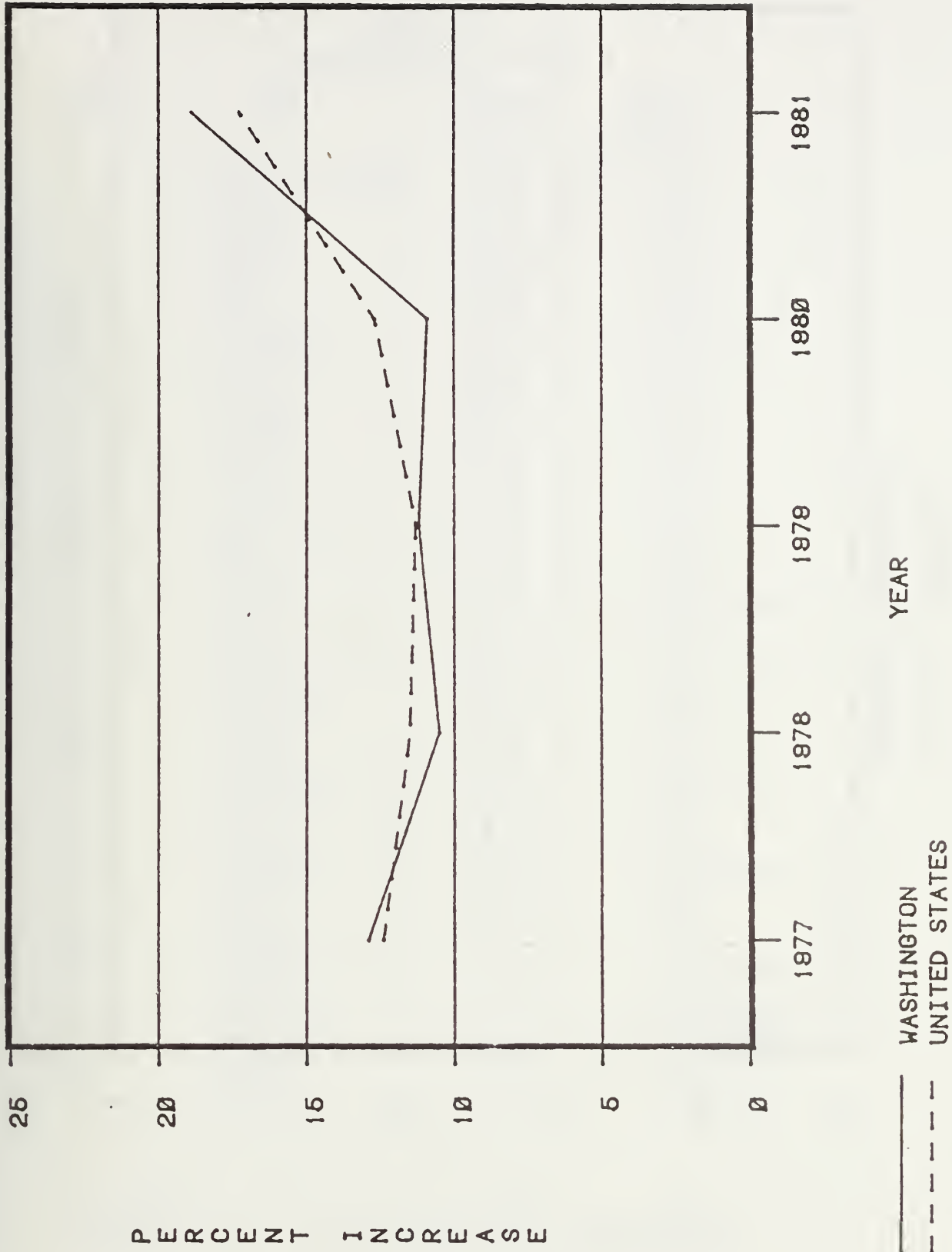
PERCENT INCREASE

YEAR

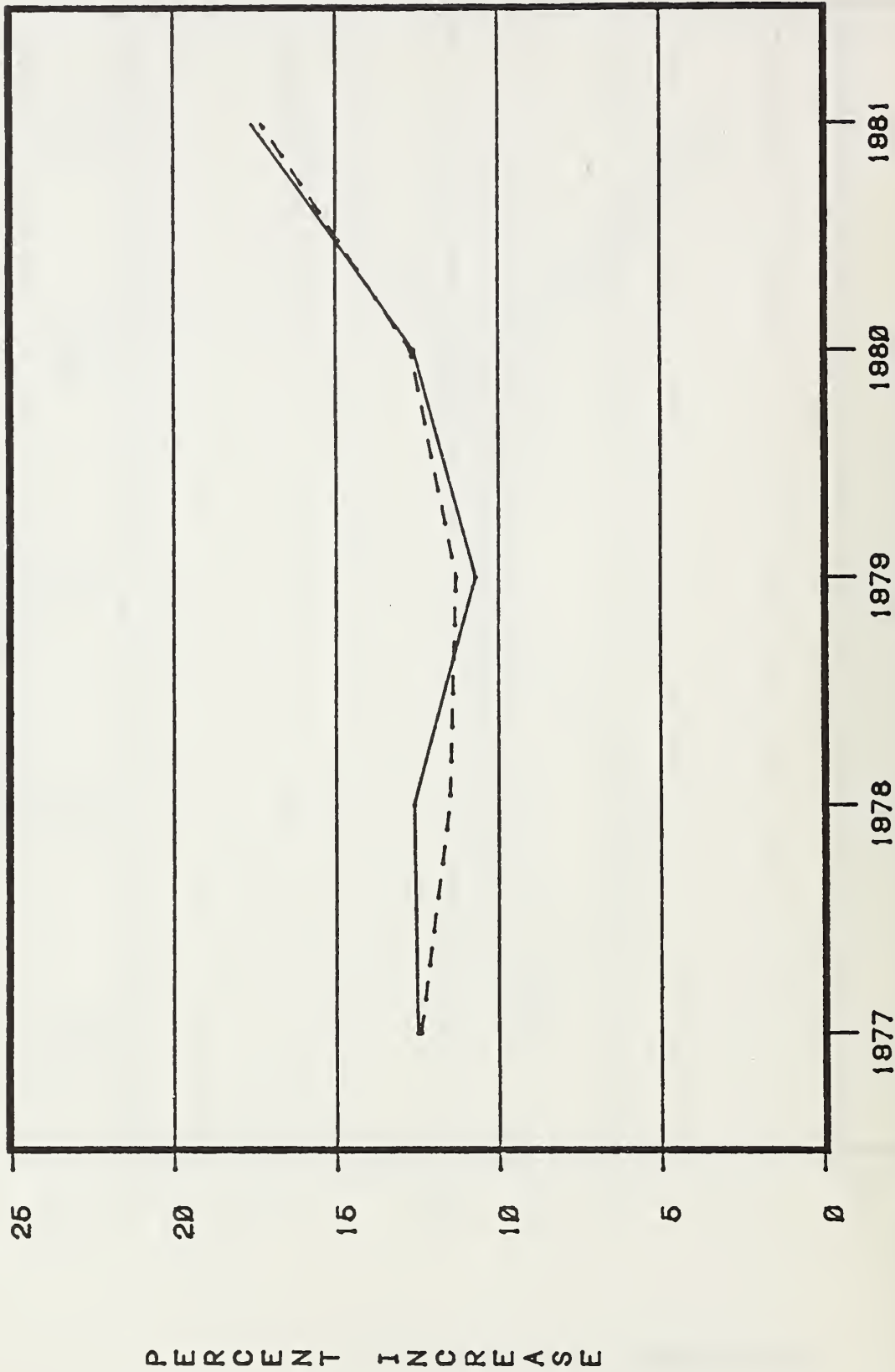
____ RHODE ISLAND
---- UNITED STATES

COST PER ADMISSION

COMMUNITY HOSPITALS



COST PER ADMISSION
COMMUNITY HOSPITALS



WISCONSIN
UNITED STATES

U.S. COMMUNITY HOSPITALS
1975-1980
PERCENT INCREASE
EXPENSE PER ADJUSTED ADMISSION

<u>RANK</u>	<u>STATE</u>	<u>CUMULATIVE INCREASE</u>	<u>ANNUAL INCREASE</u>
1	ALASKA	149.67	20.08
2	DISTRICT OF COLUMBIA	123.12	17.41
3	NEVADA	111.88	16.20
4	NEW MEXICO	111.71	16.18
5	MONTANA	109.36	15.93
6	WYOMING	108.14	15.79
7	HAWAII	107.54	15.72
8	UTAH	104.99	15.44
9	KANSAS	100.13	14.88
10	NORTH DAKOTA	97.30	14.56
11	COLORADO	96.97	14.52
12	SOUTH DAKOTA	96.18	14.43
13	MAINE	96.08	14.42
14	CALIFORNIA	95.23	14.32
15	OKLAHOMA	94.57	14.24
16	MISSOURI	93.22	14.08
17	IDAHO	92.37	13.98
18	ARKANSAS	90.78	13.79
19	ILLINOIS	90.13	13.71
20	IOWA	90.00	13.70
21	WEST VIRGINIA	89.81	13.67
22	OREGON	89.34	13.62
23	TEXAS	88.20	13.48
24	VIRGINIA	88.04	13.46
25	WISCONSIN	87.93	13.45 MANDATORY*
26	ALABAMA	87.73	13.42
27	OHIO	86.57	13.28
28	MINNESOTA	85.14	13.11
29	SOUTH CAROLINA	84.52	13.03
30	PENNSYLVANIA	84.48	13.03
31	LOUISIANA	83.95	12.96
32	INDIANA	83.92	12.96
33	TENNESSEE	83.80	12.95
34	MISSISSIPPI	83.42	12.90
35	NORTH CAROLINA	82.60	12.80
36	KENTUCKY	82.02	12.73
37	ARIZONA	80.69	12.56
38	NEW HAMPSHIRE	78.69	12.31
39	WASHINGTON	78.02	12.23 MANDATORY *
40	FLORIDA	77.98	12.22
41	GEORGIA	77.49	12.16
42	MICHIGAN	76.91	12.09
43	NEBRASKA	74.47	11.77
44	MASSACHUSETTS	72.41	11.51 MANDATORY*
45	NEW JERSEY	68.22	10.96 MANDATORY*
46	DELAWARE	67.56	10.87
47	RHODE ISLAND	67.42	10.86 MANDATORY*
48	MARYLAND	67.23	10.83 MANDATORY*
49	CONNECTICUT	65.51	10.60 MANDATORY*
50	VERMONT	63.14	10.28
51	NEW YORK	51.62	8.68 MANDATORY*

U.S. Average	79.60	12.42
Mandatory	61.83	10.1
Non-Mandatory	86.59	13.29

*Those programs which require hospitals both to participate and comply.

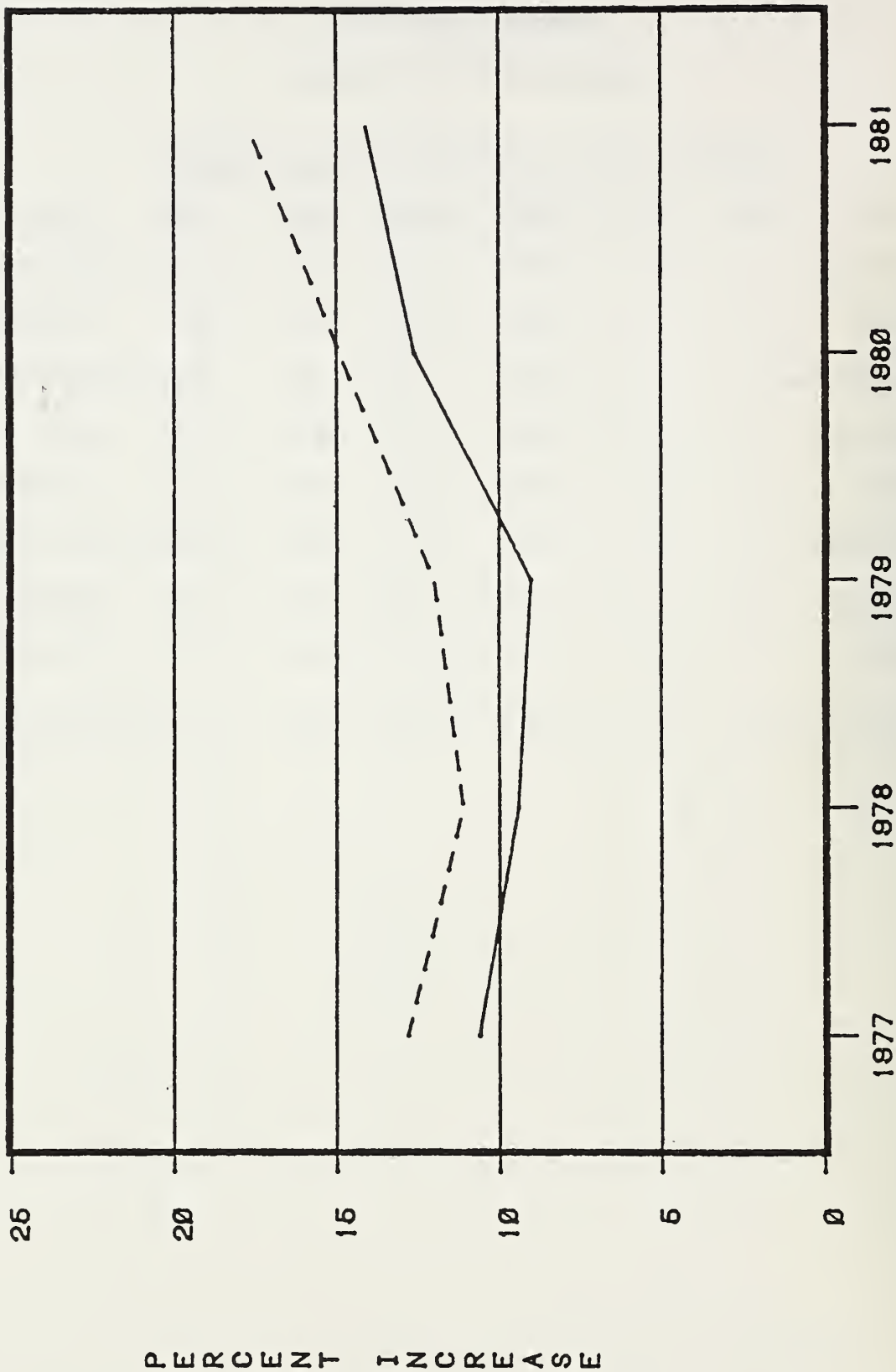
Community Hospitals
Cost Per Adjusted Admission

	<u>Annual Percent Increase</u>				
	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
Connecticut	11.1	9.5	8.1	11.4	15.9
Maryland	8.9	9.2	12.1	9.8	15.6
Massachusetts	13.8	8.1	7.6	14.1	14.1
New Jersey	10.8	8.8	11.2	10.7	11.4
New York	7.0	8.5	8.5	10.8	14.1
Rhode Island	9.5	6.1	10.9	12.4	16.3
Washington	12.9	10.5	11.2	10.9	18.9
Wisconsin	12.5	12.6	10.7	12.6	17.6
United States	12.4	11.5	11.3	12.7	17.3

Community Hospitals
Inpatient Cost Per Capita

	<u>Annual Percent Increase</u>				
	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
Connecticut	10.6	9.4	9.0	12.6	14.1
Maryland	11.3	11.8	15.1	14.5	16.0
Massachusetts	11.9	7.3	8.2	13.9	14.4
New Jersey	11.7	8.8	10.6	15.8	11.5
New York	11.5	7.5	10.0	11.5	15.2
Rhode Island	10.0	6.7	12.9	14.0	15.0
Washington	11.9	7.0	9.1	11.3	21.8
Wisconsin	10.2	11.5	10.8	14.7	16.9
United States	12.8	11.1	12.0	14.9	17.7

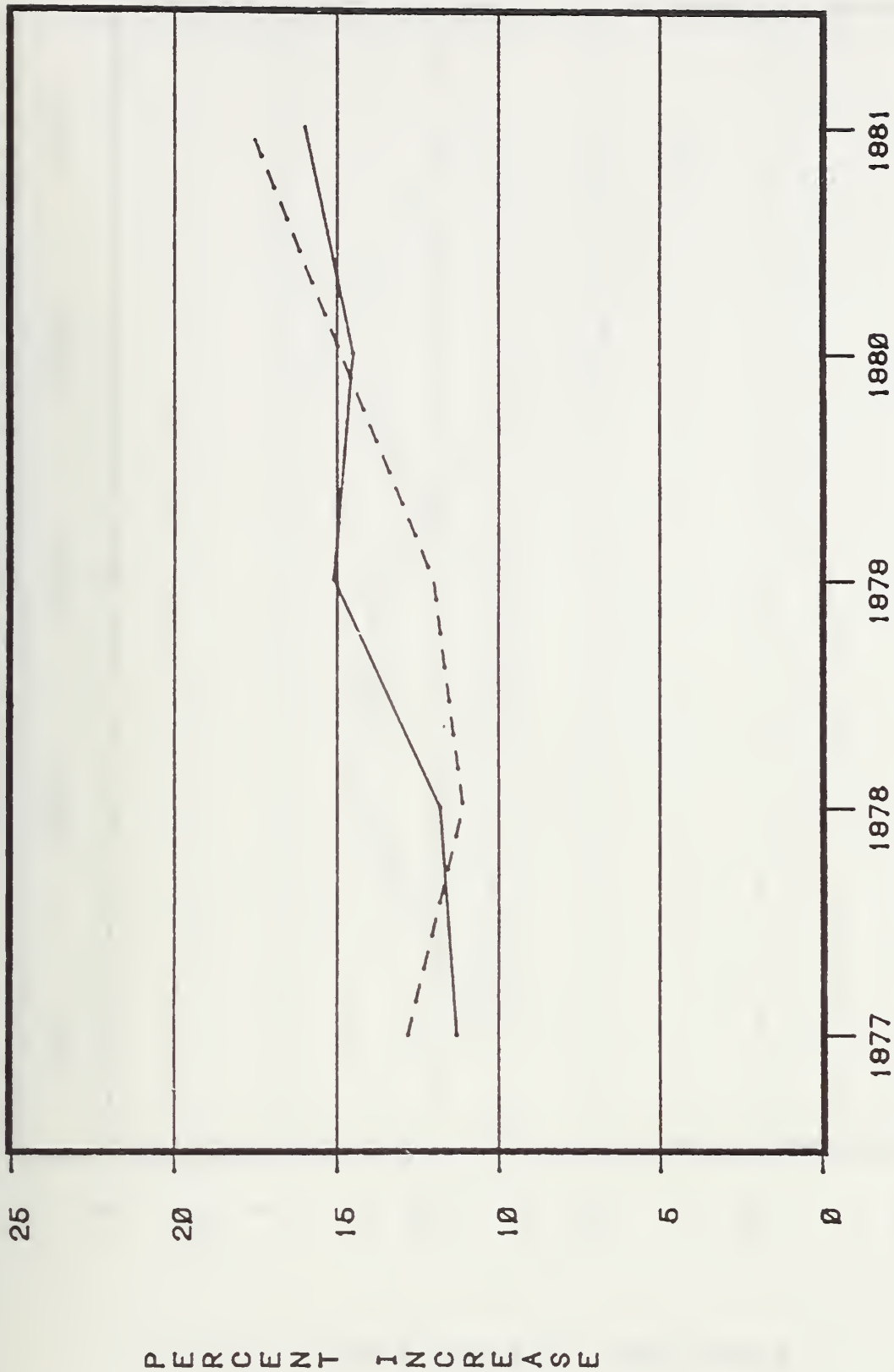
COST PER CAPITA COMMUNITY HOSPITALS



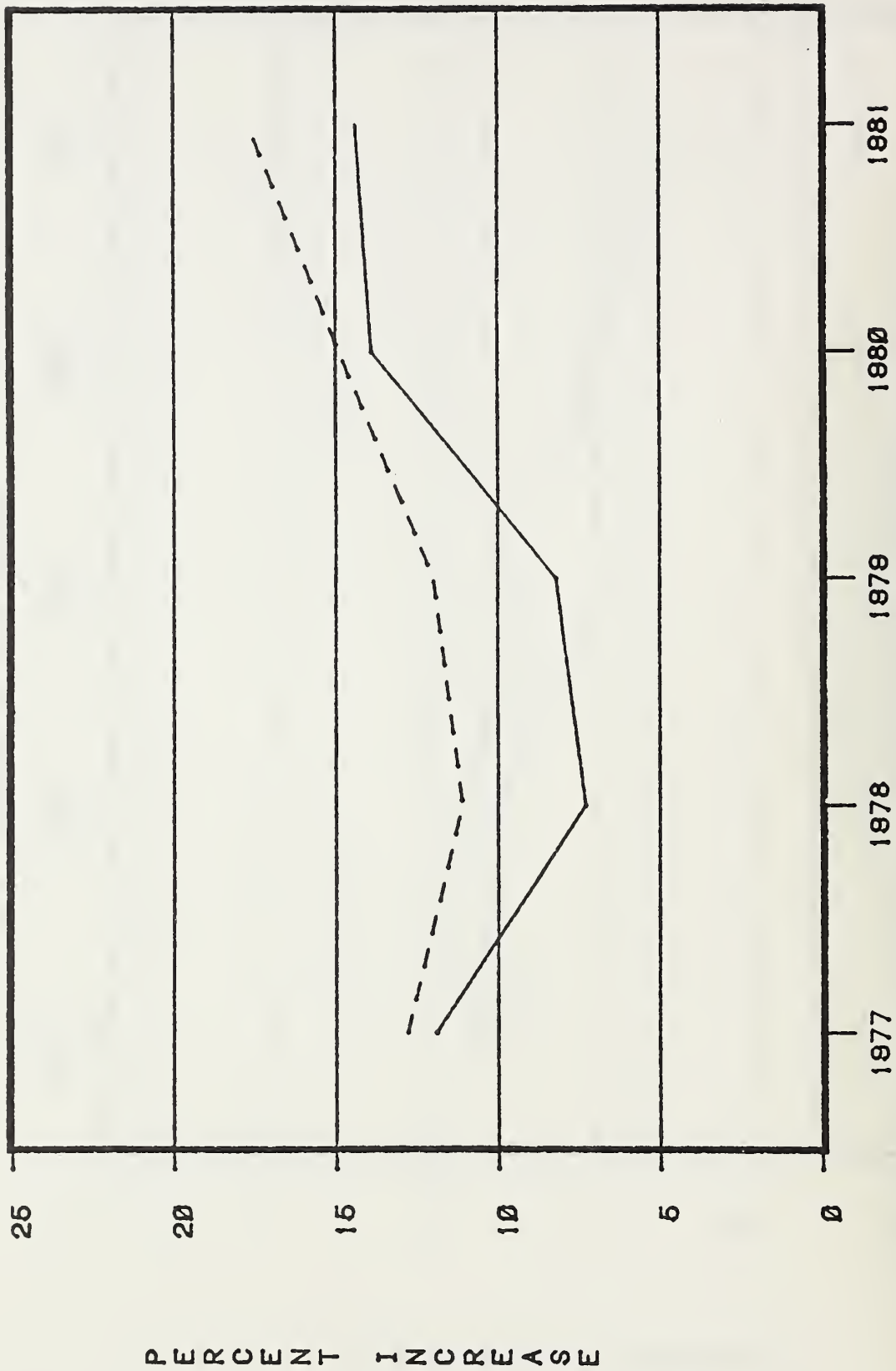
— CONNECTICUT
 - - - UNITED STATES

YEAR

COST PER CAPITA COMMUNITY HOSPITALS

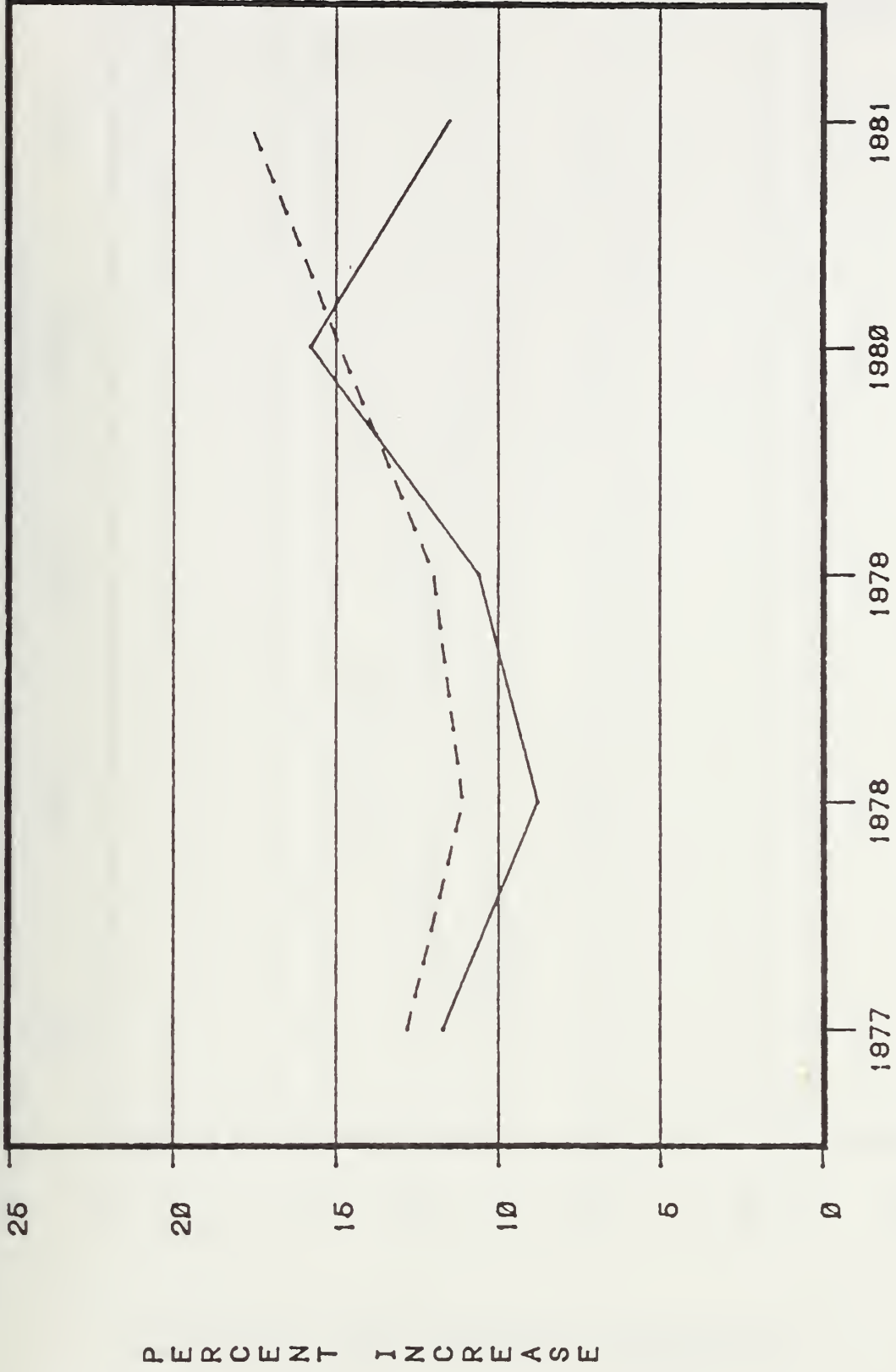


COST PER CAPITA
COMMUNITY HOSPITALS



MASSACHUSETTS
UNITED STATES

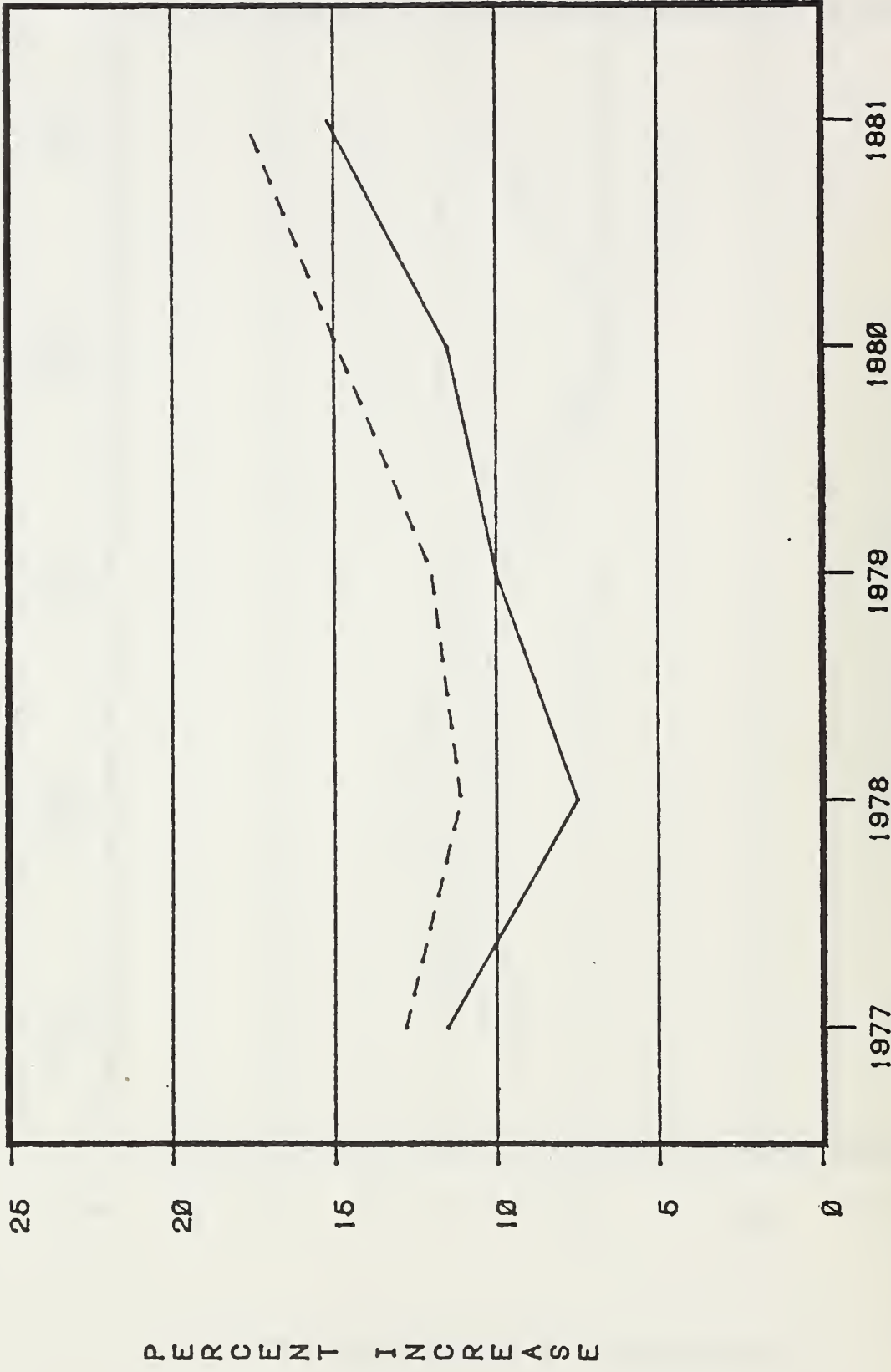
COST PER CAPITA
COMMUNITY HOSPITALS



— NEW JERSEY
-- UNITED STATES

YEAR

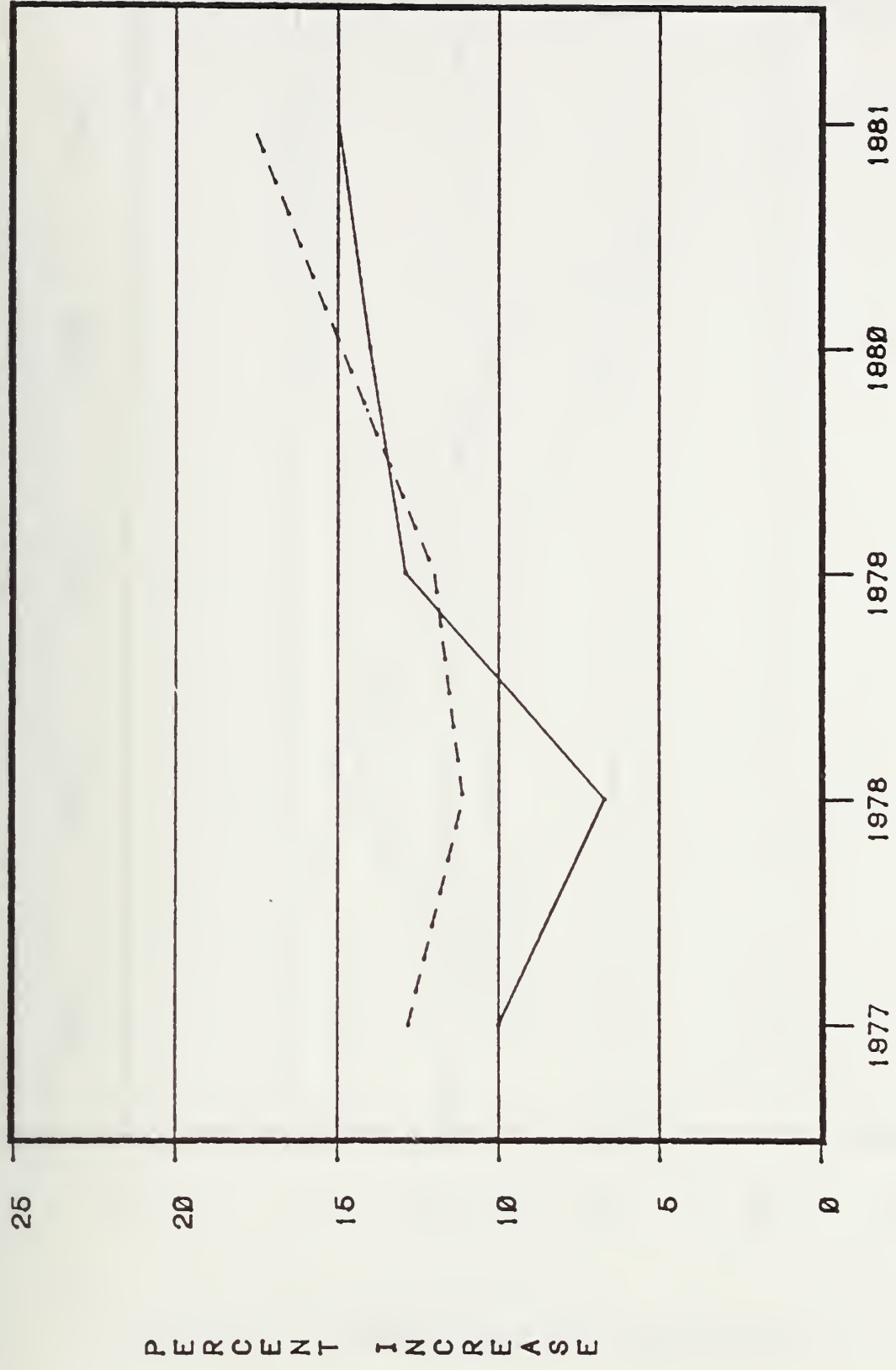
COST PER CAPITA
COMMUNITY HOSPITALS



YEAR

NEW YORK
UNITED STATES

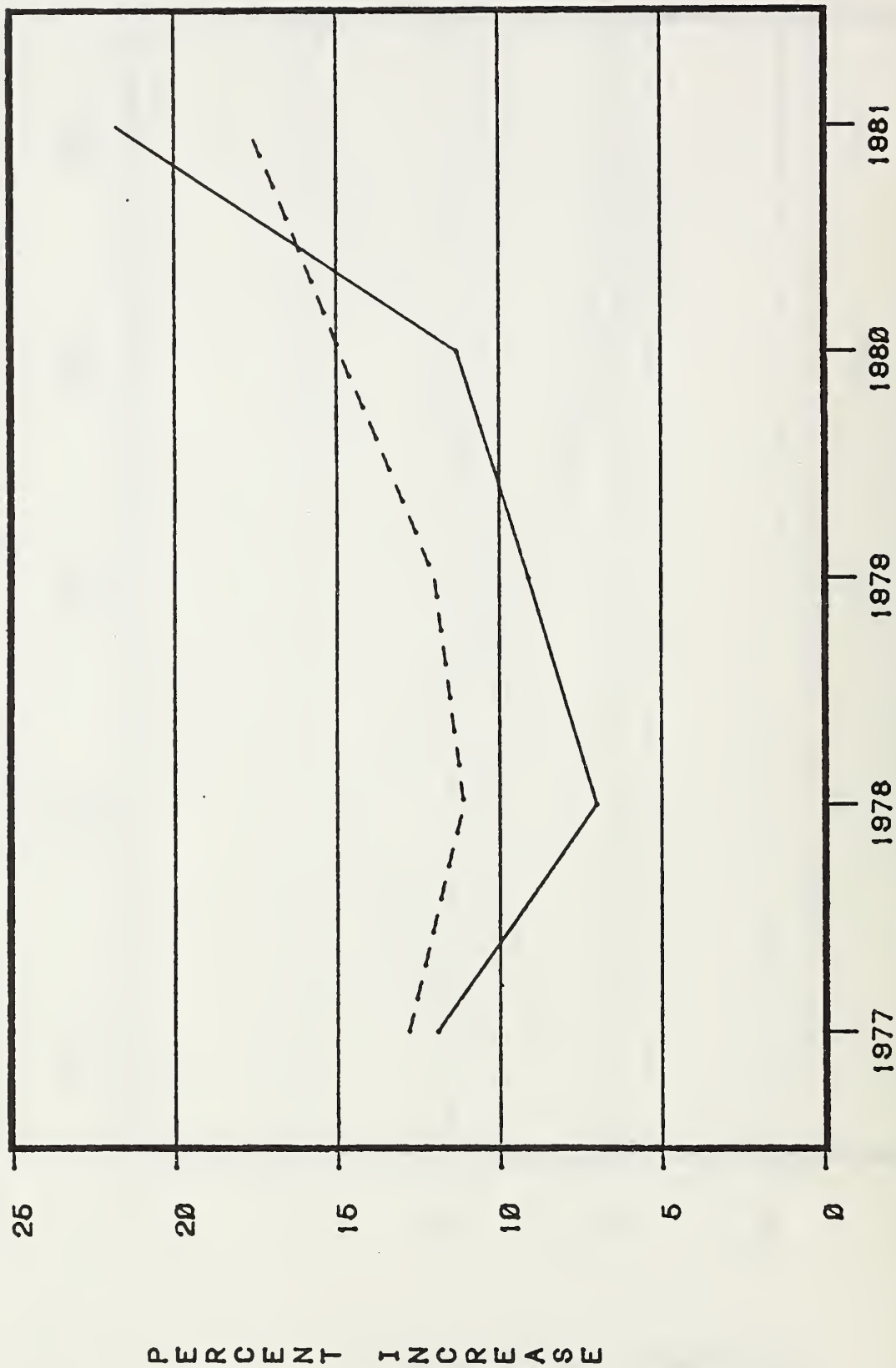
COST PER CAPITA
COMMUNITY HOSPITALS



YEAR

—— RHODE ISLAND
---- UNITED STATES

COST PER CAPITA
COMMUNITY HOSPITALS

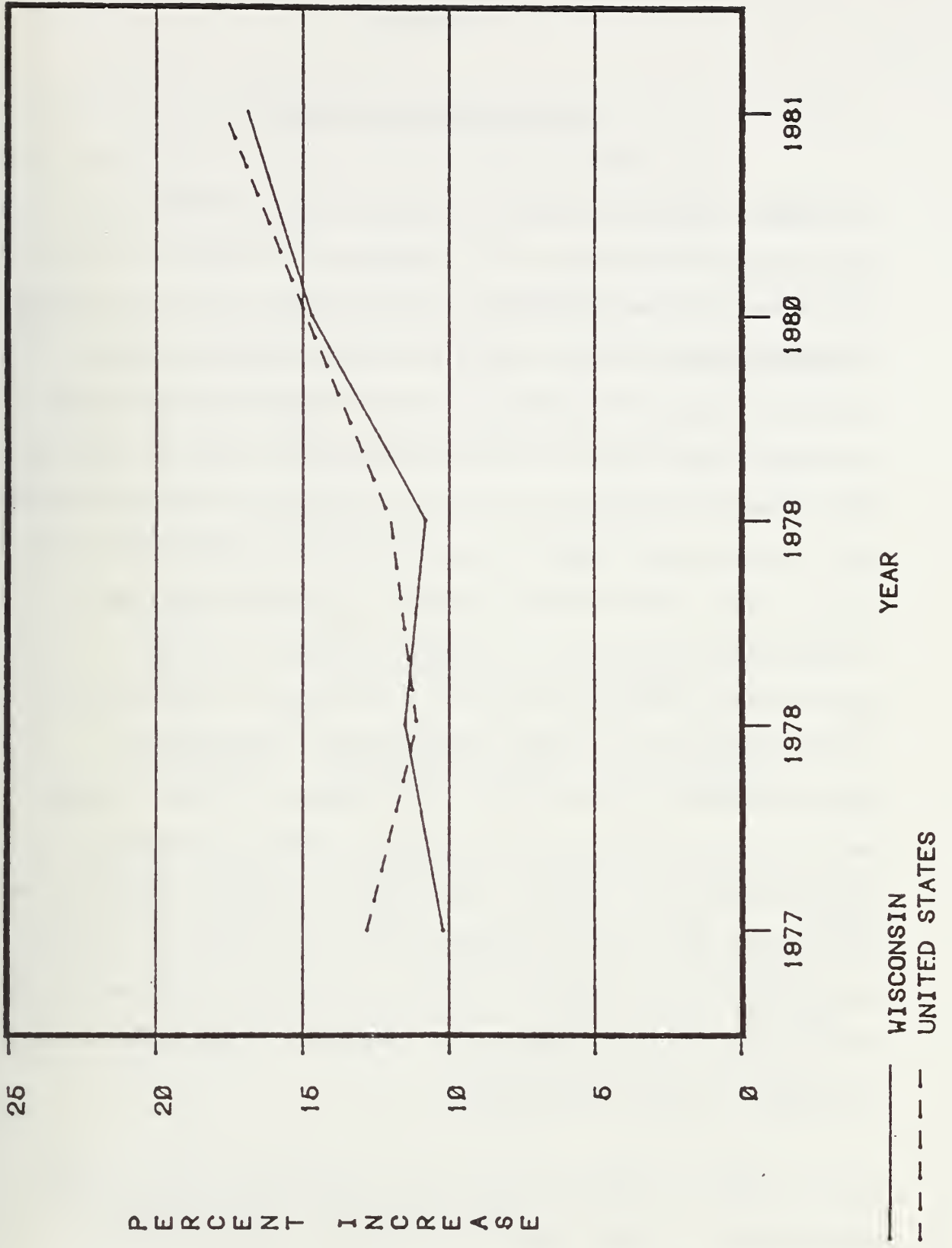


PERCENT INCREASE

YEAR

WASHINGTON
UNITED STATES

COST PER CAPITA
COMMUNITY HOSPITALS



THE MEDICARE CASE MIX INDEX

This Appendix describes the Medicare Hospital case mix index used in implementing Section 101(a) of P.L. 97-248, the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA). By "case mix" is meant the variety of patients (cared for by a hospital) in terms of their diseases, injuries and medical conditions. A case mix index may be defined as: The expected costliness of treating the hospital's case load relative to the national average case mix, computed as if all hospitals face the same set of input prices. However, measuring case mix is difficult. For example, given 8,000 principal diagnoses,* five age classes, two treatment modes, and up to five potential co-morbidities or complications, 400,000 categories would be required to describe all possible combinations of these characteristics. The number of combinations that occur with significant frequency, however, is much smaller, and many of these combinations are similar in quantity of resources required in diagnosis and treatment. Thus, the essence of the problem is to find a method of summarizing this information so that we can predict, for any individual hospital, the relative costliness of the mix of patients that it treats in any given year. This is the purpose of the Diagnosis Related Groups (DRGs).

The first step in resolving this problem is to classify hospital cases into the DRGs. The DRGs reduce the tremendous volume of patient

* The principal diagnosis is defined as "the condition established after study to be chiefly responsible for occasioning the admission of the patient to the hospital for care" (United States National Committee on Vital and Health Statistics, 1972).

information to a much smaller set of 467 distinct patient types. When the DRGs are used with Medicare billing data (the MEDPAR data), approximately 356 DRGs contain significant numbers of Medicare patients.

The second step is to create weights that measure the average cost of treating Medicare patients in each DRG. If we normalize these average cost values by dividing each one by the average cost over all DRGs, then for any hospital (j) we can construct an overall summary measure of the relative costliness of its Medicare case mix. The formula for the hospital's Medicare case mix index is:

$$CMI_j = \frac{\sum_{i=1}^{356} \text{Case proportion}_{ij} \times \text{DRG Weight}_i}{\frac{1}{N} \sum_{j=1}^N \sum_{i=1}^{356} \text{Case proportion}_{ij} \times \text{DRG Weight}_i}$$

That is, multiply the hospital's proportion of Medicare patients in a given DRG by the normalized cost weight associated with that DRG, and sum these products across all DRGs. This sum when divided by the average value over all (N) hospitals gives a measure of the hospital's expected costliness under Medicare, relative to all other hospitals, given its case-mix. In other words, the Medicare case mix index values directly represent the relative costliness of each hospital's mix of cases compared to the average mix of Medicare cases.

Severity of Illness

The use of Diagnosis Related Groups (DRGs) as a basis for setting payment rates for inpatient hospital care has occasionally been criticized on the grounds that DRGs do not fully account for differences between hospitals in the average severity level of their patients. The implication of these criticisms is that hospitals which admit more seriously ill patients could be financially disadvantaged under a system of DRG payment rates. Conversely, hospitals which admit less severely-ill patients could be unduly rewarded under such a payment system.

The extent to which various features of the Medicare Hospital Prospective Payment System (e.g., the treatment of atypical cases and the adjustment for the higher patient care costs associated with graduate medical education programs) protect hospitals from adverse financial consequences has already been discussed in Chapter III in the body of this report. It is clear from that discussion that severity of illness is not a significant issue for most hospitals.

The purpose of this Appendix is three-fold: First, to explore the concept of severity of illness; second, to evaluate the extent to which DRGs account (or fail to account) for differences in severity of illness across patients and hospitals, and; third, to describe and evaluate the major existing methods for severity measurement in terms of their applicability in a hospital payment context.

The Concept of Severity of Illness

Severity of illness is generally defined as the risk of immediate death or permanent loss of function due to the patient's disease. It is a disease-specific concept; a severely-ill patient has a greater risk of death or permanent loss of function compared to other patients with the same disease. Further, it is a concept of risk rather than a concept of resource need or utilization.

These features of the concept of severity of illness present two important difficulties for severity measurement and for the use of such measures in hospital payment systems. First, the risk of death or loss of function is not easily comparable among diseases. For example, how can a ten percent chance of death and a thirty percent chance of partial paralysis for a stroke victim be compared to a fifty percent chance of permanent loss of vision for a trauma patient? Would a ten percent increase in the risk of paralysis represent an equivalent increase in severity of illness compared to a ten percent increase in the chance of vision loss? Although it may be possible to rank patients with the same disease in ascending order of severity of illness, these rankings are not equivalent across diseases.

Second, the relationship between severity of illness and the expected cost of hospital treatment is not uniform either within or across diseases. A more severe cataract may require no more resources in treatment than a less severe case. More severely ill cancer patients may

require more resources, but beyond some point, patients who are even more severely ill may require less resources. Thus, a hospital with a higher concentration of patients with above average severity of illness may have higher or lower average treatment costs than a hospital that has patients with similar diseases but lower severity levels.

DRGs, Severity and Hospital Prospective Payment

As described in Chapter IV, the DRG category definitions are based on principal diagnosis, surgical procedures, comorbid and complicating conditions, patient age and discharge status. Given this basis, prices for the DRGs will account for the major differences in the cost of treatment among patients, due to severity of illness, in three ways.

1. To the extent that different diagnoses are associated with different levels of patient risk that trigger different hospital resource decisions by physicians, the DRG prices will reflect significant differences in average severity and cost. For example, the risks and the resource responses associated with acute myocardial infarction are different from those associated with an upper respiratory infection.
2. Similarly, to the extent that severity of illness is a major factor influencing key treatment strategy decisions between medical and surgical treatment, the DRGs will account for the cost differences

associated with differences in severity. For example, if more severely ill patients with gall bladder disease are much more likely to be treated surgically, the DRG prices will account for the severity related differences in average cost.

3. Finally, to the extent that older patients (age 70 or over) or patients with significant comorbid or complicating conditions tend to be more severely ill and more expensive to treat, separate DRGs have been established to distinguish these patients. For example, a patient treated surgically for gall bladder disease who had chronic obstructive pulmonary disease at admission (a comorbid condition) or who developed pneumonia post surgically (a complicating condition) would be considered to be more severely ill and would probably be more expensive to treat than a patient who only had gall bladder disease. The prices for the DRGs will reflect differences in average cost due to such differences in the average level of severity of illness between the categories.

Thus, the DRGs are defined in such a way that most of the major differences in the cost of treatment that are related to differences among patients in severity of illness and cost of treatment will be reflected in the Medicare DRG prices. Nevertheless, the DRGs do not distinguish the patients who have extremely severe complications (e.g., a patient who is admitted for gall bladder disease with

chronic obstructive pulmonary disease, develops a past surgical pulmonary embolism, followed by pneumonia, then renal failure and death on the 56th day). However, the prospective payment system includes provisions for making additional payments above the DRG price for such atypical cases (or "outliers").

Of course, substantial variation in the cost of treatment among patients and hospitals will remain within most DRG categories. Remaining differences in severity of illness among patients represent only one of many factors that may explain such cost variations. Determining the relative importance of severity differences compared with other factors, such as differences in physician practice patterns with respect to length of stay and ancillary service use, however, is extremely difficult for the reasons explained below.

Current Methods and Limitations of Severity Measurement

Existing methods of severity measurement have been developed along two lines. The disease staging approach is based on the notion of the natural history of a disease. This approach follows early work on the development of stage categories representing a hierarchy of severity levels for cancer and heart patients. More recently, some researchers have attempted to develop a generic method of scoring any patient in terms of severity of illness regardless of disease. Currently available systems for severity measurement and their limitations are described below.

a. SysteMetrics Disease Staging. In this approach, a panel of physicians has defined between four and seven disease stages for each of 406 diseases, resulting in approximately 2,000 categories (Gonnella et al., 1981). Each stage is intended to represent a group of patients with similar severity of illness for a given disease. However, since more than one diagnostic and therapeutic regimen may be associated with any stage of a disease, and since complicating or co-morbid conditions unrelated to the principal disease and type of procedure are not considered in staging, these categories are not homogeneous in treatment services or cost. In addition, accurate assignment of patients to severity stage categories requires that each patient's medical record be examined by specially trained personnel. The potential expense of individual chart review, the large number of categories, and the lack of resource homogeneity of the staging categories effectively eliminate this approach as a candidate for current use in measuring patient severity of illness in a payment context.

b. George Washington University (GWU) Intensive Care Severity Study.

The study was designed to measure severity of illness among patients in hospital special care units (Knaus et al., 1981). Objective indicators (clinical test scores) of the necessity of intensive care were developed and successfully tested in two hospitals. This project was not intended to develop a measure applicable over all patients, or for use in a reimbursement context. Nevertheless, this method is highly promising for

eventual use in classifying patients for payment. Expanding this method beyond the special care setting, however, would require a major effort over a significant period of time. Even then, the severity scores would need to be integrated with other information to classify patients. Finally, beyond this developmental work, this system would require significant changes to the current discharge abstract in order to collect the relevant test scores. Thus, this method has not been developed to the point where it could be widely applied in hospital payment systems.

c. Johns Hopkins' Severity Score. This approach is designed to measure severity of illness for all hospital inpatients regardless of their principal disease (Horn et al., 1981). The basic method involves assigning a severity score to each case based on examination of the patient's medical record. This measure is based on seven variables: stage of the principal disease (discharge diagnosis), other interacting comorbid diseases, complications resulting from the principal diagnosis, dependency on the nursing staff, non-operating room procedures, rate of response to therapy and residual impairment following therapy. Each of these dimensions (patient characteristics, illness under treatment and response to treatment) is subjectively rated on a scale of 1 to 4 after examination of the patient's medical chart. The rater then designates an overall severity score from 1 to 4 based on his own implicit weighting of the component variables.

This method presents three major difficulties in terms of immediate use in a hospital payment system. First, the scoring is subjective. Even with very carefully trained raters, it would be very difficult to evaluate a chart for a patient who received many inpatient services without giving that case a high severity score. In this sense, the method is potentially circular; if the patient received many services, that implies he must have been severely ill. The scoring is also open to confounding in the sense that a patient who had complications and a slow response to therapy may not have been severely ill to begin with, but instead received poor quality care. Thus, the validity of severity scores based on this method is open to question.

Second, even if the scores were unambiguous indicators of severity, the relationship between severity of illness and cost of treatment is not uniform across disease entities. Thus, the user of this method faces the problem of how to aggregate the severity scores in some fashion that will permit their use in hospital payment. Third, this method (like the others above) requires individual chart review which is expensive and time consuming. It would also require collection of patient ratings on the current discharge abstract on hospital bill for all patients.

Thus, this method does not appear to provide a valid and effective method of severity measurement for use in a hospital payment system at this time.

Conclusion

Over the last decade HCFA has provided extensive support for research aimed at the development of patient classification systems and for experimentation with such systems in hospital payment applications. Despite hundreds of thousands of dollars of research into how to measure illness severity in a manner which yields results applicable for use in a hospital payment system context--no suitable severity measurement technique of this kind has yet emerged. HCFA will continue to support such research in the future with special emphasis on the refinement of the DRGs and severity of illness measurement methods that might be applicable in hospital payment systems. However, given the obvious need to promptly begin paying for hospital inpatient care on a prospective basis, the Department's PPS will not make any payment adjustments for differences in severity of illness beyond the DRG definitions, except for the treatment of atypical cases and the adjustment for the higher patient care costs associated with hospitals that conduct general medical education programs.

APPENDIX D

A Comparison of Measures of Central Tendency

The distribution of length of stay (LOS) and cost per discharge across cases can be decidedly non-normal in that they contain a scattering of cases at the high (expensive) end which is not matched at the low end. This is typical of all kinds of economic data, e.g., income, sales, production costs. It occurs because, while there is no limit to how high costs can be, costs can never be below zero. This skewing makes the selection of outliers on a statistical basis somewhat difficult. If, for instance, the three standard deviation rule (where outliers are defined as cases for which costs are outside the boundary of the mean cost per case plus or minus three times the standard deviation of cost per case) is applied, it is very likely that no cases will be outliers at the lower end because the mean less three standard deviations is likely to be a negative number.

In one solution to this problem, the distribution of cost per case (by the number of cases) is converted to a distribution of the logarithms (logs) of cost per case. This converts the non-normal arithmetic distribution to what is hoped to be a statistically normal distribution of logarithms (logs) of cost per case. Taking three standard deviations around the mean of the distribution of the logarithms of cost per case produces sensible definitions of outliers, in that no negative numbers are involved and the percent of cases outside these limits is more predictable.

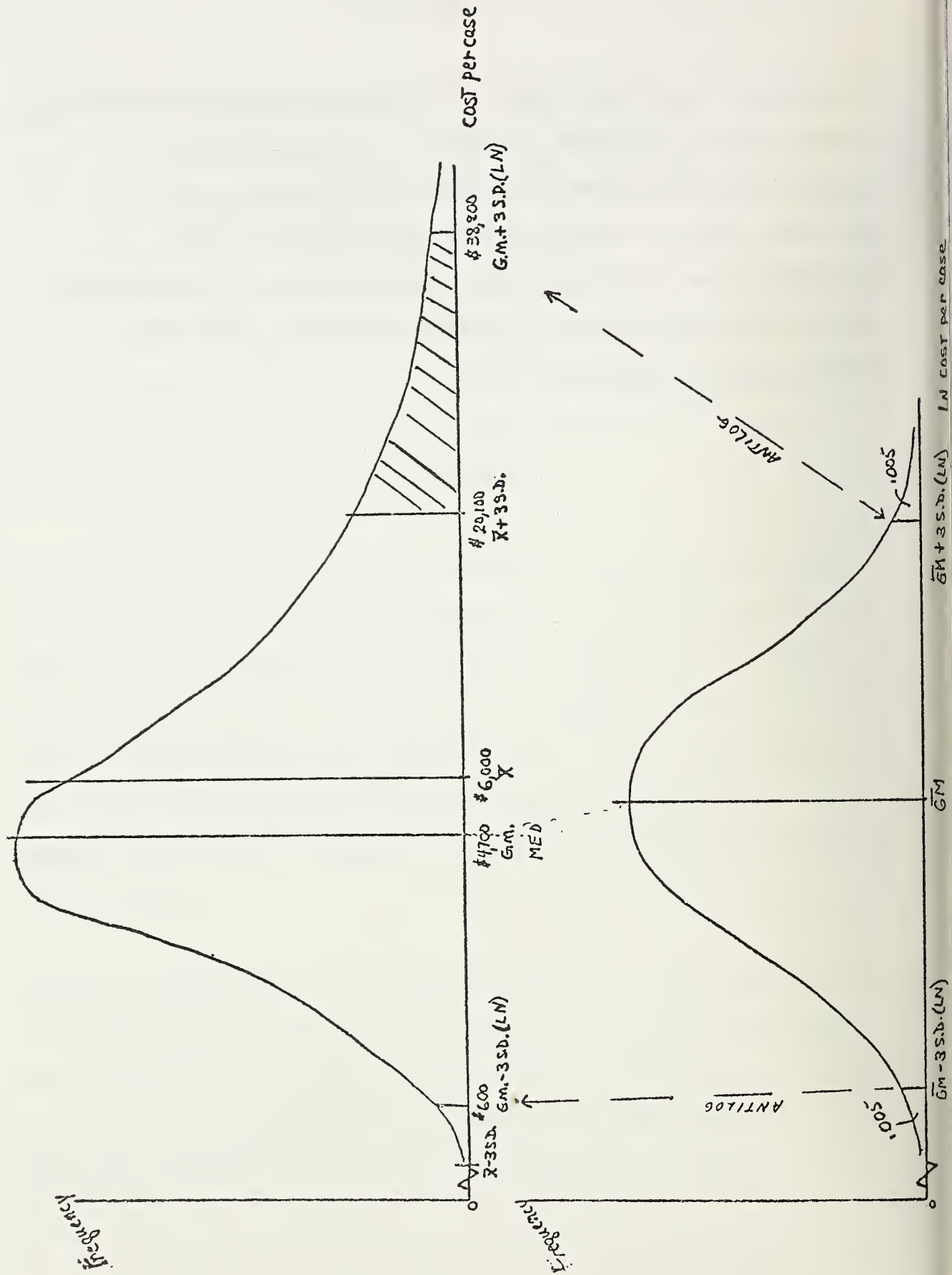
Translating the logarithmic distribution outlier cutoff points back into regular dollar values (the antilogarithms of the cutoff points) yields cutoff points that are asymmetric. That is, they are not balanced around the arithmetic mean. For our purposes this is desirable because it defines the upper cutoff to be well above the average cost per case while the lower cutoff is placed closer to the mean. Thus, this method recognizes that the distribution is asymmetric and defines appropriate cutoff points which are more likely to place an equal percent of the observations in each tail of the distribution.

The chart which follows illustrates (but not to exact scale) two curves representing the distribution of hospital costs for a hypothetical case type. The top curve portrays the arithmetic distribution and a measure of its central tendency, an arithmetic mean of \$6,000. There is an implied standard deviation (S.D.) from the mean of \$3,700. Using the conventional formula of the mean \pm three standard deviations yields a negative cut-off point on the left-hand side and a \$20,100 cut-off on the right-hand side.

To get the geometric mean from a highly skewed nominal distribution in hospital cost data, one first transforms the data to a logarithmic scale which when plotted, is more normally distributed (see bottom curve). The mean of this distribution (LN) when carried back to the original distribution (\$4,700 in the example) is the geometric mean (G.M.).

This figure is equal to the median (MED) in the top curve. Note that the arithmetic mean (\bar{X} at \$6,000) is larger than the geometric mean (\$4,700). In addition, when the outlier cutoffs at each end of the logarithmic scale are transferred from the log to the original distribution, the result is an equal number of cases falling outside the cut-off points on both ends of the distribution (below \$600 or over \$38,800 in this illustration).

HYPOTHETICAL DISTRIBUTION OF HOSPITAL STAYS



APPENDIX E

MEDPAR RECORD DESCRIPTION - 20% SAMPLE

<u>Information</u>	<u>Description</u>
1. HI Claim Number	Beneficiary's Health Insurance Claim Number
2. Age	Age as of last birthday on date of admission
3. Sex	-Male -Female
4. Race	-White -Black -Other -Unnkown
5. Medicare Status Code	-Aged -Aged with End Stage Renal Disease -Disabled -Disabled with End Stage Renal Disease -End Stage Renal Disease Only
6. Beneficiary's State and County Code of Residence	SSA Geographic Codes
7. Beneficiary's Zip Code	Actual 5 digit code
8. Day of Admission	Sunday Monday Tuesday Wednesday Thursday Friday Saturday
9. Discharge Status	-Discharged alive -Dead

Source: Bureau of Data Management and Strategy Internal Briefing Memo.

<u>Information</u>	<u>Description</u>
10. PSRO of Provider (Professional Standards Review Organization)	Actual Number
11. Medicare Provider Number	Identification Number of the provider submitting the claim
12. Date of Admission	Year and Julian date beneficiary was admitted to provider's care
13. Date of Discharge	Year and Julian date beneficiary left the provider's care or died
14. Length of Stay	Total length of the hospital stay. Date of admission through date of discharge
15. Covered Days	Number of covered days in the stay
16. Coinsurance Days	Coinsurance days used in the stay
17. Lifetime REserve Days	Lifetime reserve days used in the stay
18. Total Charges	Total amount of all expenses in this stay
19. Covered Charges	Amount of covered charges in this stay

<u>Information</u>	<u>Description</u>
20. Amount Reimbursed	Amount of reimbursement for this stay. The reimbursement amounts shown are interim payments made to the hospital. Final reimbursement is made on a cost basis based on the cost report each hospital is required to prepare at the end of their fiscal year.
21. Intensive Care and Coronary Care Days	Total days obtained from HCFA-1453, Lines 19B, 19C, and 19D.
22. Total Accomodation Charges	Total amount of all accomodation charges obtained from HCFA-1453, Lines 19B, 19C, and 19D.
23. Total Departmental (Ancillary)	Total amount of all ancillary charges obtained from HCFA-1453, sum of Lines 19H through 19T.
24. Intensive Care and Coronary Care Charges	Total charges obtained from HCFA-1453, Lines 19E and 19F.
25. Operating Room Charges	Charges obtained from HCFA-1453, Line 19H.
26. Pharmacy Charges	Charges obtained from HCFA-1453, Line 19L.
27. Laboratory Charges	Charges obtained from HCFA-1453, Line 19N.
28. Radiology Charges	Charges obtained from HCFA-1453, Line 19M.
29. Suplies Charges HCFA-1453,	Charges obtained from Line 190.

<u>Information</u>	<u>Description</u>
30. Anesthesia Charges	Charges obtained from HCFA-1453, Line 19I
31. Inhalation Therapy Charges	Charges obtained from HCFA-1453, Line 19S
32. Type of Hospital	<ul style="list-style-type: none"> -General Short Term -General Long Term -Tuberculosis -Psychiatric -Chronic Disease -Specialty Short Term -Christian Science -Other
33. Number of Facilities and Services	Actual number of facilities and services available to the beneficiary by this provider.
34. Medical School Affiliation	<ul style="list-style-type: none"> -No -Yes
35. Adult Bed Capacity	Actual number of certified hospital beds in this provider.
36. Type of Control	<ul style="list-style-type: none"> -Government -Church -Proprietary -Federal -Other non-profit
37. Principal Diagnosis	ICD-9-CM code
a. Source of Coding	Indicates where the diagnosis was coded <ul style="list-style-type: none"> -Provider -HCFA (Central Office)
38. Additional Diagnosis Indicator	<ul style="list-style-type: none"> -Yes -No -Unknown

<u>Information</u>	<u>Description</u>
39. Date of Surgery	Date surgery was performed
40. Principal Surgical Procedure Code	ICD-9-CM Volume III
a. Source of Coding	Indicate where the surgery was coded -Provider -HCFA (Central Office)
41. Additional Surgery Indicator	-Yes -No -Unknown
42. Surgery Indication	-Yes -No
43. Blood Furnished (Pints)	Whole Pints

APPENDIX F

Exclusion of Some DRGs

When HCFA calculated DRG weights for TEFRA cost limits 111 of the 467 New DRGs were eliminated. The 111 DRGs eliminated represent less than one percent of the Medicare (total admissions) less than one percent of Medicare reimbursements. The three reasons why DRGs were eliminated are presented in this appendix. Eventually all DRGs must have a price. This is important if the prospective payment system is to have a method of payment for the complete set of DRGs. The three reasons are:

- 1) Nine pairs of DRGs were combined to form nine more general categories because the MEDPAR data do not contain the necessary information to distinguish one DRG from another. This results in nine fewer DRGs. For example, in the circulatory diseases, Major Diagnostic Category (MDC), cardiac catheterization is used to distinguish coronary bypass patients. The procedure code for catheterization would appear as the second listed code. Because the MEDPAR record contains only one procedure code, designation of DRGs on catheterization is not possible.

When the full Uniform Hospital Discharge Data Set (UHDDS) for all Medicare patients is obtained, this problem area will be resolved. The UHDDS contains all of the necessary information to operate the complete DRG grouper program.

- 2) Sixty-four DRGs had too few MEDPAR cases to provide a reliable price. An example is DRG number 29, coma without a secondary diagnosis.

When final PPS rates are constructed, HCFA will combine two years of MEDPAR data. This should allow for more complete DRG development. Relative prices for at least half of these 64 very infrequent DRGs could be calculated using this technique. The remaining 32 (or so) DRGs will be treated as "no case" DRGs.

- 3) Thirty-eight DRGs had no cases in the MEDPAR file. An example is DRG number 30, coma--age less than 17. In the future, we should be able to match the New Jersey relative prices to our DRG price index. This would let us use New Jersey data to set prices for empty Medicare DRGs.

Summary of Causes:

Combined DRGs	9
Too Few Cases	64
No Cases	<u>38</u>
	111

APPENDIX G

Listing of Twenty-Three Major Diagnostic Categories

Major Diagnostic Category Number	Major Diagnostic Category English Description
01	Diseases and Disorders of th Nervous System
02	Diseases and Disorders of the Eye
03	Diseases and Disorders of the Ear, Nose and Throat
04	Diseases and Disorders of the Respiratory System
05	Diseases and Disorders of the Circulatory System
06	Diseases and Disorders of the Digestive System
07	Diseases and Disorders of the Hepatobiliary System and Pancreas
08	Diseases and Disorders of the Musculoskeletal System and Connective Tissue
09	Diseases and Disorders of Skin, Subcutaneous Tissue and Breast
10	Endocrine, Nutritional, and Metabolic Diseases and Disorders
11	Diseases and Disorders of the Kidney and Urinary Tract
12	Diseases and Disorders of the Male Reproductive System
13	Diseases and Disorders of the Female Reproductive System
14	Pregnancy, Childbirth and the Puerperium System
15	Newborns and Other Neonates with Conditions Originating in the Perinatal Period
16	Diseases and Disorders of the Blood and Blood- Forming Organs and Immunological Disorders
17	Meloproliferative Diseases and Disorders and Poorly Differentiated Neoplasms
18	Infectious and Parasitic Diseases (Systemic or Unspecified Sites)
19	Mental Diseases and Disorders
20	Substance Use and Substance Induced Organic Mental Disorders
21	Injuries, Poisonings and Toxic Effects of Drugs
22	Burns
23	Factors Influencing Health Status and Contacts with Health Services

APPENDIX H^{*}

An Example of DRG Construction

5

Overview

The application of guidelines used in the formation of DRGs can best be illustrated in the context of an example: the classification of patients in MDC 11, Diseases and Disorders of the Kidney and Urinary Tract. This category contains patients with a principal diagnosis (ICD-9-CM codes) contained in Table .4. The formation of the DRGs from this Major Diagnostic Category is summarized in the tree diagrams in Figures .1 and .2. In

*Appendix H is taken directly from the Yale University Final Report, "The New ICD-9-CM Diagnosis Related Groups Classification Scheme", which was prepared by the ICD-9-CM Project Staff of the Yale School of Organization and Management under Health Care Financing Administration grant number 95-P-97499, May, 1982.

Table .4

Listing of the Assignment of ICD-9-CM
Diagnosis Codes with English Descriptions to
MDC 11 Diseases and Disorders of the Kidney
and Urinary Tract

Diagnosis Code	Abbreviated CPHA English Description	Diagnosis Code	Abbreviated CPHA English Description
V420	KIDNEY TRANSPLANT STATUS	01694	GU TB NOS-MICRO DX
V435	BLADDER REPLACEMENT NEC	01694	GU TB NOS-CULT DX
V536	FITTING URINARY DEVICES	01695	GU TB NOS-HISTO DX
V555	ATTEN TO CYSTOSTOMY	0169e	GU TB NOS-OTH TEST
V556	ATTEN TO URINOSTOMY NEC	03284	DIPHYTERIC CYSTITIS
V560	ADMIT FOR RENAL DIALYSIS	078e	HEM NEPHROSNEPHRITIS
V568	AFTERCARE-DIALYSIS NEC	0954	SYPHILIS OF KIDNEY
V594	KIDNEY DONOR	09811	GC CYSTITIS (ACUTE)
01600	TB OF KIDNEY-UNSPEC	09830	CHR GC UPPER GU NOS
01601	TB OF KIDNEY-NO EXAM	09831	GC CYSTITIS, CHRONIC
01602	TB OF KIDNEY-EXAM UNKN	1200	SCHISTOSOMA HAEMATOBIMUM
01603	TB OF KIDNEY-MICRO DX	1372	LATE EFFECT GU TB
01604	TB OF KIDNEY-CULT DX	1880	MAL NEO BLADDER-TRIGONE
01605	TB OF KIDNEY-HISTO DX	1881	MAL NEO BLADDER-DOME
01606	TB OF KIDNEY-OTH TEST	1882	MAL NEO BLADDER-LATERAL
01610	TB OF BLADDER-UNSPEC	1883	MAL NEO BLADDER-ANTERIOR
01611	TB OF BLADDER-NO EXAM	1884	MAL NEO BLADDER-POST
01612	TB OF BLADDER-EXAM UNKN	1885	MAL NEO BLADDER NECK
01613	TB OF BLADDER-MICRO DX	1886	MAL NEO URETERIC ORIFICE
01614	TB OF BLADDER-CULT DX	1887	MALIG NEO ORACHUS
01615	TB OF BLADDER-HISTO DX	1888	MALIG NEO BLADDER NEC
01616	TB OF BLADDER-OTH TEST	1889	MALIG NEO BLADDER NOS
01620	TB OF URETER-UNSPEC	1890	MALIG NEOPL KIDNEY
01621	TB OF URETER-NO EXAM	1891	MALIG NEO RENAL PELVIS
01622	TB OF URETER-EXAM UNKN	1892	MALIG NEOPL URETER
01623	TB OF URETER-MICRO DX	1893	MALIG NEOPL URETHRA
01624	TB OF URETER-CULT DX	1894	MAL NEO PARAURETHRAL
01625	TB OF URETER-HISTO DX	1898	MAL NEO URINARY NEC
01626	TB OF URETER-OTH TEST	1899	MAL NEO URINARY NOS
01630	TB URINARY NEC-UNSPEC	1980	SECOND MALIG NEO KIDNEY
01631	TB URINARY NEC-NO EXAM	1981	SEC MALIG NEO URIN NEC
01632	TB URINARY NEC-EXAM UNKN	2230	BENIGN NEOPLASM KIDNEY
01633	TB URINARY NEC-MICRO DX	2231	BENIGN NEO RENAL PELVIS
01634	TB URINARY NEC-CULT DX	2232	BENIGN NEOPLASM URETER
01635	TB URINARY NEC-HISTO DX	2233	BENIGN NEOPLASM BLADDER
01636	TB URINARY NEC-OTH TEST	22381	BENIGN NEOPLASM URETHRA
01690	GU TB NOS-UNSPEC	22389	BENIGN NEO URINARY NEC
01691	GU TB NOS-NO EXAM	2239	BENIGN NEO URINARY NOS
01692	GU TB NOS-EXAM UNKN	2337	CA IN SITU BLADDER NEC
		2339	CA IN SITU URINARY NEC

Table .4 (Continued)

Diagnosis Code	Abbreviated CPHA English Description	Diagnosis Code	Abbreviated CPHA English Description
2367	UNC BEHAV NEO BLADDER	5832	MEMBRANOPROLIF NEPHR NOS
23690	UNC BEHAV NEO URINAR NOS	5834	RAPIDLY PROG NEPHRIT NOS
23691	UNC BEHAV NEO KIDNEY	5836	RENAL CORT NECROSIS NOS
23699	UNC BEHAV NEO URINAR NEC	5837	NEPHR NOS/MEDULL NECROS
2394	BLADDER NEOPLASM NOS	58381	NEPHRITIS NOS IN OTH DIS
2395	OTHER GU NEOPLASM NOS	58389	NEPHRITIS NEC
2710	GOUTY NEPHROPATHY NOS	5839	NEPHRITIS NOS
2711	URIC ACID NEPHROLITHIAS	5845	LOWER NEPHRON NEPHROSIS
2719	GOUTY NEPHROPATHY NEC	5846	AC RENAL FAIL, CORT NECR
30650	PSYCHOGENIC GU DIS NOS	5847	AC REN FAIL, MIDULL NECR
30653	PSYCHOGENIC DYSURIA	5848	AC RENAL FAILURE NEC
30659	PSYCHOGENIC GU DIS NEC	5849	ACUTE RENAL FAILURE NOS
34461	NEUROGENIC BLADDER	585	CHRONIC RENAL FAILURE
4030	MAL HYPERTENS RENAL DIS	586	RENAL FAILURE NOS
4031	BENIGN HYPERT RENAL DIS	587	RENAL SCLEROSIS NOS
4039	HYPERTENS RENAL DIS NOS	5880	RENAL OSTEODYSSTROPHY
4401	RENAL ARTERY ATHEROSCLER	5881	NEPHROGEN DIABETES IMBIP
4421	RENAL ARTERY ANEURYSM	5888	IMPAIRED RENAL FUNCT NEC
4473	RENAL ARTERY HYPERPLASIA	5889	IMPAIRED RENAL FUNCT NOS
4533	RENAL VEIN THROMBOSIS	5890	UNILATERAL SMALL KIDNEY
5800	AC PROLIFERAT NEPHRITIS	5891	BILATERAL SMALL KIDNEYS
5804	AC RAPD LY PROGR NEPHRIT	5899	SMALL KIDNEY NOS
58081	AC NEPHRITIS IN OTH DIS	59000	CHR PYELONEPHRITIS NOS
58089	ACUTE NEPHRITIS NEC	59001	CHR PYELONEPH W MED NECR
5809	ACUTE NEPHRITIS NOS	59010	AC PYELONEPHRITIS NOS
5810	NEPHROTIC SYN, PROLIFER	59011	AC PYELONEPHR W MED NECR
5811	EPHEMERANOUS NEPHRITIS	5902	RENAL/PERIRENAL ABSCESS
5812	MEMBRANOPROLIF NEPHROSIS	5903	PYELOURETERITIS CYSTICA
5813	MINIMAL CHANGE NEPHROSIS	59080	PYELONEPHRITIS NOS
58181	NEPHROTIC SYN IN OTH DIS	59081	PYELONEPHRIT IN OTH DIS
58189	NEPHROTIC SYNDROME NEC	5909	INFECTION OF KIDNEY NOS
5819	NEPHROTIC SYNDROME NOS	591	HYDRONEPHROSIS
5819	NEPHROTIC SYNDROME NOS	5920	CALCULUS OF KIDNEY
5820	CHR PROLIFERAT NEPHRITIS	5921	CALCULUS OF URETER
5821	CHR MEMBRANOUS NEPHRITIS	5929	URINARY CALCULUS NOS
5822	CHR MEMBRANOPROLIF NEPHR	5930	NEPHROPTOSIS
5824	CHR RAPID PROGR NEPHRIT	5931	HYPERTROPHY OF KIDNEY
58281	CHR NEPHRITIS IN OTH DIS	5932	CYST OF KIDNEY, ACQUIRED
58289	CHRONIC NEPHRITIS NEC	5933	STRICTURE OF URETER
5829	CHRONIC NEPHRITIS NOS	5934	URETERIC OBSTRUCTION NEC
5830	PROLIFERAT NEPHRITIS NOS	5935	HYDROURETER
5831	MEMBRANOUS NEPHRITIS NOS	5936	POSTURAL PROTEINURIA

Table .4 (Continued)

Diagnosis Code	Abbreviated CPHA English Description	Diagnosis Code	Abbreviated CPHA English Description
5937	VESICoureTERAL REFLUX	5991	URETHRAL FISTULA
59381	RENAL VASCULAR DISORDER	5992	URETHRAL DIVERTICULUM
59382	URETERAL FISTULA	5993	URETHRAL CARBUNCLE
59389	RENAL URETERAL DIS NEC	5994	URETHRAL FALSE PASSAGE
5939	RENAL URETERAL DIS NOS	5995	PROLAPSE URETHRAL MUCOSA
5940	BLAD DIVERTICULUM CALCUL	5996	URINARY OBSTRUCTION NOS
5941	BLADDER CALCULUS NEC	5997	HEMATURIA
5942	URETHRAL CALCULUS	5998	URINARY TRACT DIS NEC
5948	LOWER URIN CALCUL NEC	5999	URINARY TRACT DIS NOS
5949	LOWER URIN CALCUL NOS	7530	RENAL AGENESIS
5950	ACUTE CYSTITIS	7531	CYSTIC KIDNEY DISEASE
5951	CHR INTERSTIT CYSTITIS	7532	CONGEN URETERAL OBSTRUCT
5952	CHRONIC CYSTITIS NEC	7533	KIDNEY ANOMALY NEC
5953	TRIGONITIS	7534	URETERAL ANOMALY NEC
5954	CYSTITIS IN OTH DIS	7535	BLADDER EXSTROPHY
59581	CYSTITIS CYSTICA	7536	CONGEN URETHRAL STENOSIS
59582	IRRADIATION CYSTITIS	7537	ANOMALIES OF URACHUS
59589	CYSTITIS NEC	7538	CYSTOURETHRAL ANOM NEC
5959	CYSTITIS NOS	7539	URINARY ANOMALY NOS
5960	BLADDER NECK OBSTRUCTION	7880	RENAL COLIC
5961	INTESTINOVESICAL FISTULA	7881	DYSURIA
5962	VESICAL FISTULA NEC	7882	RETENTION OF URINE
5963	DIVERTICULUM OF BLADDER	7883	INCONTINENCE OF URINE
5964	ATONY OF BLADDER	7884	FREQ URINATION/POLYURIA
5965	BLADDER DYSFUNCTION NEC	7885	OLIGURIA
5966	BLADDER RUPT, NONTRAUM	7886	URINATION ABNORM
5967	BLADDER WALL HEMORRHAGE	7887	URETHRAL DISCHARGE
5968	BLADDER DISORDER NEC	7888	EXTRAVASATION OF URINE
5969	BLADDER DISORDER NOS	7889	URINARY SYS SYMPTOM NEC
5970	URETHRAL ABSCESS	7910	PROTEINURIA
5978u	URETHRITIS NOS	7911	CHYLURIA
59781	URETHRAL SYNDROME NOS	7912	HEMOGLOBINURIA
59789	URETHRITIS NEC	7917	OTH CELLS/CASTS IN URINE
59800	URETHR STRICT,INFECT NOS	7919	ABN URINE FINDINGS NEC
59801	URETH STRICT,OTH INFECT	7935	ABN FINDINGS-GU ORGANS
5981	TRAUM URETHRAL STRICTURE	7946	ABN KIDNEY FUNCT STUDY
5982	POSTOP URETHRAL STRICTUR	7949	ABN FUNCTION STUDY NEC
5988	URETHRAL STRICTURE NEC	86600	KIDNEY INJURY NOS-CLOSED
5989	URETHRAL STRICTURE NOS	86601	KIDNEY HEMATOMA-CLOSED
5990	URIN TRACT INFECTION NOS	86602	KIDNEY LACERATION-CLOSED
		86603	KIDNEY DISRUPTION-OPEN

Table .4 (Continued)

Diagnosis Code	Abbreviated CPMA English Description
86610	KIDNEY INJURY NOS-OPEN
86611	KIDNEY NEPHATOMA-OPEN
86612	KIDNEY LACERATION-OPEN
86613	KIDNEY DISRUPTION-OPEN
8670	BLADDER/URETHRA INJ-CLOS
8671	BLADDER/URETHRA INJ-OPEN
8672	URETER INJURY-CLOSED
8673	URETER INJURY-OPEN
86804	RETROPERITONEUM INJ-CL
86814	RETROPERITONEUM INJ-OPEN
9390	FB BLADDER URETHRA
9399	FOREIGN BDY GU TRACT NOS
9505	TRAUMATIC AMBRIA
99630	MALFUNC GU DEV/GRAFT NOS
99631	MALFUNC URETHRAL CATH
99639	MALFUNC GU DEV/GRAFT MEC
9975	SURG COMPL-URINARY TRACT

Diseases and Disorders of the Kidney and Urinary Tract

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graph TD
    RF[Renal Failure] --> PD[Principal Diagnosis of Dialysis]
    RF --> N[Neoplasm]
    RF --> I[Infection]
    RF --> S[Stone]
    RF --> SS[Signs and Symptoms]
    RF --> US[Urethral Structure]
    RF --> OD[Other Diagnoses]

    PD --> PD_No[No]
    PD --> PD_Yes1[Yes]
    PD --> PD_Yes2[Yes]
    PD_No --> DRG316[DRG 316]
    PD_Yes1 --> DRG317[DRG 317]
    PD_Yes2 --> DRG318[DRG 318]
    PD_Yes2 --> DRG319[DRG 319]

    N --> N_Age70[Age ≥ 70 and/or CC]
    N_Age70 --> N_Age70_No[No]
    N_Age70 --> N_Age70_Yes[Yes]
    N_Age70_No --> DRG320[DRG 320]
    N_Age70_Yes --> DRG321[DRG 321]

    I --> I_Age[Age]
    I_Age --> I_Age_0_17[0-17]
    I_Age --> I_Age_18_70[18+ Age ≥ 70 and/or CC]
    I_Age_0_17 --> DRG322[DRG 322]
    I_Age_18_70 --> DRG323[DRG 323]
    I_Age_18_70 --> DRG324[DRG 324]

    S --> S_Age70[Age ≥ 70 and/or CC]
    S_Age70 --> S_Age70_No[No]
    S_Age70 --> S_Age70_Yes[Yes]
    S_Age70_No --> DRG325[DRG 325]
    S_Age70_Yes --> DRG326[DRG 326]

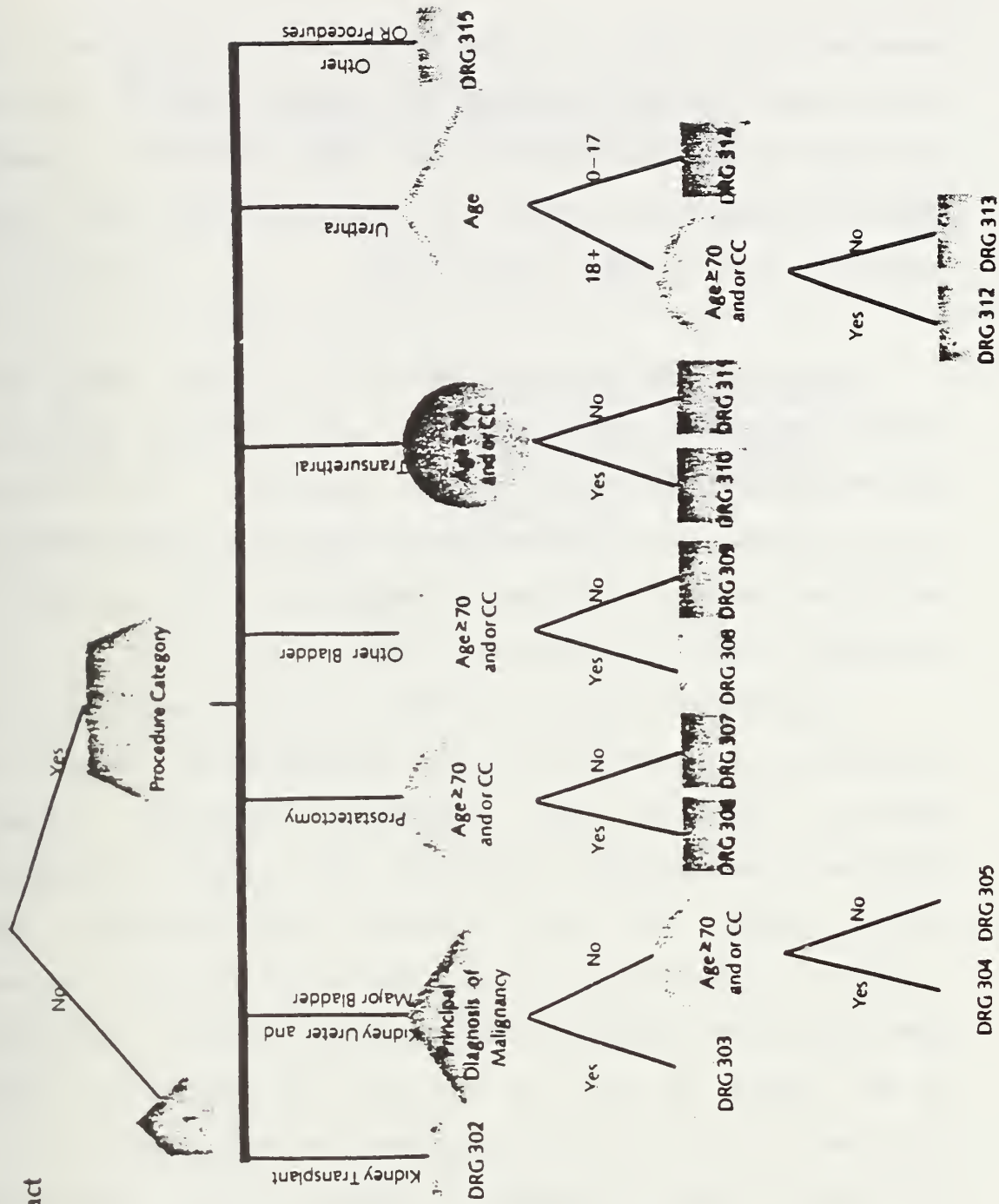
    SS --> SS_Age[Age]
    SS_Age --> SS_Age_0_17[0-17]
    SS_Age --> SS_Age_18_70[18+ Age ≥ 70 and/or CC]
    SS_Age_0_17 --> DRG327[DRG 327]
    SS_Age_18_70 --> DRG328[DRG 328]
    SS_Age_18_70 --> DRG329[DRG 329]

    US --> US_Age[Age]
    US_Age --> US_Age_0_17[0-17]
    US_Age --> US_Age_18_70[18+ Age ≥ 70 and/or CC]
    US_Age_0_17 --> DRG330[DRG 330]
    US_Age_18_70 --> DRG331[DRG 331]
    US_Age_18_70 --> DRG332[DRG 332]

    OD --> OD_Age[Age]
    OD_Age --> OD_Age_0_17[0-17]
    OD_Age --> OD_Age_18_70[18+ Age ≥ 70 and/or CC]
    OD_Age_0_17 --> DRG333[DRG 333]
    OD_Age_18_70 --> DRG334[DRG 334]
    OD_Age_18_70 --> DRG335[DRG 335]
  
```

Figure .2

Surgical Partitioning



CC=Comorbidity and/or Complication

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accordance with DRG guidelines, the initial partition of MDC 11 was based on the presence or absence of a procedure performed in the operating room. Each ICD-9-CM procedure code is classified either as requiring the use of an operating room or not.

The group of medical patients includes both those without operating room procedures, and/or those identified by a non-operating room procedure code(s). The surgical group contains patients who had an operating room procedure performed. Several examples of operating room procedure(s) as found in MDC 11 are given in Table .5.

All surgical patients in MDC 11 with an operating room procedure are divided into seven subcategories, based on the specific operating room procedures performed. Broadly defined, these surgical subgroups are: kidney transplant, kidney ureter and major bladder, prostatectomy, other bladder, transurethral, urethra and other. Five of the seven operating room procedure categories are further partitioned on the basis of one or two of the following patient attributes: age, principal diagnosis of malignancy, age 70 or over, and the presence or absence of a substantial comorbidity or complication.

For MDC 11, the medical group is also divided into seven categories based on principal diagnosis: renal failure, neoplasm, infection, stone, signs and symptoms, urethral stricture and other. Again, each of these groups is

Table .5

Examples of Operating Room Procedures
MDC 11: Diseases and Disorders of
the Kidney and Urinary Tract

Procedure Code	Abbreviated CPHA English Description
5551	Nephroureterectomy
602	Transurethral Prostatectomy
604	Retropubic Prostatectomy
5786	Bladder Exstrophy Repair
5569	Kidney Transplant Not Elsewhere Classified
5685	Ureteropexy

further subdivided on at least one variable. Among the variables used are principal diagnosis of dialysis, age, age 70 or over, and the presence or absence of a substantial complication or comorbidity.

Through the classification process thirty-two terminal groups or DRGs were formed for MDC 11, Diseases and Disorders of the Kidney and Urinary Tract. (Table .6) contains abbreviated descriptions of DRGs 302 through 333.

Figure .3 contains a descriptive statistical summary and LOS histogram for the CPHA LOS database used to construct DRGs in MDC 11. This category is comprised of 9,342 observations, with a mean LOS of 6.46 and standard deviation of 6.08. The variables used in partitioning were operating room procedure, principal diagnosis, age, and age 70 or over, or the presence of a substantial complication or comorbidity.

Using the above definitions, the groups were tested by comparing them to the New Jersey State Department of Health cost data set. The group statistics were examined to determine if the splits based on cost confirmed those groups developed found using CPHA LOS data. In general there was a consistent agreement found between the databases. In this case, no additional DRGs were recommended for the surgical and medical partitions as a result of this comparison.

We concluded that specific operating room procedures, principal diagnosis, age, presence of substantial

Table .6

Descriptive Summary of DRGs 302-333
Major Diagnostic Category 11:
Diseases and Disorders of the Kidney and Urinary Tract

MDC	DRG Number	English Description
11	- 302	KIDNEY TRANSPLANT
11	- 303	KIDNEY, URETER & MAJOR BLADDER PROCEDURE FOR NEOPLASM
11	- 304	KIDNEY, URETER & MAJ BLDR PROC FOR NON-MALIG AGE ≥ 70 &/OR C.C.
11	- 305	KIDNEY, URETER & MAJ BLDR PROC FOR NON-MALIG AGE ≤ 70 W/O C.C.
11	- 306	PROSTATECTOMY AGE ≥ 70 AND/OR C.C.
11	- 307	PROSTATECTOMY AGE ≤ 70 W/O C.C.
11	- 308	MINOR BLADDER PROCEDURES AGE ≥ 70 AND/OR C.C.
11	- 309	MINOR BLADDER PROCEDURES AGE ≤ 70 W/O C.C.
11	- 310	TRANSURETHRAL PROCEDURES AGE ≥ 70 AND/OR C.C.
11	- 311	TRANSURETHRAL PROCEDURES AGE ≤ 70 W/O C.C.
11	- 312	URETHRAL PROCEDURES, AGE ≥ 70 AND/OR C.C.
11	- 313	URETHRAL PROCEDURES, AGE 18-69 W/O C.C.
11	- 314	URETHRAL PROCEDURES, AGE 0-17
11	- 315	OTHER KIDNEY & URINARY TRACT O.R. PROCEDURES
11	- 316	RENAL FAILURE W/O DIALYSIS
11	- 317	RENAL FAILURE WITH DIALYSIS
11	- 318	KIDNEY & URINARY TRACT NEOPLASMS AGE ≥ 70 AND/OR C.C.
11	- 319	KIDNEY & URINARY TRACT NEOPLASMS AGE ≤ 70 W/O C.C.
11	- 320	KIDNEY & URINARY TRACT INFECTIONS AGE ≥ 70 AND/OR C.C.
11	- 321	KIDNEY & URINARY TRACT INFECTIONS AGE 18-69 W/O C.C.
11	- 322	KIDNEY & URINARY TRACT INFECTIONS AGE 0-7
11	- 323	URINARY STONES AGE ≥ 70 AND/OR C.C.
11	- 324	URINARY STONES AGE ≤ 70 W/O C.C.
11	- 325	KIDNEY & URINARY TRACT SIGNS & SYMPTOMS AGE ≥ 70 AND/OR C.C.
11	- 326	KIDNEY & URINARY TRACT SIGNS & SYMPTOMS AGE 18-69 W/O C.C.
11	- 327	KIDNEY & URINARY TRACT SIGNS & SYMPTOMS AGE 0-17
11	- 328	URETHRAL STRICTURE AGE ≥ 70 AND/OR C.C.
11	- 329	URETHRAL STRICTURE AGE 18-69 W/O C.C.
11	- 330	URETHRAL STRICTURE AGE 0-17
11	- 331	OTHER KIDNEY & URINARY TRACT DIAGNOSES AGE ≥ 70 AND/OR C.C.
11	- 332	OTHER KIDNEY & URINARY TRACT DIAGNOSES AGE 18-69 W/O C.C.
11	- 333	OTHER KIDNEY & URINARY TRACT DIAGNOSES AGE 0-17

Figure .3

Length of Stay Distributions
for all Patients in MDC 11:
Diseases and Disorders of the Kidney
and Urinary Tract

Mean	Standard Deviation	Number of Patients
6.46	6.08	9,342

VALUE	CNS	PCT	CUM %	
1.00	1170	12.52	12.52	*****
2.00	1502	16.08	28.60	*****
3.00	1129	12.09	40.69	*****
4.00	947	10.14	50.82	*****
5.00	742	7.94	58.77	*****
6.00	534	6.25	65.02	*****
7.00	492	5.16	70.18	*****
8.00	422	4.52	74.69	*****
9.00	406	4.35	79.04	*****
10.00	295	3.16	82.20	*****
11.00	232	2.48	84.68	****
12.00	209	2.24	86.92	****
13.00	176	1.88	88.80	***
14.00	166	1.79	90.59	***
15.00	115	1.23	91.81	**
16.00	87	.93	92.74	*
17.00	102	1.09	93.83	**
18.00	71	.76	94.59	*
19.00	64	.68	95.28	*
20.00	49	.52	95.80	*
21.00	56	.60	96.40	*
22.00	46	.49	96.89	
23.00	41	.44	97.33	
24.00	25	.27	97.60	
25.00	22	.24	97.84	
26.00	24	.26	98.09	
27.00	20	.31	98.40	
28.00	17	.18	98.59	
29.00	16	.17	98.76	
30.00	17	.18	98.94	
31.00	23	.25	99.19	
32.00	17	.18	99.37	
33.00	15	.16	99.53	
34.00	10	.11	99.64	
35.00	11	.12	99.75	
36.00	14	.15	99.90	
37.00	9	.10	100.00	

complications, and comorbidities were important variables in predicting LOS and cost. Each DRG formed is clinically coherent and the DRG definitions can be used to communicate effectively with physicians and other health care professionals. Additionally, each DRG is distinct with respect to both LOS and cost.

The actual process of constructing these DRGs from the Major Diagnostic Category 11 is summarized in the following steps:

Step 1: Removal of Outliers. Records with obvious coding errors or missing data were excluded from the data set since their data could be misleading. In addition, all observations which had a LOS which exceeded three standard deviations above the mean were removed. As a result, one hundred and twenty-one records (outliers) were deleted. This reduced the size of MDC 11 from 9,463 to 9,342. In the 383 DRG version, deaths were excluded from further analysis; in this scheme they were included.

Step 2:

In accordance with the guidelines described in Section II the initial subdivision of this category was on the basis of the presence or absence of an operating room procedure. Thus, resulting in the formation of two groups comprised of surgical and medical patients respectively.

Step 3:

The Automated Interaction Detector (AID) algorithm was applied to define operating room procedure categories for

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the surgical patients, and diagnostic groups for medical patients. The objective of the AID approach is to analyze the interrelationships of the variables in the database and to determine which one(s) is/are related to the dependent variable.

Surgical Categories: The AID statistical algorithm was invoked to determine how to further subdivide surgical cases. Initially, an abbreviated list of operating room procedures for patients with disorders of Kidney and Urinary Tract was grouped using the "classify" command in AUTOGRP. This approach attempts to maximize the percentage of variance that is explained by subdividing the cases into categories. The number of groups formed by the algorithm and the corresponding percent reduction in unexplained variation for patients undergoing operating room procedures is described in Table .7. The algorithm suggested that five groups should be formed with length of stay functioning as the dependent variable. This table presents the different surgical procedures contained in each group, the corresponding number of observation (SIZE), and the mean length of stay (MEAN). A closer examination was made of the characteristics of the AID results. Combining statistical results and clinical judgement produced a definitional change in the original five groups suggested by the AID method shown in Table .8. The data suggested possibly creating six groups a three day short-stay group of procedures on the urethra(U); a transurethral(T) group

Table .7

Preliminary Operating Room Procedure Listing
Used in the Conceptualization
of Initial Operating Room Procedure Categories

94 CELLS TSS= 1.449E+05 OBSERVATIONS= 2939
5 GROUPS TSS= 87909.00 PCT.REDUCT= 39.32

*** SIZE= 454 MEAN= 3.43 SD= 3.56 SSQ= 5757.77 ***					
	SIZE	MEAN	INDEP VAR		
U	5	117	2.49	581	URETHRAL MEATOTOMY
U	7	31	3.35	5847	URETHRAL MEATOPLASTY
U	8	285	3.84	585	URETH STRICTURE RELEASE
OB	9	13	4.23	5791	BLADDER SPHINCTEROTOMY
*** SIZE= 1200 MEAN= 5.68 SD= 4.58 SSQ= 25158.21 ***					
	SIZE	MEAN	INDEP VAR		
KU&B	12	22	5.05	561	URETERAL MEATOTOMY
T	13	293	5.29	560	TU REMOV URETER OBSTRUCT
T	14	77	5.35	5733	TRANSURETH BLADD BIOPSY
T	15	529	5.41	5749	TU DESTRUCT BLADD LES NEC
OB	18	98	6.24	5734	BLADDER BIOPSY NEC
U	24	22	7.77	580	URETHROTOMY
OB	27	18	8.28	5759	BLADDER LES DESTRUCT NEC
*** SIZE= 900 MEAN= 11.12 SD= 6.30 SSQ= 35457.31 ***					
	SIZE	MEAN	INDEP VAR		
	39	13	9.38	3942	REVIS REN DIALYSIS SHUNT
	40	76	9.66	3927	DIALYSIS ARTERIOVENOSTOM
U	42	25	10.12	5849	URETHRAL REPAIR NEC
OB	43	22	10.41	595	RETROPUBIC URETH SUSPENS
KU&B	44	46	10.70	5674	URETERONEOCYSTOSTOMY
KU&B	45	265	10.86	562	URETEROTOMY
KU&B	48	119	11.40	5511	PYELOTOMY
	49	170	11.54	602	TRANSURETHRAL PROSTATECT
	52	35	12.17	3993	INSERT VES-TO-VES CANNUL
KU&S	53	21	12.43	5641	PARTIAL URETERECTOMY
OB	54	30	12.43	5721	FORMATION OF CYSTOSTOMY
KU&B	56	29	12.79	5587	CORRECT URETEROPELV JUNC
KU&B	58	14	13.00	554	PARTIAL NEPHRECTOMY
*** SIZE= 338 MEAN= 15.49 SD= 7.38 SSQ= 18360.00 ***					
	SIZE	MEAN	INDEP VAR		
	61	8	14.00	5411	EXPLORATORY LAPAROTOMY
KU&B	64	49	14.27	5501	NEPHROTOMY
OB	65	25	14.32	576	PARTIAL CYSTECTOMY
KU&B	68	146	15.29	5551	NEPHROURETERECTOMY
OB	69	11	15.36	5781	SUTURE BLADDER LACERAT
	70	5	15.40	604	RETROPUBIC PROSTATECTOMY
KU&B	72	25	15.52	5524	RENAL BIOPSY NEC
KU&B	74	9	16.33	5502	NEPHROSTOMY
KU&B	78	14	17.29	5651	FORM CUTAN ILEOURETEROST
	81	13	18.62	603	SUPRAPUBIC PROSTATECTOMY
KU&B	83	9	19.33	5771	RADICAL CYSTECTOMY
*** SIZE= 45 MEAN= 25.53 SD= 8.22 SSQ= 2975.81 ***					
	SIZE	MEAN	INDEP VAR		
KU&B	85	15	22.80	5779	TOTAL CYSTECTOMY NEC
	86	5	23.00	4011	LYMPHATIC STRUCT BIOPSY
KU&B	87	1	24.00	5591	RENAL DECAPSULATION
KT	88	11	24.45	5369	KIDNEY TRANSPLANT NEC
	89	3	25.67	5012	LIVER BIOPSY NEC
	90	2	30.00	605	RADICAL PROSTATECTOMY
	91	1	32.00	5412	REOPEN RECENT LAP SITE
OB	92	4	32.25	5783	ENTEROVESICO FIST REPAIR
KU&B	93	2	32.50	5901	URETEROLYS FOR FIBROSIS
	94	1	36.00	3943	REMOV REN DIALYSIS SHUNT

Key:

KT = Kidney Transplant
KU&B = Kidney Ureter and Major Bladder

OB = Other Bladder
U = Urethra

T = Transurethral

Table .8

Step One of Preliminary Assignment to
Operating Room Procedure Categories

Ureteral Meatotomy
Loc Destr Renal Les NEC
Ureterotomy
Pyelotomy
Partial Ureterectomy
Correct Ureteropelvic Junc
Partial Nephrectomy
Nephrotomy
Renal Biopsy NEC
Nephrostomy
Form Cutan Ileoureterost
Radical Cystectomy
Total Cystectomy NEC
Renal Decapulation
Ureterolysis for Fibrosis
Ureteroneocystostomy
Nephroureterectomy

Kidney Ureter and Major Bladder
Average LOS is
Approximately Twelve Days

Urethral Meatotomy
Urethral Meatoplasty
Ureth Stricture Release
Urethrotomy
Urethral Repair NEC
Urethral Meatoplasty

Urethra
Average LOS is
Approximately Three Days

TU Removal Ureter Obstruct
TU Descruc Bladd Les NEC
Transureth Bladd Biopsy

Transurethral
Average LOS
is Approximately Five Days

Kidney Transplant

Kidney Transplant
Average LOS
is Approximately
Twenty-four Days

Bladder Biopsy NEC
Bladder Spincterotomy
Bladder Les Destruction NEC
Retropubic Ureth Suspens
Patial Cystectomy
Enterovesico Fist Repair
Formation of Cystostomy
Suture Bladder Lacerat

Other Bladder
Average LOS
is Approximately
Eight Days

Other

staying five days; an eight day short stay bladder group(OB); a group consisting of procedures on the kidney, ureter or major procedures on the bladder (KU&B) staying approximately twelve days; a small distinctive group of kidney transplant (KT) patients staying twenty-three days and an "other" group. A separate kidney transplant group was justified on clinical grounds even though the CPHA database contained only a small number of such rare cases.

Often in exploring independent variables selected to define potential subgroups we would alter groups initially defined. For instance, groups may be combined, or a smaller subset may be spun off from a larger group. For example, in this MDC a Prostatectomy Group was separated from the other operating room procedure category. This resulted in the creation of seven surgical categories.

Medical Categories:

The set of steps used in the analysis of the surgical categories was repeated for the Medical Categories. First, an abbreviated list of principal diagnoses for medical patients with disorders of kidney and urinary tract was reviewed (Shown in Table .9). For this MDC, the LOS for the principal diagnoses ranged from one day to seventeen days. The statistical algorithm (AID) was applied to all medical patients with disorders of the kidney and urinary tract. The statistics suggested three groups should be formed. The first group of patients were a short stay stone group. Additionally this group contained patients with infections,

Table .9

Preliminary Principal Diagnosis Listing
Used in the Conceptualization
of Initial Categories

Principal Diagnoses

154 CELLS TSS= 1.647E+05 OBSERVATIONS= 6204
3 GROUPS TSS= 1.416E+05 PCT.REDUCT= 14%

*** SIZE= 3159		MEAN= 3.71		SD= 3.40	SSQ= 36440.82	***
	SIZE	MEAN	INDEP VAR			
	1	1.14	U568	AFTERCARE-DIALYSIS NEC		
S&S	17	2.92	7883	INCONTINENCE OF URINE		
S	26	3.06	5929	URINARY CALCULUS NOS		
S	27	3.16	5921	CALCULUS OF URETER		
S	28	3.21	5942	URETHRAL CALCULUS		
S	32	3.46	7880	RENAL COLIC		
I	37	3.53	59780	URETHRITIS NOS		
	39	3.86	5989	URETHRAL STRICTURE NOS		
S	40	3.98	5920	CALCULUS OF KIDNEY		
I	41	4.00	5953	TRIGONITIS		
S&S	53	4.16	5997	HEMATURIA		
	54	4.16	5934	URETERIC OBSTRUCTION NEC		
	58	4.34	5960	BLADDER NECK OBSTRUCTION		
	73	5.02	86601	KIDNEY HEMATOMA-CLOSED		
I	75	5.17	5950	ACUTE CYSTITIS		
	76	5.24	5932	CYST OF KIDNEY, ACQUIRED		
*** SIZE= 2714		MEAN= 6.69		SD= 5.52	SSQ= 82655.12	***
	SIZE	MEAN	INDEP VAR			
I	83	5.64	5959	CYSTITIS NOS		
I	84	5.68	59080	PYELONEPHRITIS NOS		
I	91	6.16	59000	CHR PYELONEPHRITIS NOS		
S&S	93	6.23	7882	RETENTION OF URINE		
	94	6.29	34461	NEUROGENIC BLADDER		
I	96	6.50	59010	AC PYELONEPHRITIS NOS		
I	99	6.75	5990	URIN TRACT INFECTION NOS		
I	101	6.87	5952	CHRONIC CYSTITIS NEC		
	103	6.96	5939	RENAL URETERAL DIS NOS		
S&S	110	7.54	5819	NEPHROTIC SYNDROME NOS		
RF	117	8.13	585	CHRONIC RENAL FAILURE		
N	119	8.23	1889	MALIG NEO BLADDER NOS		
	121	8.40	4039	HYPERTENS RENAL DIS NOS		
*** SIZE= 331		MEAN= 10.77		SD= 8.26	SSQ= 22503.77	***
	SIZE	MEAN	INDEP VAR			
N	130	9.08	1890	MALIG NEOPL KIDNEY		
	131	9.40	5888	IMPAIRED RENAL FUNCT NEC		
	132	9.63	58389	NEPHRITIS NEC		
RF	133	9.75	5809	ACUTE NEPHRITIS NOS		
	135	10.00	587	RENAL SCLEROSIS NOS		
	137	10.00	1981	SEC MALIG NEO URIN NEC		
	138	10.06	586	RENAL FAILURE NOS		
	139	10.22	5964	ATONY OF BLADDER		
S&S	140	10.64	7919	ABN URINE FINDINGS NEC		
	141	10.67	4031	BENIGN HYPERT RENAL DIS		
	144	11.75	58181	NEPHROTIC SYN IN OTH DIS		
	147	12.00	5829	CHRONIC NEPHRITIS NOS		
RF	148	13.45	5849	ACUTE RENAL FAILURE NOS		
	149	13.80	1892	MALIGN NEOPL URETER		
	151	15.25	4030	MAL HYPERTENS RENAL DIS		
	154	17.00	4421	RENAL ARTERY ANEURYSM		

Key:

I = Infection

RF = Renal Failure

S = Stone

S&S = Signs and Symptoms

N = Neoplasm

signs and symptoms. The second group had a slightly different mix of cases. It contained cases with a principal diagnoses of infections, signs and symptoms, renal failure and neoplasms. The third group consisted of a mixture of principal diagnoses, including renal failure, neoplasms, and signs and symptoms. Based on clinical judgement, along with statistical results described above, major subsets within all three groups were identified as stone, infection, renal failure, signs and symptoms, neoplasms and other (shown in table .10). The "other" group consisted of principal diagnoses which occurred relatively infrequently. There were insufficient observations to separate them into distinct groups. It should be noted that a seventh category was isolated from one of the six categories resulting in the formation of a seventh medical category referred to as urethral stricture.

Step 4:

All possible principal diagnoses and operating room procedures relating to diseases and disorders of the kidney do not appear in the sample. It was therefore necessary to refer to the ICD-9-CM Volume II, Diseases: Tabular List to develop a comprehensive list for each of the diagnostic categories and ICD-9-CM Volume III, Procedures: Tabular List and Alphabetic Index for each of the surgical categories. For purposes of illustration consider the Infection Category in MDC 11 (summarized in Table .11). Only nine diagnoses relating to infections of the urinary system occurred with

Table .10

Step One of Preliminary Assignment
of Principal Diagnoses

Calculus of Ureter	}	Stone Average LOS is Three Days
Urethral Calculus		
Urinary Calculus NOS		
Renal Colic		
Calculus of Kidney		

Urethritis NOS	}	Infection Average LOS is Approximately Six Days
Trigonitis		
Acute Cystitis		
Cystitis NOS		
Pyelonephritis NOS		
CHR Pyelonephritis NOS		
AC Pyelonephritis NOS		
Urin Tract Infection NOS		
Chronic Cystitis NEC		

Chronic Renal	}	Renal Failure Average LOS is Approximately Ten Days
Failure		
Renal Failure NOS		
Acute Renal Failure		

Step Two of Preliminary Assignment
of Principal Diagnoses

Malignant Neo Bladder NOS	}	Neoplasm with Average LOS is Approximately Eight Days
Malignant Neo Kidney		

Incontinence of Urine	}	Signs and Symptoms Average LOS is Approximately Six Days
Hematuria		
Retention of Urine		
Neprotic Syndrome NOS		
Abn. Urine Findings NEC		

Table .11

Major Diagnostic Category 11: Diseases and
Disorders of the Kidney and Urinary Tract,
Kidney Ureter and Major Bladder Category

Procedure Code	Abbreviated CPHA English Description
3924	Aorta-Renal Bypass
3955	Reimplan Aberr Renal Ves
4052	Rad Dissec Periaort Node
4053	Rad Dissect Iliac Nodes
4054	Radical Groin Dissection
4059	Rad Node Dissection Nec
*5501	Nephrostomy
*5502	Nephrostomy
*5511	Pyelostomy
5512	Pyelostomy
*5524	Renal Biopsy Nec
5529	Renal Diagnost Proc Nec
5531	Renal Les Marsupializat
*5539	Loc Destr Renal Les Nec
* 554	Partial Nephrectomy
*5551	Nephroureterectomy
5552	Solitary Kidney Nephrect
5553	Rejected Kidney Nephrect
5554	Bilateral Nephrectomy
5561	Renal Autotransplant
557	Nephropexy
5581	Suture Kidney Laceration
5582	Close Nephrost Pyelost
5583	Close Renal Fistula Nec
5584	Reduce Renal Pedicl Tors
5585	Symphysiotomy
5586	Renal Anastomosis
*5587	Correct Ureteropelv Junc
5589	Renal Repair Nec
*5591	Renal Decapsulation
5597	Implant Mechanic Kidney
5598	Remov Mechanical Kidney
5599	Renal Operation Nec
* 561	Ureteral Meatotomy

Table .11 (Continued)

Procedure Code	Abbreviated CPHA English Description
* 562	Ureterotomy
5633	Ureteral Biopsy Nec
5639	Ureteral DX Procedur Nec
5640	Ureterectomy Nos
*5641	Partial Ureterectomy
5642	Total Ureterectomy
*5651	Form Cutan Ileoureterost
5652	Revis Cutan Ileoureteros
5661	Form Cutan Ureterostomy
5662	Revis Cutan Ureteros Nec
5671	Urin Diversion to Bowel
5672	Revis Ureteroenterostomy
5673	Nephrocystanastomosi Nos
5674	Ureteroneocystostomy
5675	Transureteroureterostomy
5679	Ureteral Anastomosis Nec
5681	Intralum Urete Adhesiolys
5682	Suture Ureteral Lacerat
5683	Ureterostomy Closure
5684	Close Ureter Fistula Nec
5685	Ureteropexy
5686	Remove Ureteral Ligature
5689	Repair of Ureter Nec
5692	Implant Ureteral Stimul
5693	Replace Ureteral Stimul
5694	Remove Ureteral Stimulat
5695	Ligation of Ureter
5699	Ureteral Operation Nec
*5771	Radical Cystectomy
*5779	Total Cystectomy Nec
5900	Retroperit Dissect Nos
*5901	Ureterolys For Fibrosis
5902	Periren Adhesiolys Nec
5909	Periren/ureter Incis Nec

* Indicates operating room procedure (ICD-9-CM codes) of Kidney Uret and Major Bladder which occurred with any frequency in the CF dataset.

any significant frequency within our database, the final group definition was comprised of 66 diagnoses. Therefore, when we refer to DRGs 320-321 we include all infections related to the urinary system. Again, the principal diagnosis listing from the sample was used primarily to identify any additional underlying concepts.

For each of the remaining groups other than infection, both within and across the MDCs, a comprehensive list of all diagnoses relating to that specific definition was then formed. In the conceptualization of the medical side, based on both clinical and statistical input, principal diagnoses that appeared in the CPHA data set were used (along with the ICD-9-CM Disease Listing, Volume 1) to form these seven groups.

Next, the ICD-9-CM Volume III, Procedures Tabular List and Alphabetic Index was reviewed, expanding the operating room procedure listing for each of the newly created surgical categories. This resulted in a comprehensive clinical definition for each group. For example, Table .12 describes the expanded list for the kidney, ureter and major bladder group. Once the operating room procedure categories were defined, a surgical hierarchy was then established by staff physicians.

Step 5: Surgical Hierarchy. When at least one procedure on a patient's record matches an operating room procedure on a predefined list, he/she is then assigned to one of the above operating room procedure categories. Since patients

Table .12.

Major Diagnostic Category 11: Diseases and
Disorders of Kidney and Urinary Tract

INFECTION CATEGORY

Diagnosis Code	Abbreviated CPHA English Description
01600	TB of Kidney-Unspec
01601	TB of Kidney-No Exam
01602	TB of Kidney-Exam Unkn
01603	TB of Kidney-Micro DX
01604	TB of Kidney-Cult DX
01605	TB of Kidney-Histo DX
01606	TB of Kidney-OTH Test
01610	TB of Bladder-Unspec
01611	TB of Bladder-No Exam
01612	TB of Bladder-Exam Unkn
01613	TB of Bladder-Micro DX
01614	TB of Bladder-Cult DX
01615	TB of Bladder-Histo DX
01616	TB of Bladder-OTH Test
01620	TB of Ureter-Unspec
01621	TB of Ureter-No Exam
01622	TB of Ureter-Exam Unkn
01623	TB of Ureter-Micro DX
01624	TB of Ureter-Cult DX
01625	TB of Ureter-Histo DX
01626	TB of Ureter-OTH Test
01630	TB Urinary Nec-Unspec
01631	TB Urinary Nec-No Exam
01632	TB Urinary Nec-Exam Unkn
01633	TB Urinary Nec-Micro DX
01634	TB Urinary Nec-Cult DX
01635	TB Urinary Nec-Histo DX
01636	TB Urinary Nec-OTH Test
01690	GU TB Nos-Unspec
01691	GU TB Nos-No Exam
01692	GU TB Nos-Exam Unkn
01693	GU TB Nos-Micro DX
01694	GU TB Nos-Cult DX

Table .12 (Continued)

INFECTION CATEGORY

Diagnosis Code	Abbreviated CPHA English Description
01695	GU TB Nos-Histo DX
01696	GU TB Nos-OTH Test
03284	Diphtheritic Cystitis
0786	Hem Nephrosonephritis
0954	Syphilis of Kidney
09811	GC Cystitis (Acute)
09830	Chr GC Upper GU Nos
09831	GC Cystitis, Chronic
1200	Schistosoma Haematobium
1372	Late Effect GU TB
*59000	Chr Pyelonephritis Nos
59001	Chr Pyeloneph W Med Necr
*59010	AC Pyelonephritis Nos
59011	AC Pyelonephr W Med Necr
5902	Renal/Perirenal Abscess
5903	Pyelooreteritis Cystica
*59080	Pyelonephritis Nos
59081	Pyelonephrit In OTH Dis
5909	Infection of Kidney Nos
5933	Stricture of Ureter
* 5950	Acute Cystitis
5951	CHR Interstit Cystitis
* 5952	Chronic Cystitis Nec
* 5953	Trigunitis
5954	Cystitis in OTH Dis
59581	Cystitis Cystica
59589	Cystitis Nec
* 5959	Cystitis Nos
5970	Urethral Abscess
*59780	Urethritis Nos
59781	Urethral Syndrome Nos
59789	Urethritis Nec
* 5990	Urin Tract Infection Nos

* Indicates principal diagnosis (ICD-9-CM Codes) of infection which occurred with any frequency in the CPHA data set.

can have multiple operating room procedures per episode of care, a particular patient could be assigned to more than one of the categories described above. Therefore, based on clinical input and judgement, each of the operating room procedure categories was ranked in order of resource intensity and the patient assigned to the group including his/her most resource intensive category. This ranking is referred to as an operating room procedure hierarchy. (shown in Table .13). How this hierarchy determines patient membership in surgical categories is illustrated in the following example:

A hypothetical patient with a urinary tract disorder underwent several procedures during his/her hospital stay. Upon review of the procedures during listed on the patient's medical abstract, two procedures (5733 Transurethral Biopsy of the Bladder and 5779 Other Total Cystectomy) matched pre-established definitions for MDC 11 operating room procedures. These two operating room procedures are in different surgical categories (i.e., 5779 in major bladder and 5733 in transurethral). Therefore, assignment to a particular category is derived from the operating room procedure hierarchy. The patient is identified with the more resource intensive major bladder category, rather than the transurethral category.

Step 6:

The stepwise construction of DRGs from these surgical and medical categories in MDC 11 is also illustrated with the "Kidney, Ureter and Major Bladder" and "Infection" categories. The remaining step will summarize each of the groups formed by further subdividing "Kidney, Ureter and

Table .13

Operating Room Procedure Category Hierarchy
Ranked in Descending Order of Importance for MDC 11
Diseases and Disorders of the Kidney and Urinary Tract

Rank	Procedure Category
1	Kidney Transplant
2	Kidney Ureter and Major Bladder
3	Prostatectomy
4	Other Bladder
5	Transurethral
6	Urethra
7	Other Operating Room Procedures

Major Bladder" (Surgical Category) and "Infection" (Medical Category). A similar process was followed for the remaining surgical and medical categories within MDC 11 to determine what if any independent variables should be selected for further subdivisions.

Analysis of the Kidney Ureter and Major Bladder Operating Room Procedure Category. Next, a histogram and summary statistics were reviewed for the Kidney, Ureter and Major Bladder Group. Figure .4 gives these histograms. The predominant research question asked was, what other variables might be useful in understanding resource consumption of patients undergoing Kidney, Ureter and Major Bladder operating room procedures?

The classify algorithm was used to further partition the data set based on the operating room procedure categories formed in Step 3. The following set of independent variables was selected for defining potential subgroups: operating room procedure (DRGop), procedure (oper11), principal diagnosis (dx1), secondary diagnosis (dx2), diagnostic category (dxcat), urinary tract infection (uti), pneumonia (pneumo), heart, alcohol, emergency (emerg), admitted through the emergency room (er), payor (pay1), race, sex, discharge status (dstat), dead, admitted to an intensive care unit (adicu), admitted to a coronary care unit (adccu), admitted to a special care unit (adscu), etiology, dialysis, yes/no substantial comorbidity and/or complication (yncc), age, age 70 cc.

Figure .4

Length of Stay Distributions
for Patients in
Operating Room Procedure Category
Kidney Ureter and Major Bladder

Mean	Standard Deviation	Number of Patients
12.62	6.67	833

VALUE	OBS	PCT	CUM %
1.00	3	.36	.36
2.00	13	1.56	1.92 ***
3.00	14	1.68	3.60 ***
4.00	11	1.32	4.92 **
5.00	10	2.16	7.08 ****
6.00	44	5.28	12.36 *****
7.00	45	5.40	17.77 *****
8.00	57	10.44	28.21 *****
9.00	72	11.04	39.26 *****
10.00	71	8.52	47.78 *****
11.00	51	6.12	53.90 *****
12.00	52	6.24	60.14 *****
13.00	44	5.28	65.43 *****
14.00	42	5.04	70.47 *****
15.00	31	3.72	74.19 *****
16.00	26	3.12	77.31 *****
17.00	34	4.08	81.39 *****
18.00	16	1.92	83.31 ***
19.00	26	3.12	86.43 *****
20.00	14	1.68	88.12 ***
21.00	11	1.32	89.44 **
22.00	12	1.44	90.88 **
23.00	11	1.32	92.20 **
24.00	14	1.68	93.88 ***
25.00	5	.60	94.48 *
26.00	4	.48	94.96
27.00	5	.60	95.56 *
28.00	2	.24	95.80
29.00	5	.60	96.40 *
30.00	4	.48	96.88
31.00	9	1.08	97.96 **
32.00	3	.36	98.32
33.00	5	.60	98.92 *
34.00	1	.12	99.04
35.00	3	.36	99.40
36.00	3	.36	99.76
37.00	2	.24	100.00

of all independent variables used in this study is described in Section II. Table .14 describes for Kidney Ureter and Major Bladder Group the different variables explored, the number of groups formed by the classify algorithm; as well as, the corresponding percent reduction in explained variation for each of the variables.

Tables .15 and .16 indicate that the principal diagnosis has a great deal of explanatory power in the Kidney Ureter and Major Bladder Group which is comprised of patients who underwent an operating room procedure on their kidney or ureter or bladder. Our analysis of these patients revealed a long stay group whose principal diagnoses were malignancy, resulting in the formation of a malignancy variable defined in Table .17.

Each of the groups formed was then considered for further partitioning. The malignancy group was of relatively small size with 147 observations. If an additional split were to be made, the end result would be two very small terminal groups. Therefore the group was not further partitioned.

A closer examination was made of the Kidney, Ureter and Major Bladder patients without malignancy to determine further potential subdivisions. The number of groups formed by the algorithm and the corresponding percent reduction in unexplained variation for each of the independent variables contained on the data set are shown in Table .18.

Given these results, several things were considered in

Table .14

Independent Variables Reviewed in the
Partitoning Process for Kidney Ureter
and Major Bladder

Variable Name	Number of Observations	Number of Cells	Number of Groups	Percent Reduction	Total Sum of Squares
* AGE	833	88	3	12.72%	36978.54
AGE >5CC	833	4	2	7.56%	36976.27
AGE >10CC	833	4	2	7.69%	36976.27
AGE >15CC	833	4	2	7.62%	36976.27
AGE >20CC	833	4	2	7.92%	36976.18
AGE >25CC	833	4	3	9.49%	36976.27
AGE >30CC	833	4	3	9.83%	36976.27
AGE >35CC	833	4	3	10.91%	36976.27
AGE >40CC	833	4	3	12.27%	36976.27
AGE >45CC	833	4	3	12.12%	36976.27
AGE >50CC	833	4	3	14.75%	36976.08
AGE >55CC	833	4	3	15.39%	36976.18
AGE >60CC	833	4	3	15.82%	36976.18
AGE >65CC	833	4	3	14.03%	36976.08
AGE >70CC	833	4	3	12.38%	36976.27
AGE >75CC	833	4	3	10.86%	36976.27
AGE >80CC	833	4	3	8.38%	36976.18
YNCC	833	2	2	7.56%	36976.08
DIALYSIS	833	2	1	.00%	36976.08
ETIOLOGY	833	4	2	9.49%	36976.27
ADSCU	833	2	1	.00%	36976.08
ADCCU	833	2	1	.00%	36976.08
ADICU	833	2	2	5.58%	36976.08
DSTAT	833	7	2	5.14%	36975.98
SEX	833	2	1	.00%	36976.08
RACE	833	7	1	.00%	36976.27
DEAD	833	2	1	.00%	36975.98
PAY1	833	10	2	9.53%	36976.27
ER	833	2	1	.00%	36976.08
EMERG	833	2	2	1.61%	36976.08
ALCOHOL	833	1	1	.00%	36975.98
DRGOP	833	35	4	18.97%	36977.96
HEART	833	2	2	1.37%	36976.08
PNEUMO	833	2	1	.00%	36975.98
UTI	833	2	2	1.92%	36976.08
OPER11	833	66	4	23.32%	36976.67
DX1	833	76	4	20.28%	36976.87

Table .15

Kidney Ureter and Major Bladder
Operating Room Category
Partitioning on the Basis of Principal Diagnosis

Group	Number of Observations	Mean	Standard Deviation
1	353	10.12	5.18
2	264	12.38	6.07
3	158	15.62	6.59
4	58	20.78	7.88

Table .16

Suggested Partitioning (4 groups) of
Kidney, Ureter, and Major Bladder
Operating Room Procedure Category on
The Basis of Principal Diagnosis

Group	Size	Mean	Independent Variable	Abbreviated CPHA English Description
1	1	2.00	22381	BENIGN NEOPLASM URETHA
	1	2.00	59781	URETHRAL SYNDROME NOS
	1	2.00	59780	URETHRITIS NOS
	1	2.00	2367	UNC BEHAV NEO BLADDER
	1	4.00	5821	CHR MEMBRANDOUS NEPHRITIS
	1	6.00	5839	NEPHRITIS NOS
	1	7.00	5845	LOWER NEPHRON NEPHROSIS
	1	7.00	86613	KIDNEY DISRUPTION-OPEN
	1	7.00	5829	CHRONIC NEPHRITIS NOS
	1	7.00	2233	BENIGN NEOPLASM BLADDER
	8	7.63	5989	URETHRAL STRICTURE NOS
	3	7.67	7880	RENAL COLIC
	1	8.00	V594	KIDNEY DONOR
	2	8.50	5930	NEPHROTOSIS
	6	8.50	5932	CYST OF KIDNEY, ACQUIRED
	28	9.00	5937	VESICoureTERAL REFLUX
	1	9.00	5953	TRIGONITIS
	1	9.00	7533	KIDNEY ANOMALY NEC
	1	9.00	86612	KIDNEY LACERATION-OPEN
	6	9.17	5942	URETHRAL CALCULUS
	3	9.33	7538	CYSToureTERAL ANOM NEC
	10	9.40	5990	URIN TRACT INFECTION NOS
	2	9.50	59080	PYELONEPHRITIS
	2	9.50	86600	KIDNEY INJURY NOS-CLOSED
	1	10.00	5935	HYDROURETER
	258	10.68	5921	CALCULUS OF URETER
	8	10.75	5939	RENAL URETERAL DIS NOS
	1	11.00	4473	RENAL ARTERY HYPERPLASIA
	1	11.00	7883	INCONTINENCE OF URINE
2	7	11.43	5933	STRICTURE OF URETER
	1	12.00	23691	UNC BEHAV NEO KIDNEY
	1	12.00	7910	PROTEINURIA
	174	12.05	5920	CALCULUS OF KIDNEY
	7	12.43	59000	CHR PYELONEPHRITIS NOS
	8	12.50	7532	CONGEN URETERAL OBSTRUCT
	4	12.75	7534	URETERAL ANOMALY NEC
	8	12.88	5997	HEMATURIA
	1	13.00	2230	BENIGN NEOPHASM KIDNEY
	1	13.00	5951	CHR INTERSTIT CYSTITIS
	1	13.00	4039	HYPERTENS RENAL DIS NOS
	6	13.00	5902	RENAL/PERIRENAL ABSCESS
	3	13.33	586	RENAL FAILURE NOS

Table .16 (Continued)

Group	Size	Mean	Independent Variable	Abbreviated CPHA English Description
	33	13.52	5934	URETERIC OBSTRUCTION NEC
	5	13.60	7531	CYSTIC KIDNEY DISEASE
	1	14.00	8670	BLADDER/URETHRA INJ-CLOS
	1	14.00	5849	ACUTE RENAL FAILURE NOS
	2	14.00	5830	PROLIFERAT NEPHRITIS NOS
3	16	14.38	59389	RENAL URETERAL DIS NEC
	8	14.38	1891	MALIG NEO RENAL PELVIS
	23	14.43	591	HYDROHEPHROSIS
	4	14.75	5929	URINARY CALCULUS NOS
	1	15.00	1885	MAL NEO BLADDER NECK
	2	15.50	4030	MAL HYPERTENS RENAL DIS
	17	15.82	1892	MALIGN NEOPL URETER
	1	16.00	590001	CHR PYELONEPH W MED NECR
	77	16.17	1890	MALIG NEOPL KIDNEY
	1	17.00	4421	RENAL ARTERY ANEURYSM
	2	17.00	59381	RENAL VASCULAR DISORDER
	2	17.00	9975	SURG COMPL-URINARY TRACT
	2	17.50	86602	KIDNEY LACERATION-CLOSED
	1	18.00	1899	MAL NEO URINARY NOS
	1	18.00	7888	EXTRAVASATION OF URINE
4	5	18.60	34461	NEUROGENIC BLADDER
	1	19.00	5952	CHRONIC CYSTITIS NEC
	2	19.50	4401	RENAL ARTERY ATHEROSCLER
	4	19.75	585	CHRONIC RENAL FAILURE
	32	19.78	1889	MALIG NEO BLADDER NOS
	1	20.00	1893	MALIGH NEOPL URETHRA
	3	20.33	59010	AC PYELONEPHRITIS NOS
	2	22.00	5819	NEPHROTIC SYNDROME NOS
	1	23.00	1981	SEC MALIG NEO URIN NEC
	2	24.00	1888	MALIG NEO BLADDER NEC
	2	26.50	5834	RAPIDLY PROG NEPHRIT NOS
	1	29.00	V420	KIDNEY TRANSPLANT STATUS
	1	31.00	1980	SECOND MALIG NEO KIDNEY
	1	33.00	2337	CA IN SITU BLADDER

Table .17

Definition of Malignancy Used in Partitioning of
Kidney Ureter and Major Bladder
Operating Room Procedure Category

Diagnosis Code	Abbreviated CPHA English Description
1880	MAL NEO BLADDER-TRIGONE
1881	MAL NEO BLADDER-DOME
1882	MAL NEO BLADDER-LATERAL
1883	MAL NEO BLADDER-ANTERIOR
1884	MAL NEO BLADDER-POST
1885	MAL NEO BLADDER NECK
1886	MAL NEO URETERIC ORIFICE
1887	MALIG NEO URACHUS
1888	MALIG NEO BLADDER NEC
1889	MALIG NEO BLADDER NOS
1890	MALIG NEOPL KIDNEY
1891	MALIG NEO RENAL PELVIS
1892	MALIGN NEOPL URETER
1893	MALIGN NEOPL URETHRA
1894	MAL NEO PARAURETHRAL
1898	MAL NEO URINARY NEC
1899	MAL NEO URINARY NOS
1980	SECOND MALIG NEO KIDNEY
1981	SEC MALIG NEO URIN NEC
2230	BENIGN NEOPLASM KIDNEY
2231	BENIGN NEO RENAL PELVIS
2232	BENIGN NEOPLASM URETER
2233	BENIGN NEOPLASM BLADDER
22381	BENIGN NEOPLASM URETHRA
22389	BENIGN NEO URINARY NEC
2239	BENIGN NEO URINARY NOS
2337	CA IN SITU BLADDER
2339	CA IN SITU URINARY NEC
2367	UNC BEHAV NEO BLADDER
23690	UNC BEHAV NEO URINAR NOS
23691	UNC BEHAV NEO KIDNEY
23699	UNC BEHAV NEO URINAR NEC
2394	BLADDER NEOPLASM NOS
2395	OTHER GU NEOPLASM NOS

Table .18

Independent Variables Reviewed in the
Partitioning Process for Kidney Ureter
and Major Bladder Without Malignancy

Variable Name	Number of Observations	Number of Cells	Number of Groups	Percent Reduction	Total Sum of Squares
*AGE	686	88	3	9.78%	25917.53
AGE >5CC	686	4	2	9.93%	25915.70
AGE >10CC	686	4	2	9.93%	25915.70
AGE >15CC	686	4	2	9.93%	25915.70
AGE >20CC	686	4	2	10.02%	25915.61
AGE >25CC	686	4	3	11.09%	25915.70
AGE >30CC	686	4	3	11.04%	25915.61
AGE >35CC	686	4	3	11.18%	25915.61
AGE >40CC	686	4	3	12.42%	25915.52
AGE >45CC	686	4	4	13.06%	25915.61
AGE >50CC	686	4	3	15.18%	25915.61
AGE >55CC	686	4	3	15.47%	25915.61
AGE >60CC	686	4	3	16.58%	25915.61
AGE >65CC	686	4	3	15.32%	25915.70
AGE >70CC	686	4	3	13.10%	25915.61
AGE >75CC	686	4	2	11.15%	25915.70
AGE >80CC	686	4	2	10.22%	25915.61
YNCC	686	2	2	9.93%	25915.52
DIALYSIS	686	2	1	.00%	25915.52
ETIOLOGY	686	3	1	.00%	25915.61
ADSCU	686	2	1	.00%	25915.52
ADCCU	686	2	1	.00%	25915.43
AD1CU	686	2	2	4.87%	25915.52
DSTAT	686	7	2	6.01%	25915.70
SEX	686	2	1	.00%	25915.52
RACE	686	7	1	.00%	25915.52
DEAD	686	2	1	.00%	25915.52
PAY1	686	9	2	8.83%	25915.70
ER	686	2	1	.00%	25915.52
EMERG	686	2	2	1.51%	25915.52
ALCOHOL	686	1	1	.00%	25915.43
DRGOP	686	41	4	16.00%	25916.34
HEART	686	2	1	.00%	25915.43
PNEUMU	686	2	1	.00%	25915.43
UTI	686	2	2	2.32%	25915.52
OPER11	686	54	4	16.82%	25916.16
DX1	686	60	4	12.53%	25916.07

further partitioning the non-malignancy group. The independent variables chosen to define potential subgroups were age ≥ 50 cc, age ≥ 55 , age ≥ 60 , age ≥ 65 cc, age ≥ 70 , procedure (oper11), and operating room procedure (DRGop). Descriptive statistics for each of these independent variables are summarized in Table .19. Both the procedure and operating room procedure variables were ruled out for further partitioning. These independent variables take on many different values and it is an artifact of the variance reduction algorithms that many subgroups can be created when there are a large number of different values of the patient characteristic. These groups formed were not judged clinically coherent. Further, in accordance with guidelines described in Section II, partitions based on age should be consistent with DRG definitions for a particular MDC, unless there is a specific clinical rationale to do otherwise. Therefore, the group without malignancy was further split on age ≥ 70 cc. A two way split was implemented over the three way split in order to keep the number of terminal groups in the entire DRG system a manageable size. In addition the difference in variance reduction resulting from the change from a three way split to a two way split was found to be small. This resulted in the construction of DRGs 303-305.

To further clarify the construction of DRGs, let us examine the Infection category on the medical side of the tree. A histogram and summary statistics for the Infection Group were reviewed. (Figure .5). Table .20 describes, for

Table .19
Kidney, Ureter and Major Bladder
Without Malignancy

Variable	Group	Number Observed	Mean	Standad Deviation
Age \geq 50CC	1	277	9.34	4.26
	2,3	301	12.22	6.11
	4	108	16.32	7.34
Age \geq 55CC	1	331	9.63	4.74
	2,3	264	12.52	5.93
	4	91	16.86	7.62
Age \geq 60CC	1	385	9.86	4.92
	2,3	230	12.90	5.98
	4	71	17.82	7.68
Age \geq 65CC	1	420	10.06	4.94
	2,3	212	13.29	6.36
	4	54	18.24	7.79
Age \geq 70CC	1	454	10.20	5.04
	2,3	200	14.15	6.82
	4	32	17.75	7.53
Age \geq 70CC	1*	454	10.20	5.04
	2	232	14.65	7.01
Oper11	1	34	6.18	2.97
	2	488	10.92	5.33
	3	154	14.53	6.85
	4	10	25.10	5.45
DRGop	1	35	5.89	2.89
	2	453	10.79	5.22
	3	173	14.10	6.89
	4	25	19.68	6.45

*The maximum number of subgroups we specified for AUTOGRP to recommend was two.

Figure .5

Length of Stay Distributions
for Medical Patients
with an Infection

				Mean	Standard Deviation	Number of Patients
				6.10	5.03	2,261
VALUE	OBS	PCT	CUV %			
1.00	209	9.24	9.24	*****		
2.00	293	12.96	22.20	*****		
3.00	311	13.75	35.96	*****		
4.00	275	12.16	48.12	*****		
5.00	237	10.48	58.60	*****		
6.00	170	7.52	66.12	*****		
7.00	140	6.50	72.71	*****		
8.00	116	5.13	77.84	*****		
9.00	104	4.60	82.44	*****		
10.00	65	2.97	85.32	*****		
11.00	58	2.57	87.88	*****		
12.00	50	2.34	90.23	****		
13.00	40	1.77	91.99	***		
14.00	40	1.77	93.76	***		
15.00	29	1.28	95.05	**		
16.00	19	.84	95.89	*		
17.00	20	.98	96.77	*		
18.00	9	.40	97.17			
19.00	4	.18	97.35			
20.00	5	.22	97.57			
21.00	14	.62	98.19	*		
22.00	6	.27	98.46			
23.00	6	.27	98.72			
24.00	2	.09	98.81			
25.00	5	.22	99.03			
26.00	3	.13	99.16			
27.00	2	.09	99.25			
28.00	3	.13	99.38			
29.00	2	.09	99.47			
30.00	0	.00	99.47			
31.00	2	.09	99.56			
32.00	1	.04	99.60			
33.00	2	.09	99.69			
34.00	1	.04	99.73			
35.00	1	.04	99.78			
36.00	2	.09	99.87			
37.00	3	.13	100.00			

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Table .20

Independent Variables Reviewed in the
Partitioning Process for Infection

Variable Name	Number of Observations	Number of Cells	Number of Groups	Percent Reduction	Total Sum of Squares
* AGE	2261	99	3	14.98%	57275.41
AGE >5CC	2261	4	2	6.98%	57273.17
AGE >10CC	2261	4	3	8.42%	57273.12
AGE >15CC	2261	4	3	8.69%	57273.12
AGE >20CC	2261	4	3	10.03%	57273.12
AGE >25CC	2261	4	3	11.62%	57273.12
AGE >30CC	2261	4	3	12.62%	57273.12
AGE >35CC	2261	4	3	13.23%	57273.12
AGE >40CC	2261	4	3	14.56%	57273.12
AGE >45CC	2261	4	3	15.14%	57273.12
AGE >50CC	2261	4	3	15.10%	57273.12
AGE >55CC	2261	4	4	16.16%	57273.17
AGE >60CC	2261	4	4	16.41%	57273.17
AGE >65CC	2261	4	4	15.65%	57273.17
AGE >70CC	2261	4	4	15.76%	57273.1
AGE >75CC	2261	4	4	14.75%	57273.1
AGE >80CC	2261	4	3	12.32%	57273.12
YNCC	2261	2	2	6.76%	57273.07
DIALYSIS	2261	2	1	.00%	57273.03
ETIOLOGY	2261	2	1	.00%	57273.03
ADSCU	2261	2	1	.00%	57273.03
ADCCU	2261	2	1	.00%	57273.03
ADICU	2261	2	2	1.96%	57273.07
DSTAT	2261	8	2	7.12%	57273.31
SEX	2261	2	1	.00%	57273.07
RACE	2261	7	1	.00%	57273.17
DEAD	2261	2	1	.00%	57273.07
PAY1	2261	11	2	12.90%	57273.17
ER	2261	2	2	1.85%	57273.07
EMERG	2261	2	2	1.43%	57273.07
ALCOHOL	2261	2	1	.00%	57273.07
HEART	2261	2	2	1.85%	57273.07
PNEUMO	2261	2	1	.00%	57273.07
UTI	2261	2	1	.00%	57273.07
OPER11	2261	117	5	17.82%	57273.88
DX1	2261	22	2	2.54%	57273.31

the Infection group, the different independent variables explored, the number of groups formed by the classify algorithm, and the corresponding percent reduction in explained variation for each of these variables.

Since a substantial percentage of reduction in explained variation was achieved with procedure (oper11), payor source (pay1), age, and age70cc, these variables were evaluated individually as candidates for further subdividing this category. The descriptive statistics are summarized in Table .21. Pay source was not further evaluated as it is a system variable not related to the care process. The remaining variables in the list were discarded as candidates for the partitioning of this group at this level of the tree. It was decided, however, to split further the Infection Group of the urinary system into two parts, similar to those suggested by the classify algorithm, namely a group of patients age eighteen and over and a group of patients age 0-17.

A closer examination was made of the characteristics of the two Infection Groups formed, which are age 0-17 and 18 and over. Table .22 describes the number of groups formed by the classify algorithm and the explained variation for each of the variables. No further partitioning was suggested by the classify algorithm for the 0-17 age group. However, the eighteen years and over Infection Group was partitioned on age70cc. Descriptive statistics are summarized in Table .23.

Table .21

Infection

Group Name	Group	Number Observed	Mean	Standard Deviation
Oper11	1	788	4.75	4.29
	2	1256	6.08	4.33
	3	147	8.72	5.49
	4	60	14.50	8.24
	5	10	24.90	8.37
Age >70CC	1	1222	4.52	3.47
	2	474	6.55	4.91
	3	282	7.96	5.65
	4	283	10.27	6.83
Age >70CC *	1	1222	4.52	3.47
	2	1039	7.95	5.89
Age	1	1398	4.66	3.69
	(ages 1-58)			
	2	566	7.63	5.32
	(ages 59-79)			
	3	297	9.93	6.80
	(ages 80-99)			
Pay1	1	1455	4.75	3.65
	2	806	8.52	6.16

* The maximum number of subgroups we specified for AUTOGRP to recommend was two.

Table .22

Independent Variables Reviewed in the
Partitioning Process for Infection
with Age 0-17, and With Age 18 and Over

AGE 0-17

Variable Name	Number of Observations	Number of Cells	Number of Groups	Percent Reduction	Total Sum of Squares
* AGE	355	18	3	6.96%	4139.17
AGE >5CC	355	4	2	4.80%	4139.16
AGE >10CC	355	4	2	4.80%	4139.16
AGE >15CC	355	4	2	4.80%	4139.16
YNCC	355	2	2	4.80%	4139.16
DIALYSIS	355	1	1	.00%	4139.16
ETIOLOGY	355	1	1	.00%	4139.16
ADSCU	355	2	1	.00%	4139.16
ADCCU	355	1	1	.00%	4139.16
ADICU	355	1	1	.00%	4139.16
DSTAT	355	3	1	.00%	4139.16
SEX	355	2	1	.00%	4139.16
RACE	355	7	2	2.46%	4139.16
DEAD	355	1	1	.00%	4139.16
PAY1	355	8	2	1.40%	4139.16
ER	355	2	2	2.44%	4139.16
EMERG	355	2	2	3.69%	4139.16
ALCOHOL	355	1	1	.00%	4139.16
DRGOP	355	1	1	.00%	4139.16
HEART	355	1	1	.00%	4139.16
PNEUMO	355	2	1	.00%	4139.16
UTI	355	2	1	.00%	4139.16
OPER11	355	29	3	18.07%	4139.16
DX1	355	15	3	4.10%	4139.16

Table .22 (Continued)

Independent Variables Reviewed in the
Partitioning Process for Kidney Ureter
Infection and Major Bladder
With Age 0-17, and With Age 18 and Over

Age 18 And Over

Variable Name	Number of Observations	Number of Cells	Number of Groups	Percent Reduction	Total Sum of Squares
* AGE	1906	81	3	13.16%	50893.23
AGE >5CC	1906	2	2	5.63%	50891.29
AGE >10CC	1906	2	2	5.63%	50891.29
AGE >15CC	1906	2	2	5.63%	50891.34
AGE >20CC	1906	4	2	6.47%	50891.34
AGE >25CC	1906	4	2	7.42%	50891.34
AGE >30CC	1906	4	3	9.58%	50891.34
AGE >35CC	1906	4	3	10.36%	50891.34
AGE >40CC	1906	4	3	11.93%	50891.34
AGE >45CC	1906	4	3	13.01%	50891.34
AGE >50CC	1906	4	3	13.08%	50891.34
AGE >55CC	1906	4	3	13.12%	50891.34
AGE >60CC	1906	4	3	13.41%	50891.34
AGE >65CC	1906	4	4	13.67%	50891.34
AGE >70CC	1906	4	4	13.95%	50891.39
AGE >75CC	1906	4	4	13.19%	50891.39
AGE >80CC	1906	4	3	10.97%	50891.34
YNCC	1906	2	2	5.63%	50891.29
DIALYSIS	1906	2	1	.00%	50891.24
ETIOLOGY	833	4	2	.00%	50891.24
ADSCU	1906	2	1	.00%	50891.29
ADCCU	1906	2	1	.00%	50891.24
AD1CU	1906	2	2	1.94%	50891.29
DSTAT	1906	8	2	6.54%	50891.49
SEX	1906	2	1	.00%	50891.29
RACE	1906	7	1	.00%	50891.39
DEAD	1906	2	1	.00%	50891.29
PAY1	1906	11	2	11.67%	50891.44
ER	1906	2	2	1.32%	50891.29
EMERG	1906	2	2	1.15%	50891.29
ALCOHOL	1906	2	1	.00%	50891.29
DRGOF	1906	1	1	.00%	50891.24
HEART	1906	2	2	1.74%	50891.29
PNEUMU	1906	2	1	.00%	50891.29
UTI	1906	2	1	.00%	50891.29
OPER11	1906	114	5	17.90%	50891.11
DX1	1906	22	3	4.68%	50891.34

Table .23
Infection

AGE 18 And Over

VARIABLE NAME	GROUP	NUMBER	MEAN	STANDARD DEVIATION
OPER11	1	658	5.21	4.44
	2	1038	6.41	4.45
	3	141	8.84	5.12
	4	59	14.58	8.30
	5	10	24.90	8.37
Age >70CC	1	923	4.87	3.55
	2	418	6.69	4.91
	3	282	7.96	5.65
	4	283	10.27	6.83
AGE >70CC*	1	923	4.87	3.55
	2	983	8.08	5.92

* The maximum number of subgroups we specified for AUTOGRP to recommend was two.

Appendix I

Cummulative Frequencies for Costs by DRG

HEALTH CARE FINANCING ADMINISTRATION BUREAU OF DATA MANAGEMENT AND STRATEGY 6-21-82
1979 20% SAMPLE DISCHARGES BY DIAGNOSIS RELATED GROUP ADJUSTED SAMPLE COST IS \$3,291,791,275 FOR 1,766,107 DISCHA

DRG NUMBER	AVG COST	DISCHARGES	TOTAL COST	% OF TOTAL	CUMULATIVE %
132 ATHEROSCLEROSIS AGE >69 AND/OR C.C.	\$1,602.29	93,453	\$158,149,577	4.80%	4.80%
14 SPECIFIC CEREBROVASCULAR DISORDERS EXCEPT I	\$2,349.05	51,748	\$121,558,639	3.69%	8.50%
127 HEART FAILURE + SHOCK	\$1,903.62	62,218	\$118,439,429	3.60%	12.10%
122 CIRCULATORY DISORDERS WITH AMI W/O C.V. COM	\$2,759.80	37,640	\$103,878,872	3.16%	15.25%
88 CHRONIC OBSTRUCTIVE PULMONARY DISEASE	\$1,899.35	43,623	\$82,855,345	2.52%	17.77%
182 ESOPHAGITIS-GASTROENT. + MISC. DIGEST. DIS A	\$1,112.85	74,179	\$82,550,100	2.51%	20.28%
89 SIMPLE PNEUMONIA + PLEURISY AGE >69 AND/OR	\$1,965.11	39,577	\$77,694,554	2.36%	22.64%
467 OTHER FACTORS INFLUENCING HEALTH STATUS	\$2,086.50	30,397	\$63,423,340	1.93%	24.56%
294 DIABETES AGE >69	\$1,479.26	38,996	\$57,685,222	1.75%	26.32%
209 MAJOR JOINT PROCEDURES	\$4,237.14	12,448	\$52,743,918	1.60%	27.92%
210 HIP + FEMUR PROCEDURES EXCEPT MAJOR JOINT A	\$3,808.55	12,853	\$48,951,293	1.49%	29.40%
39 LENS PROCEDURES	\$893.96	54,422	\$48,651,091	1.48%	30.88%
243 MEDICAL BACK PROBLEMS	\$1,419.80	33,855	\$48,067,329	1.46%	32.34%
148 MAJOR SMALL + LARGE BOWEL PROCEDURES AGE >6	\$4,626.88	9,752	\$45,121,333	1.37%	33.71%
82 RESPIRATORY NEOPLASMS	\$2,177.91	20,451	\$44,540,437	1.35%	35.07%
130 PERIPHERAL VASCULAR DISORDERS AGE >69 AND/O	\$1,797.64	24,319	\$43,716,807	1.33%	36.39%
197 TOTAL CHOLECYSTECTOMY W/O C.D.E. AGE >69 AND	\$2,915.73	14,747	\$42,998,270	1.31%	37.70%
138 CARDIAC ARRHYTHMIA + CONDUCTION DISORDERS A	\$1,738.78	23,199	\$40,337,957	1.23%	38.93%
140 ANGINA PECTORIS	\$1,364.71	29,510	\$40,272,592	1.22%	40.15%
116 PERMANENT CARDIAC PACEMAKER IMPLANT W/O AMI	\$5,031.18	7,919	\$39,841,914	1.21%	41.36%
172 DIGESTIVE MALIGNANCY AGE >69 AND/OR C.C.	\$2,248.46	15,091	\$33,931,509	1.03%	42.39%
336 TRANSURETHRAL PROSTATECTOMY AGE >69 AND/OR	\$1,923.19	17,572	\$33,794,294	1.03%	43.42%
96 BRONCHITIS + ASTHMA AGE >69 AND/OR C.C.	\$1,409.49	23,772	\$33,506,396	1.02%	44.44%
134 HYPERTENSION	\$1,297.57	25,615	\$33,237,255	1.01%	45.44%
233 OTHER MUSCULOSKELET SYS + CONN TISS O.R. PR	\$3,311.61	9,648	\$31,950,413	0.97%	46.42%
320 KIDNEY + URINARY TRACT INFECTIONS AGE >69 A	\$1,416.90	20,835	\$29,521,111	0.90%	47.31%
235 FRACTURES OF HIP + PELVIS	\$2,670.71	10,867	\$29,022,605	0.88%	48.19%
174 G.I. HEMORRHAGE AGE >69 AND/OR C.C.	\$1,728.37	16,349	\$28,257,121	0.86%	49.05%
15 TRANSIENT ISCHEMIC ATTACKS	\$1,215.13	22,478	\$27,313,692	0.83%	49.88%
112 VASCULAR PROCEDURES EXCEPT MAJOR RECONSTRUC	\$4,276.54	5,911	\$25,278,627	0.77%	50.65%
395 RED BLOOD CELL DISORDERS AGE >17	\$1,452.81	17,083	\$24,818,353	0.75%	51.40%
430 PSYCHOSES	\$2,049.92	11,939	\$24,473,994	0.74%	52.15%
133 ATHEROSCLEROSIS AGE <70 W/O C.C.	\$1,579.86	15,405	\$24,337,743	0.74%	52.89%
296 NUTRITIONAL + MISC. METABOLIC DISORDERS AGE	\$1,626.88	14,724	\$23,954,181	0.73%	53.61%
413 OTHER MYELOPROLIF DISORD OR POORLY DIFF NEOP	\$2,003.34	11,746	\$23,531,231	0.71%	54.33%
107 CORONARY BYPASS W/O CARDIAC CATH	\$7,641.65	3,035	\$23,192,407	0.70%	55.03%
403 LYMPHOMA OR LEUKEMIA AGE >69 AND/OR C.C.	\$2,135.90	10,109	\$21,591,813	0.66%	55.69%
316 RENAL FAILURE W/O DIALYSIS	\$2,333.52	8,956	\$20,899,005	0.63%	56.32%
188 OTHER DIGESTIVE SYSTEM DIAGNOSES AGE >69 AN	\$1,363.24	15,136	\$20,634,000	0.63%	56.95%
87 PULMONARY EDEMA + RESPIRATORY FAILURE	\$2,380.27	8,575	\$20,410,815	0.62%	57.57%
110 MAJOR RECONSTRUCTIVE VASCULAR PROCEDURES AG	\$5,464.20	3,650	\$19,944,330	0.61%	58.18%
207 DISORDERS OF THE BILIARY TRACT AGE >69 AND/	\$1,486.64	13,190	\$19,608,781	0.60%	58.77%
244 BONE DISEASES + SEPTIC ARTHROPATHY AGE >69	\$1,447.64	13,504	\$19,548,930	0.59%	59.37%
12 DEGENERATIVE NERVOUS SYSTEM DISORDERS	\$1,981.59	9,515	\$18,854,828	0.57%	59.94%

HEALTH CARE FINANCING ADMINISTRATION BUREAU OF DATA MANAGEMENT AND STRATEGY 6-21-82
 1975 20% SAMPLE DISCHARGES BY DIAGNOSIS RELATED GROUP ADJUSTED SAMPLE COST IS \$3,291,791.275 FOR 1,766,107 DISCHA

DRG NUMBER	AVG COST	DISCHARGES	TOTAL COST	% OF TOTAL	CUMULATIVE %
170 OTHER DIGESTIVE SYSTEM PROCEDURES AGE >69 A	\$4,720.33	3,936	\$18,614,642	0.57%	60.51% -45
101 OTHER RESPIRATORY DIAGNOSES AGE >69 AND/OR	\$1,718.61	10,678	\$18,351,317	0.56%	61.06%
429 ORGANIC DISTURBANCES + MENTAL RETARDATION	\$1,769.56	10,340	\$18,297,250	0.56%	61.62%
154 STOMACH, ESOPHAGEAL + DUODENAL PROCEDURES A	\$4,901.80	3,568	\$17,489,622	0.53%	62.15%
331 OTHER KIDNEY + URINARY TRACT DIAGNOSES AGE	\$1,625.16	10,447	\$16,978,046	0.52%	62.67%
123 CIRCULATORY DISORDERS WITH AMI, EXPIRED	\$1,860.70	9,087	\$16,908,180	0.51%	63.18% -50
461 O.R. PROC WITH DIAGNOSES OF OTHER CONTACT W	\$2,943.56	5,693	\$16,757,687	0.51%	63.69%
161 INGUINAL + FEMORAL HERNIA PROCEDURES AGE >6	\$1,305.58	12,022	\$15,695,682	0.48%	64.17%
348 BENIGN PROSTATIC HYPERTROPHY AGE >69 AND/OR	\$1,682.19	9,319	\$15,676,328	0.48%	64.64%
346 MALIGNANCY, MALE REPRODUCTIVE SYSTEM, AGE >	\$1,784.20	8,655	\$15,442,251	0.47%	65.11%
183 ESOPHAGITIS, GASTROENT. + MISC. DIGEST. DIS A	\$976.86	15,619	\$15,257,576	0.46%	65.57%
78 PULMONARY EMBOLISM	\$2,631.14	5,158	\$13,571,420	0.41%	65.99%
277 CELLULITIS AGE >69 AND/OR C.C.	\$1,619.60	8,341	\$13,509,083	0.41%	66.40%
113 AMPUTATION, FOR CIRC SYSTEM DISORDERS EXCEPT	\$4,534.46	2,967	\$13,453,742	0.41%	66.81%
253 FX, SPRLNS, STRNS + DISL OF UPARM, LOWLEG EX FO	\$1,432.40	9,338	\$13,375,751	0.41%	67.21%
16 NONSPECIFIC CEREBROVASCULAR DISORDERS WITH	\$1,568.80	8,348	\$13,096,342	0.40%	67.61% -60
180 G.I. OBSTRUCTION AGE >69 AND/OR C.C.	\$1,481.80	8,770	\$12,995,386	0.39%	68.00%
177 UNCOMPLICATED PEPTIC ULCER >69 AND/OR C.C.	\$1,376.21	9,372	\$12,897,840	0.39%	68.40%
17 NONSPECIFIC CEREBROVASCULAR DISORDERS W/O C	\$1,526.39	8,067	\$12,313,388	0.37%	68.77%
271 SKIN ULCERS	\$2,397.48	5,083	\$12,186,390	0.37%	69.14%
274 MALIGNANT BREAST DISORDERS AGE >69 AND/OR	\$1,907.05	6,326	\$12,063,998	0.37%	69.51%
90 SIMPLE PNEUMONIA + PLEURISY AGE 18-69 W/O C	\$1,671.99	7,060	\$11,804,249	0.36%	69.87%
426 DEPRESSIVE NEUROSES	\$1,778.08	6,403	\$11,385,046	0.35%	70.21%
129 CARDIAC ARREST	\$2,656.72	4,254	\$11,301,686	0.34%	70.55%
318 KIDNEY + URINARY TRACT NEOPLASMS AGE >69 AN	\$1,635.49	6,764	\$11,062,454	0.34%	70.89%
438 ALCOHOL + SUBSTANCE INDUCED ORGANIC MENTAL	\$1,365.49	8,049	\$10,990,829	0.33%	71.22% -70
120 OTHER O.P. PROCEDURES ON THE CIRCULATORY SY	\$6,344.03	1,646	\$10,442,273	0.32%	71.54%
416 SEPTICEMIA AGE >17	\$2,890.07	3,556	\$10,277,088	0.31%	71.85%
280 TRAUMA TO THE SKIN, SUBCUT TISS + BREAST AG	\$1,106.57	9,113	\$10,084,172	0.31%	72.16%
105 CARDIAC VALVE PROCEDURE WITH PUMP + W/O CAR	\$9,703.83	1,020	\$9,897,906	0.30%	72.46%
143 CHEST PAIN	\$1,245.22	7,904	\$9,842,218	0.30%	72.76%
5 EXTRACRANIAL VASCULAR PROCEDURES	\$3,013.45	3,227	\$9,724,403	0.30%	73.06%
1 CRANIOTOMY AGE >17 EXCEPT FOR TRAUMA	\$6,012.92	1,614	\$9,704,852	0.29%	73.35%
75 PERIPHERAL VASCULAR DISORDERS AGE <70 W/O C	\$1,764.43	5,488	\$9,683,191	0.29%	73.64%
240 CONNECTIVE TISSUE DISORDERS AGE >69 AND/OR	\$4,482.02	2,117	\$9,488,436	0.29%	73.93%
144 OTHER CIRCULATORY DIAGNOSES WITH C.C.	\$1,815.53	5,043	\$9,155,717	0.28%	74.21% -80
128 DEEP VEIN THROMBOPHLEBITIS	\$2,029.93	4,472	\$9,077,846	0.28%	74.49%
159 HERNIA PROCEDURES EXCEPT INGUINAL + FEMORAL	\$1,592.51	5,662	\$9,016,791	0.27%	74.76%
125 CIRCULATORY DISORDERS EXC AMI, WITH CARD CAT	\$1,716.52	5,226	\$8,970,533	0.27%	75.03% -83
202 CIRRHOSIS + ALCOHOLIC HEPATITIS	\$3,538.42	2,496	\$8,831,896	0.27%	75.30%
203 MALIGNANCY OF HEPATOBIILIARY SYSTEM OR PANCR	\$2,101.86	4,170	\$8,764,756	0.27%	75.57%
149 MAJOR SMALL + LARGE BOWEL PROCEDURES AGE <7	\$2,058.24	4,218	\$8,681,656	0.26%	75.83%
256 OTHER DIAGNOSES OF MUSCULOSKELETAL SYSTEM +	\$4,230.75	2,045	\$8,651,883	0.26%	76.09%
	\$1,540.03	5,460	\$8,408,563	0.26%	76.35% 88

HEALTH CARE FINANCIAL ADMINISTRATION BUREAU OF DATA MANAGEMENT AND STRATEGY 6-21-82
 1970 202 SAMPLE DISCHARGES BY DIAGNOSIS RELATED GROUP ADJUSTED SAMPLE COST IS \$1,291,791,275 FOR 1,766,107 DISCHA

ICD-9	AVG COST	DISCHARGES	TOTAL COST	% OF TOTAL	CUMULATIVE %
240	\$1,314.10	6,373	\$8,374,759	0.25%	76.50%
241	\$1,268.89	6,354	\$8,195,961	0.25%	76.85%
242	\$1,197.74	4,522	\$5,429,380	0.25%	77.10%
243	\$1,077.39	7,519	\$8,100,895	0.25%	77.35%
244	\$1,137.68	4,655	\$5,308,900	0.25%	77.59%
245	\$1,291.06	5,100	\$6,675,466	0.24%	77.83%
246	\$1,384.85	5,615	\$7,798,392	0.24%	78.07%
247	\$1,582.05	4,869	\$7,703,001	0.23%	78.30%
248	\$1,205.39	5,897	\$7,097,884	0.23%	78.54%
249	\$1,889.77	1,561	\$2,932,930	0.23%	78.77%
250	\$1,956.03	3,852	\$7,616,371	0.23%	79.00%
251	\$4,091.23	1,849	\$7,564,684	0.23%	79.23%
252	\$2,110.23	3,514	\$7,415,348	0.23%	79.46%
253	\$1,712.28	4,224	\$7,232,670	0.22%	79.67%
254	\$1,308.65	5,506	\$7,210,932	0.22%	79.89%
255	\$3,060.18	2,304	\$7,050,654	0.21%	80.11%
256	\$1,120.14	6,228	\$6,976,231	0.21%	80.32%
257	\$1,889.49	3,641	\$6,916,043	0.21%	80.53%
258	\$3,603.99	1,878	\$6,769,105	0.21%	80.73%
259	\$1,281.71	5,253	\$6,732,822	0.20%	80.94%
260	\$1,482.42	4,435	\$6,574,532	0.20%	81.14%
261	\$2,180.89	2,735	\$5,811,734	0.20%	81.34%
262	\$6,660.21	957	\$6,373,820	0.19%	81.53%
263	\$2,004.30	3,158	\$6,329,579	0.19%	81.72%
264	\$1,999.20	3,134	\$6,265,492	0.19%	81.91%
265	\$1,173.22	5,294	\$6,211,026	0.19%	82.10%
266	\$2,523.42	1,733	\$6,106,086	0.19%	82.29%
267	\$1,994.64	3,023	\$6,029,796	0.18%	82.47%
268	\$4,082.09	1,475	\$6,021,082	0.18%	82.65%
269	\$2,366.67	2,506	\$5,930,875	0.18%	82.83%
270	\$4,846.96	1,202	\$5,826,045	0.18%	83.01%
271	\$3,287.10	1,765	\$5,801,731	0.18%	83.19%
272	\$1,463.20	3,952	\$5,782,566	0.18%	83.36%
273	\$1,200.15	4,716	\$5,719,914	0.17%	83.54%
274	\$1,975.48	2,871	\$5,671,603	0.17%	83.71%
275	\$1,260.77	4,470	\$5,635,641	0.17%	83.88%
276	\$1,104.14	4,063	\$5,479,846	0.17%	84.05%
277	\$12,877.62	455	\$5,477,117	0.17%	84.21%
278	\$4,507.11	1,215	\$5,476,138	0.17%	84.38%
279	\$1,424.44	3,838	\$5,474,676	0.17%	84.55%
280	\$3,061.66	1,761	\$5,452,816	0.17%	84.71%
281	\$4,393.71	1,238	\$5,439,412	0.17%	84.88%
282	\$1,725.72	3,130	\$5,401,503	0.16%	85.04%
283	\$1,891.19	2,812	\$5,318,026	0.16%	85.20%

PROC CODE	AVG COST	DISCHARGES	TOTAL COST	% OF TOTAL	CUMULATIVE %
59 RESPIRATORY SIGNS + SYMPTOMS AGE >69 AND/OR	11,448.01	3,651	45,286,684	0.16%	85.36%
339 MAJOR MALL PLVLC PROCEDURES W/O C.C.	12,567.13	2,052	25,267,750	0.14%	85.52%
172 MAJOR MALL DISCHARGES AGE >69 AND/OR C.C.	11,646.04	3,104	35,240,991	0.16%	85.68%
229 PATHOLOGICAL FRACTURES + MUSCULOSKELETAL +	12,050.71	2,510	30,152,302	0.16%	85.84%
464 OTHER + SYMPTOMS W/ C.C.	11,335.76	3,853	45,146,683	0.16%	86.00%
146 RECTAL RESPECTIVE AGE >69 AND/OR C.C.	14,808.17	1,060	15,135,125	0.16%	86.15%
211 HIP + FEMUR PROCEDURES EXCEPT MAJOR JOINT A	13,521.75	1,448	19,099,494	0.15%	86.31%
162 UNGUINAL + FEMORAL HERNIA PROCEDURES AGE 18	11,050.29	4,794	55,035,090	0.15%	86.46%
109 CARDIOPULMONARY PROCEDURES W/O PUMP	19,244.71	544	10,429,122	0.15%	86.61%
64 EAR, NOSE + THROAT MALIGNANCY	11,805.28	2,784	35,025,899	0.15%	86.76%
231 OTHER PULMONARY + URINARY TRACT DIAGNOSES AGE	11,508.75	3,218	35,016,057	0.15%	86.92%
63 GYN GYNECOLOGY	18,822.77	5,622	106,292,932	0.15%	87.07%
304 KIDNEY/URETER + MAJ BLDR PROC FOR NON-MALIG	13,272.93	1,512	19,948,670	0.15%	87.22%
65 FLEURAL EFFUSION AGE >69 AND/OR C.C.	12,268.82	2,120	25,809,898	0.15%	87.36%
246 NON-SPECIFIC ARTHROPATHIES	11,355.92	3,536	39,794,533	0.15%	87.51%
171 OTHER DIGESTIVE SYSTEM PROCEDURES AGE <70 W	14,121.50	1,162	16,789,287	0.15%	87.65%
24 OTHER DIAGNOSIS OF NERVOUS SYSTEM AGE >69 A	11,590.95	2,915	33,637,619	0.14%	87.80%
263 SKIN LESIONS FOR SKIN ULCER OR CELLULITIS AG	14,038.95	1,144	16,020,558	0.14%	87.94%
175 GYN. MENOPAUSE AGE <70 W/O C.C.	11,535.06	2,966	34,552,987	0.14%	88.07%
155 STOMACH, ESOPHAGEAL + OCCASIONAL PROCEDURES A	14,280.45	1,063	15,550,118	0.14%	88.21%
10 SERVING SYSTEM PROCEDURES AGE >69 AND/OR C.C	12,497.59	1,810	22,450,637	0.14%	88.35%
269 OTHER SKIN. SUBCUT TISS + BREAST O.R. PROC	12,205.48	1,995	24,399,932	0.13%	88.48%
321 KIDNEY + URINARY TRACT INFECTIONS AGE 18-65	11,142.74	3,820	42,365,266	0.13%	88.62%
356 FEMALE REPRODUCTIVE SYSTEM RECONSTRUCTIVE P	11,577.40	2,765	31,361,511	0.13%	88.75%
415 G.A. PROCEDURE FOR INFECTIONS + PARASITIC D	15,125.25	849	12,851,337	0.13%	88.88%
229 FOOT PROCEDURES	11,227.85	3,480	39,272,918	0.13%	89.01%
369 GASTROINTESTINAL + OTHER FEMALE REPRODUCTIVE SYSTE	11,303.54	3,273	37,266,486	0.13%	89.14%
444 MULTIPLE TRAUMA AGE >69 AND/OR C.C.	11,637.26	2,571	30,209,395	0.13%	89.27%
47 OTHER DISORDERS OF THE EYE AGE >17 W/O C.C.	18,611.42	4,766	88,105,527	0.12%	89.39%
215 INTERSTITIAL LUNG DISEASE AGE >69 AND/OR C.C.	11,919.48	2,038	24,511,900	0.12%	89.51%
215 BACK + NECK PROCEDURES AGE <70 W/O C.C.	12,802.88	1,380	17,887,974	0.12%	89.63%
407 MYELOIDOLIF DISORD OR POORLY DIFF NEOPL W M	14,188.56	894	12,744,572	0.11%	89.74%
303 KIDNEY/URETER + MAJOR PLACED PROCEDURE FOR	14,317.79	847	12,157,168	0.11%	89.85%
28 TRAUMATIC STUPOR + COMA. COMA <1 HR AGE >69	11,866.94	1,956	23,651,734	0.11%	89.96%
2 CRANIOTOMY FOR TRAUMA AGE >17	15,720.89	635	10,020,065	0.11%	90.07%
195 HEPATOCHOLIC DIAGNOSTIC PROCEDURE FOR MALI	14,375.17	792	11,465,134	0.11%	90.18%
349 PERIPHERAL PROSTATIC HYPERTROPHY AGE <70 W/O C.C.	11,326.45	2,597	29,444,790	0.10%	90.28%
423 OTHER INFECTIONS + PARASITIC DISEASES DIAGN	12,066.88	1,623	19,354,546	0.10%	90.39%
231 LOCAL EXCISION + REMOVAL OF INT FIX DEVICES	11,903.86	1,757	20,345,082	0.10%	90.49%
160 HERNIA PROCEDURES EXCEPT INGUINAL + FEMORAL	11,361.81	2,450	27,336,434	0.10%	90.59%
102 OTHER RESPIRATORY DIAGNOSES AGE <70	11,686.19	1,977	22,333,597	0.10%	90.69%
176 GASTROINTESTINAL REPTIC ULCER	12,323.75	1,431	17,325,286	0.10%	90.79%
30 RETINAL PROCEDURES	11,256.20	2,643	29,320,136	0.10%	90.89%
25 SEIZURE + HEADACHE AGE 18-65 W/O C.C.	11,043.47	3,177	35,315,104	0.10%	90.99%

RESULTS OF SELECTED EPIDEMIOLOGIC ADMINISTRATION BUREAU OF DATA MANAGEMENT AND STRATEGY F-21-R2
 1979 200 SAMPLE DISCHARGES BY DIAGNOSIS RELATED GROUP ADJUSTED SAMPLE COST IS \$3,291,791,275 FOR 1,766,107 DISCHA

DRG NUMBER	AVG COST	DISCHARGES	TOTAL COST	% OF TOTAL	CUMULATIVE %
424 C.C. PROCEDURES WITH PRINCIPAL DIAGNOSIS OF	\$3,551.52	921	\$3,270,949	0.10%	91.06%
208 DEFTORAL STRUCTURE AGE >69 AND/OR C.C.	\$1,222.57	2,633	\$3,219,026	0.10%	91.19%
202 OTHER ENDOCRINE, NUTRIT + METAB O.R. PROC A	\$3,922.60	874	\$3,198,048	0.10%	91.29%
241 CONJUNCTIVE TISSUE DISORDERS AGE <70 W/O C.C	\$1,677.18	1,874	\$3,143,035	0.10%	91.38%
443 OTHER C.C. PROCEDURES FOR INFANTS AGE <70	\$3,349.80	1,006	\$3,068,098	0.09%	91.48%
248 TENDINITIS, MYOSITIS + EUPHYSIS	\$1,121.11	2,724	\$3,053,903	0.09%	91.57%
245 JOINT DISEASES + SEPTIC ARTHROPATHY AGE <70	\$1,335.51	2,268	\$3,028,936	0.09%	91.66%
13 MULTIPLE SCLEROSIS + CEREBELLAR ATAXIA	\$1,895.38	1,584	\$3,008,617	0.09%	91.75%
178 UNCOMPLICATED EPTIC ULCER <70 W/O C.C.	\$1,108.99	2,679	\$2,979,984	0.09%	91.84%
452 COMPLICATIONS OF TREATMENT AGE >69 AND/OR C	\$1,674.48	1,800	\$2,942,064	0.09%	91.93%
364 C.C. COMPLICATIONS EXCEPT FOR MALIGNANCY	\$724.36	4,058	\$2,939,452	0.09%	92.02%
221 KNEE PROCEDURES AGE >69 AND/OR C.C.	\$2,546.00	1,154	\$2,938,084	0.09%	92.11%
73 OTHER EAR, NOSE + THROAT DIAGNOSES AGE >17	\$966.14	3,016	\$2,883,718	0.09%	92.20%
218 LOWER EXTREM + TUMOR PROC EXC HIP, FOOT, FEMU	\$2,716.61	1,058	\$2,874,173	0.09%	92.29%
406 MYOPLASTIC DISORD OR FULLY DIFF NEOPLASM	\$4,333.30	663	\$2,872,977	0.09%	92.37%
334 MAJOR MALE PELVIC PROCEDURES WITH C.C.	\$2,855.39	1,006	\$2,872,522	0.09%	92.46%
350 NON-RADICAL HYSTERECTOMY AGE <70 W/O C.C.	\$1,600.26	1,589	\$2,860,613	0.09%	92.55%
360 INFLAMMATION OF THE MALE REPRODUCTIVE SYSTE	\$1,138.16	2,487	\$2,830,603	0.09%	92.63%
254 INJURIES, STABS + DISC OF UTERUS, LOWLEG EX FO	\$1,160.29	2,419	\$2,828,512	0.09%	92.72%
42 INTRACELLULAR PROCEDURES EXCEPT RETINA, IPIS	\$1,110.02	2,458	\$2,772,829	0.08%	92.80%
15 MISCELLANEOUS EAR, NOSE + THROAT PROCEDURES	\$912.99	3,408	\$2,770,669	0.08%	92.88%
278 CELLULITIS AND 18-69 W/O C.C.	\$1,444.99	1,915	\$2,767,155	0.08%	92.97%
208 DISORDERS OF THE BILIARY TRACT AGE <70 W/O	\$1,277.14	2,149	\$2,744,573	0.08%	93.05%
114 URETH LITH + JOE AMPUTATION FOR CIRC SYSTEM	\$4,073.50	673	\$2,741,465	0.08%	93.14%
324 URINARY STONES AGE <70 W/O C.C.	\$1,020.54	2,643	\$2,697,287	0.08%	93.22%
100 RESPIRATORY SYSTEM + SYSTEMS AGE <70 W/O C.	\$1,253.82	2,145	\$2,689,434	0.08%	93.30%
77 C.C. PROC ON THE RESP SYSTEM EXCEPT MAJOR C	\$3,421.50	783	\$2,679,033	0.08%	93.38%
396 RETICULOENDOTHELIAL + IMMUNITY DISORDERS AG	\$1,654.93	1,617	\$2,676,021	0.08%	93.46%
262 CONTACT DERMATITIS + LOCAL EXCISION FOR NON-MALI	\$819.32	3,100	\$2,613,630	0.08%	93.54%
305 KIDNEY, URETER + MAJ PLUR PROC FOR NON-MALIG	\$3,255.17	802	\$2,610,646	0.08%	93.62%
189 CERVICAL + OVAL DIS. EYE RECTIONS + FISTOR	\$1,143.67	2,275	\$2,601,849	0.08%	93.70%
259 SUBTOTAL PACTORY FOR MALIGNANCY AGE >69	\$1,905.14	1,359	\$2,589,085	0.08%	93.78%
309 TONGUE FLAPER PROCEDURES AGE >69 AND/OR C.C	\$2,149.51	1,200	\$2,579,412	0.08%	93.86%
319 KIDNEY + URINARY TRACT NEOPLASMS AGE <70 W/	\$1,445.03	1,764	\$2,566,672	0.08%	93.94%
460 COL-EXTENSIVE TUMORS W/O G.R. PROCEDURE	\$2,569.07	975	\$2,504,843	0.08%	94.01%
22 HYPEREMESIS + OPHTHALMOLOGY	\$1,441.30	1,727	\$2,489,125	0.08%	94.09%
150 BLACK SPALL + LARGE FOWEL PROCEDURES AGE >6	\$3,081.70	801	\$2,468,441	0.07%	94.16%
46 OTHER DISORDERS OF THE EYE AGE >17 WITH C.C	\$1,063.74	2,709	\$2,456,175	0.07%	94.24%
785 OTHER FEMALE REPRODUCTIVE SYSTEM O.R. PROC	\$3,027.03	811	\$2,454,921	0.07%	94.31%
76 G.P. PROC OF THE RESP SYSTEM EXCEPT MAJOR C	\$4,050.92	583	\$2,385,006	0.07%	94.39%
31 COMPRESSION AGE >69 AND/OR C.C.	\$1,130.98	2,080	\$2,352,438	0.07%	94.46%
297 NUTRITIONAL + MISC. METABOLIC DISORDERS AGE	\$1,407.92	1,657	\$2,332,923	0.07%	94.53%
166 AFFECTED TONGUE W/O COMPLICATED PRINC. DIAG AG	\$2,635.99	863	\$2,274,773	0.07%	94.60%
179 INFLAMMATORY BOWEL DISEASE	\$1,935.29	1,175	\$2,273,965	0.07%	94.67%

HEALTH CARE FINANCIAL APPROPRIATION BUREAU OF DATA MANAGEMENT AND STRATEGY 6-21-82
1979 2% SAMPLE DISCHARGES BY DIAGNOSIS RELATED GROUP ADJUSTED SAMPLE COST IS \$3,291,791,275 FOR 1,766,107 DISCHA

DISC NUMBER	AVG COST	DISCHARGES	TOTAL COST	% OF TOTAL	CUMULATIVE %
276 GALL BLADDER TUMORS AGE <70 W/O C.C.	\$1,000.05	1,418	\$2,258,974	0.07%	94.73%
161 GALL BLADDER TUMORS AGE <70 W/O C.C.	\$1,260.90	1,776	\$2,239,180	0.07%	94.80%
416 PANCREAS TUMORS EXCEPT PANCREAS CANCER	\$1,581.11	1,414	\$2,235,689	0.07%	94.87%
490 LIVER TUMORS EXCEPT HEPATOCARCINOMA	\$5,256.60	421	\$2,213,870	0.07%	94.94%
40 PANCREAS TUMORS EXCEPT PANCREAS CANCER	\$4,205.33	521	\$2,193,060	0.07%	95.00%
40 EXTRAOCULAR PROCEDURES EXCEPT ORBIT AGE >17	\$680.81	3,202	\$2,179,953	0.07%	95.07%
228 HAND PROCEDURES EXCEPT GANGLION	\$1,146.42	1,831	\$2,102,757	0.07%	95.13%
254 TOTAL HEPATITIS FOR HEPATITIS AGE <70 W/O	\$1,551.60	1,105	\$2,092,429	0.06%	95.20%
256 DISORDERS OF LIVER EXCEPT HEPATITIS	\$1,752.40	1,192	\$2,098,968	0.06%	95.26%
421 VITREOUS BODY PROCEDURES	\$1,073.37	1,933	\$2,074,824	0.06%	95.32%
297 COAGULATION DISORDERS	\$1,914.84	1,080	\$2,068,027	0.06%	95.38%
284 VITREOUS BODY PROCEDURES AGE <70 W/O C.C.	\$957.04	2,156	\$2,063,378	0.06%	95.44%
347 GALLBLADDER TUMORS EXCEPT PANCREAS CANCER	\$1,524.20	1,342	\$2,058,896	0.06%	95.51%
356 TESTES PROCEDURES FOR MALIGNANCY	\$1,775.10	1,153	\$2,046,690	0.06%	95.57%
168 ANAL PROCEDURES AGE <70 W/O C.C.	\$1,104.28	1,681	\$2,007,584	0.06%	95.64%
238 CERVICITIS	\$2,662.36	752	\$2,002,094	0.06%	95.70%
4 SPINAL PROCEDURES	\$4,530.98	440	\$1,993,631	0.06%	95.76%
94 INTRACRANIAL AGE >69 AND/OR C.C.	\$2,296.89	866	\$1,989,106	0.06%	95.82%
290 THYROID PROCEDURES	\$1,528.74	1,295	\$1,979,718	0.06%	95.88%
7 PERICARDIAL FLUID + OTHER AERIAL SYST FR	\$1,037.62	991	\$1,920,181	0.06%	95.94%
363 ORBITAL PROCEDURES + EYE EXAMINATIONS FOR MALIGNANCY	\$1,189.86	1,612	\$1,916,442	0.06%	95.99%
230 LOCAL EXCISION + REMOVAL OF INT FIX DEVICES	\$2,414.51	779	\$1,880,903	0.06%	96.05%
245 OTHER GALL BLADDER TUMORS EXCEPT HEPATOCARCINOMA	\$1,630.11	1,151	\$1,876,256	0.06%	96.11%
217 VNO DEBITO + SKN GRAFT EXC HAND FOR MUSCULOSKELETAL	\$4,114.93	455	\$1,872,293	0.06%	96.16%
220 TESTES PROCEDURES, NON-MALIGNANT AGE >17	\$1,123.97	1,621	\$1,821,955	0.06%	96.22%
20 NERVOUS SYSTEM INFECTION EXCEPT VIRAL MENINGITIS	\$2,305.69	777	\$1,791,521	0.05%	96.27%
117 CARDIAC PACEMAKER REPLACEMENT + REVIS EXC PULSE	\$3,091.20	580	\$1,787,096	0.05%	96.33%
126 CARDIAC COARCTATION + VALVULAR DISORDERS AGE <70	\$1,683.05	1,057	\$1,778,983	0.05%	96.38%
9 SPINAL PROCEDURES + FRACTURES	\$1,897.47	924	\$1,753,262	0.05%	96.44%
267 MALIGNANCY, FEMALE REPRODUCTIVE SYSTEM AGE <70	\$2,496.30	657	\$1,741,315	0.05%	96.49%
450 TOXIC EFFECTS OF DRUGS AGE 18-65 W/O C.C.	\$1,262.82	1,370	\$1,731,433	0.05%	96.54%
453 COMPLICATIONS OF TREATMENT AGE <70 W/O C.C.	\$1,115.17	1,549	\$1,727,398	0.05%	96.59%
344 OTHER GALL BLADDER TUMORS EXCEPT HEPATOCARCINOMA	\$1,552.01	1,038	\$1,715,824	0.05%	96.65%
25 OTHER TUMORS OF NERVOUS SYSTEM AGE <70 W/O	\$2,176.16	783	\$1,703,033	0.05%	96.70%
256 KIDNEY + URETERAL TUMORS + SYMPTOMS AGE <70	\$1,303.83	1,294	\$1,687,156	0.05%	96.75%
245 AFTEREFFECTS OF MUSCULOSKELETAL SYSTEM + COMPLICATIONS	\$1,640.02	1,617	\$1,681,712	0.05%	96.80%
211 TRANSURINARY PROCEDURES AGE <70 W/O C.C.	\$1,078.24	889	\$1,669,755	0.05%	96.85%
15 CRANIAL + CEREBRAL NERVE DISORDERS AGE <70	\$1,081.36	1,537	\$1,662,050	0.05%	96.90%
224 SOFT TISSUE PROCEDURES AGE >69 AND/OR C.C.	\$1,217.16	1,365	\$1,661,423	0.05%	96.95%
213 AMPUTATIONS FOR MUSCULOSKELETAL SYSTEM + COMPLICATIONS	\$1,527.55	1,079	\$1,648,226	0.05%	97.00%
201 OTHER HEPATOCARCINOMA OR PANCREAS CANCER	\$4,078.21	399	\$1,627,205	0.05%	97.05%
251 EXOSTOSES + DISC OF FOREARM, HAND, FOOT	\$4,508.72	351	\$1,617,660	0.05%	97.10%
164 APPENDICITIS WITH COMPLICATED PRINC. DIAG A	\$1,012.30	1,578	\$1,597,409	0.05%	97.15%
	\$3,416.57	466	\$1,592,121	0.05%	97.20%

HEALTH CARE FINANCING ADMINISTRATION BUREAU OF DATA MANAGEMENT AND STRATEGY 6-21-82
 1979 20% SAMPLE DISCHARGES BY DIAGNOSIS RELATED GROUP ADJUSTED SAMPLE COST IS \$3,291,791,275 FOR 1,766,107 DISCHA

DRG NUMBER	AVG COST	DISCHARGES	TOTAL COST	% OF TOTAL	CUMULATIVE %
126 ACUTE + SUBACUTE ENDOCARDITIS	\$5,322.88	299	\$1,591,541	0.05%	97.25%
11 NERVOUS SYSTEM NEOPLASMS AGE <70 W/O C.C.	\$2,216.98	701	\$1,554,102	0.05%	97.29%
408 MYELOPROLIF DISORD OR POORLY DIFF NEOPL WIT	\$1,977.03	784	\$1,549,991	0.05%	97.34%
108 CARDIOTHOR PROC EXCEPT VALVE + CORONARY BYP	\$6,920.01	218	\$1,508,562	0.05%	97.39%
69 OTITIS MEDIA + URI AGE 18-69 W/O C.C.	\$858.60	1,661	\$1,492,574	0.05%	97.43%
261 BREAST PROC FOR NON-MALIG EXCEPT BIOPSY + L	\$1,331.21	1,106	\$1,472,318	0.04%	97.48%
281 TRAUMA TO THE SKIN, SUBCUT TISS + BREAST AG	\$1,012.66	1,444	\$1,462,281	0.04%	97.52%
80 RESPIRATORY INFECTIONS + INFLAMMATIONS AGE	\$2,849.36	511	\$1,456,022	0.04%	97.56%
454 OTHER INJURIES, POISONINGS + TOXIC EFF OIAG	\$1,687.86	854	\$1,441,432	0.04%	97.61%
287 SKIN GRAFTS + WOUND DEBRIDE FOR ENDOC, NUTRI	\$5,024.56	285	\$1,431,999	0.04%	97.65%
312 URETHRAL PROCEDURES, AGE >69 AND/OR C.C.	\$1,529.20	909	\$1,390,042	0.04%	97.69%
360 VAGINA, CERVIX + VULVA PROCEDURES	\$1,201.77	1,138	\$1,367,614	0.04%	97.74%
222 KNEE PROCEDURES AGE <70 W/O C.C.	\$2,100.05	636	\$1,335,631	0.04%	97.78%
38 PRIMARY IRIS PROCEDURES	\$810.82	1,640	\$1,329,744	0.04%	97.82%
266 SKIN GRAFTS EXCEPT FOR SKIN ULCER OR CELLUL	\$1,589.81	827	\$1,314,772	0.04%	97.86%
66 EPISTAXIS	\$749.50	1,747	\$1,309,376	0.04%	97.90%
119 VEIN LIGATION + STRIPPING	\$1,674.64	778	\$1,302,869	0.04%	97.94%
264 SKIN GRAFTS FOR SKIN ULCER OR CELLULITIS AG	\$4,161.53	310	\$1,290,074	0.04%	97.98%
191 MAJOR PANCREAS, LIVER + SHUNT PROCEDURES	\$7,951.56	158	\$1,256,346	0.04%	98.01%
151 PERITONEAL ADHESIOLYSIS AGE <70 W/O C.C.	\$3,646.69	344	\$1,254,461	0.04%	98.05%
147 RECTAL RESECTION AGE <70 W/O C.C.	\$4,213.44	296	\$1,247,178	0.04%	98.09%
458 NON-EXTENSIVE BURNS WITH SKIN GRAFTS	\$5,407.42	230	\$1,243,706	0.04%	98.13%
168 PROCEDURES ON THE MOUTH AGE >69 AND/OR C.C.	\$1,459.88	840	\$1,226,299	0.04%	98.16%
6 CARPAL TUNNEL RELEASE	\$745.37	1,635	\$1,218,679	0.04%	98.20%
307 PROSTATCTOMY AGE <70 W/O C.C.	\$1,654.29	731	\$1,209,285	0.04%	98.24%
418 POSTOPERATIVE + POST-TRAUMATIC INFECTIONS	\$1,641.62	730	\$1,198,382	0.04%	98.27%
401 LYMPHOMA OR LEUKEMIA WITH MINOR O.R. PROC A	\$2,524.17	470	\$1,186,359	0.04%	98.31%
270 OTHER SKIN, SUBCUT TISS + BREAST O.R. PROC	\$1,711.59	692	\$1,184,420	0.04%	98.35%
63 OTHER EAR, NOSE + THROAT O.R. PROCEDURES	\$2,026.83	577	\$1,169,480	0.04%	98.38%
276 NON-MALIGNANT BREAST DISORDERS	\$1,157.53	1,007	\$1,165,632	0.04%	98.42%
301 ENDOCRINE DISORDERS AGE <70 W/O C.C.	\$1,309.41	881	\$1,153,590	0.04%	98.45%
142 SYNCOPÉ + COLLAPSE AGE <70 W/O C.C.	\$1,117.38	990	\$1,106,206	0.03%	98.49%
392 SPLENECTOMY AGE >17	\$5,486.39	201	\$1,102,764	0.03%	98.52%
219 LOWER EXTREM + HUMER PROC EXC HIP, FOOT, FEMU	\$2,015.03	541	\$1,090,131	0.03%	98.55%
124 CIRCULATORY DISORDERS EXC AMI, WITH CARO CAT	\$4,272.05	251	\$1,072,284	0.03%	98.59%
273 MAJOR SKIN DISORDERS AGE <70 W/O C.C.	\$1,481.34	708	\$1,048,788	0.03%	98.62%
352 OTHER MALE REPRODUCTIVE SYSTEM DIAGNOSES	\$1,264.03	828	\$1,046,616	0.03%	98.65%
358 UTERUS + ADENEXA PROC FOR NON-MALIGNANCY EX	\$1,870.36	536	\$1,002,512	0.03%	98.68%
187 DENTAL EXTRACTIONS + RESTORATIONS	\$687.82	1,432	\$984,958	0.03%	98.71%
427 NEUROSES EXCEPT DEPRESSIVE	\$1,381.46	707	\$976,692	0.03%	98.74%
223 UPPER EXTREMITY PROC EXC HUMERUS + HAND AGE	\$1,894.75	501	\$949,269	0.03%	98.77%
23 NONTRAUMATIC STUPOR + COMA	\$2,140.95	437	\$935,595	0.03%	98.80%
216 BIOPSIES OF MUSCULOSKELETAL SYSTEM + CONNEX	\$2,897.55	311	\$901,138	0.03%	98.82%
459 NON-EXTENSIVE BURNS WITH WOUND DEBRIDEMENT	\$6,611.86	135	\$892,601	0.03%	98.85%

HEALTH CARE FINANCIAL ADMINISTRATION BUREAU OF DATA MANAGEMENT AND STRATEGY 6-21-82
 1976 FOR SAMPLE DISCHARGES BY DIAGNOSIS RELATED GROUP ADJUSTED SAMPLE COST IS \$3,291,791.275 FOR 1,766,107 DISCH

PROC. NUMBER	AVG COST	DISCHARGES	TOTAL COST	% OF TOTAL	CUMULATIVE %
402 STOM + GYFIONS WITH C.C.	\$1,776.67	645	\$187,952	0.03%	98.88%
309 HOF PLASTER PROCEDURES AGE <70 W/O C.C.	\$2,055.87	431	\$86,079	0.03%	98.90%
167 APPENDICITOMY W/O COMPLICATED PRINC. DIAG AG	\$12,005.18	437	\$526,263	0.03%	98.93%
445 MULTIPLE TRAUMA AGE 18-60 W/O C.C.	\$1,396.92	613	\$856,311	0.03%	98.96%
237 SPRAINS, STRAINS, + DISLOCATIONS OF HIP, PE	\$1,571.15	542	\$851,563	0.03%	98.98%
295 DIABETES AGE 0-25	\$1,392.12	611	\$850,585	0.03%	99.01%
227 SOFT TISSUE PROCEDURES AGE <70 W/O C.C.	\$1,251.64	671	\$839,850	0.03%	99.03%
304 OTHER C.C. PROCEDURES OF THE ELBOW + PLEOH	\$2,165.10	386	\$835,103	0.03%	99.06%
43 STOM + GASTROID PROCEDURES AGE >17	\$1,116.83	742	\$828,687	0.03%	99.09%
42 INTERSTITIAL LUNG DISEASE AGE <70 W/O C.C.	\$1,561.41	456	\$812,582	0.02%	99.11%
429 FEVER OF UNKNOWN ORIGIN AGE 18-60 W/O C.C.	\$1,770.48	515	\$804,126	0.02%	99.13%
201 SURGICAL WASTECTOMY FOR MALIGNANCY AGE <70	\$1,527.21	453	\$802,027	0.02%	99.16%
294 THYROID GLANDS OF METABOLISM	\$1,647.40	521	\$795,676	0.02%	99.18%
341 LEIS PROCEDURES	\$2,989.65	480	\$790,752	0.02%	99.21%
357 VITUS + ADRENAL PROCEDURES, FOR MALIGNANCY	\$1,982.10	262	\$783,340	0.02%	99.23%
85 PLURAL EFFUSION AGE <70 W/O C.C.	\$3,025.71	385	\$763,108	0.02%	99.25%
353 PELVIC EVISCERATION, RADICAL HYSTERECTOMY +	\$965.69	242	\$732,221	0.02%	99.28%
329 URETERAL STRICTURE AGE 18-69 W/O C.C.	\$1,152.19	725	\$700,125	0.02%	99.30%
411 HISTORY OF MALIGNANCY W/O ENDOSCOPY	\$2,622.65	599	\$690,161	0.02%	99.32%
194 GASTRIC TRACT PROC EXC TOT GASTROCYSTECTOMY	\$1,630.81	190	\$688,303	0.02%	99.34%
45 NEUROLOGICAL EYE DISORDERS	\$1,740.66	687	\$685,612	0.02%	99.35%
20 TRAUMATIC EYE + CORA <1 HP AGE 18-69 W/O	\$1,504.84	371	\$679,271	0.02%	99.38%
27 ORBITAL LESIONS	\$1,401.35	676	\$670,173	0.02%	99.40%
242 SEPTIC ARTHRITIS	\$1,584.68	461	\$667,244	0.02%	99.44%
240 DISCOMFORTS AGE >17	\$1,400.51	335	\$664,867	0.02%	99.46%
426 ECTOPY OF FERTILITY + TUBULE CONTRI	\$1,125.78	443	\$656,751	0.02%	99.48%
368 INFECTIONS, CERVICAL NERVIC + OTHER REPV SYST PR	\$1,777.09	581	\$654,659	0.02%	99.50%
293 OTHER ENDOCRINE, NUTRIT + METAB O.R. PROC A	\$2,969.82	213	\$632,571	0.02%	99.52%
153 BLIND SMALL + LARGE BOWEL PROCEDURES AGE <7	\$2,635.55	239	\$629,896	0.02%	99.54%
289 PARATHYROID PROCEDURES	\$1,515.17	237	\$590,338	0.02%	99.56%
399 PTERIGIOID ECTHESIAL + IMMUNITY DISORDERS AG	\$1,799.71	389	\$589,401	0.02%	99.58%
224 UPPER EXTREMITY PROC EXC HUMERUS + HAND AGE	\$2,018.06	324	\$583,106	0.02%	99.61%
265 SKIN GRAFTS EXCEPT FOR SKIN ULCER OR CELLUL	\$1,287.43	287	\$579,183	0.02%	99.63%
50 SIALADENITOMY	\$1,583.18	438	\$563,894	0.02%	99.65%
432 OTHER DIAGNOSES OF DENTAL DISORDERS	\$1,463.50	343	\$543,030	0.02%	99.66%
350 SCALDATES WITH OTHER SIGNIFICANT PROBLEMS	\$3,317.04	352	\$515,152	0.02%	99.68%
440 CORON DEFICIENCY FOR INJURIES	\$525.30	145	\$480,970	0.01%	99.70%
70 CASAL TRAUMA + EFFICACY	\$718.92	515	\$476,529	0.01%	99.71%
56 RHINOPLASTY	\$1,401.18	661	\$475,206	0.01%	99.72%
140 PROCEDURES ON THE MOUTH AGE <70 W/O C.C.	\$1,238.83	337	\$472,197	0.01%	99.74%
44 ACUTE NAUSEA EYE INFECTIONS	\$1,267.58	369	\$457,128	0.01%	99.75%
232 ARTHROSCOPY		336	\$425,906	0.01%	99.77%

HEALTH CARE FINANCIAL ADMINISTRATION BUREAU OF DATA MANAGEMENT AND STRATEGY 6-21-82
 1976 COST ADJUSTED DISCHARGES BY DIAGNOSIS RELATED GROUP ADJUSTED SAMPLE COST IS \$1,791,275 FOR 1,766,107 DISCHA

PROCEDURE	AVG COST	DISCHARGES	TOTAL COST	% OF TOTAL	CUMULATIVE %
447 ALL OTHER PROCEDURES AGE >17	1097.22	463	\$415,412	0.01%	0.01%
448 ALL OTHER PROCEDURES, AGE 16-17 W/O C.C.	11,272.13	267	\$390,850	0.01%	0.02%
449 ALL OTHER PROCEDURES, AGE 15-16 W/O C.C.	11,000.24	337	\$369,996	0.01%	0.03%
450 ALL OTHER PROCEDURES, AGE 14-15 W/O C.C.	10,000.34	41	\$40,014	0.00%	0.03%
451 ALL OTHER PROCEDURES, AGE 13-14 W/O C.C.	11,015.05	329	\$362,505	0.01%	0.04%
452 ALL OTHER PROCEDURES, AGE 12-13 W/O C.C.	1780.00	403	\$714,340	0.01%	0.05%
453 ALL OTHER PROCEDURES, AGE 11-12 W/O C.C.	11,426.39	216	\$248,532	0.01%	0.06%
454 ALL OTHER PROCEDURES, AGE 10-11 W/O C.C.	12,413.24	120	\$148,958	0.01%	0.07%
455 ALL OTHER PROCEDURES, AGE 9-10 W/O C.C.	1723.30	379	\$652,130	0.01%	0.08%
456 ALL OTHER PROCEDURES, AGE 8-9 W/O C.C.	12,911.90	88	\$112,912	0.01%	0.09%
457 ALL OTHER PROCEDURES, AGE 7-8 W/O C.C.	12,000.71	85	\$102,007	0.01%	0.10%
458 ALL OTHER PROCEDURES, AGE 6-7 W/O C.C.	11,313.30	167	\$189,321	0.01%	0.11%
459 ALL OTHER PROCEDURES, AGE 5-6 W/O C.C.	11,201.77	178	\$199,515	0.01%	0.12%
460 ALL OTHER PROCEDURES, AGE 4-5 W/O C.C.	1526.55	393	\$599,934	0.01%	0.13%
461 ALL OTHER PROCEDURES, AGE 3-4 W/O C.C.	1580.21	206	\$325,571	0.01%	0.14%
462 ALL OTHER PROCEDURES, AGE 2-3 W/O C.C.	13,511.21	55	\$743,116	0.01%	0.15%
463 ALL OTHER PROCEDURES, AGE 1-2 W/O C.C.	15,062.61	38	\$572,379	0.01%	0.16%
464 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,918.94	96	\$114,218	0.01%	0.17%
465 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	12,846.74	62	\$806,497	0.01%	0.18%
466 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	1631.76	274	\$447,102	0.01%	0.19%
467 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,648.11	104	\$121,403	0.01%	0.20%
468 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,552.47	106	\$122,561	0.00%	0.20%
469 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,414.17	103	\$118,659	0.00%	0.21%
470 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,012.12	75	\$83,409	0.00%	0.21%
471 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	12,873.56	49	\$63,804	0.00%	0.22%
472 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,294.25	108	\$121,779	0.00%	0.22%
473 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	1781.96	175	\$313,843	0.00%	0.23%
474 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,847.82	69	\$817,499	0.00%	0.24%
475 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,204.15	97	\$109,802	0.00%	0.24%
476 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,956.06	55	\$65,583	0.00%	0.25%
477 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	18,415.09	12	\$220,941	0.00%	0.25%
478 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,451.44	67	\$77,246	0.00%	0.26%
479 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,233.81	71	\$79,600	0.00%	0.26%
480 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	1797.25	100	\$179,725	0.00%	0.27%
481 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	1304.59	87	\$113,708	0.00%	0.27%
482 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,492.60	50	\$574,680	0.00%	0.28%
483 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	12,118.04	29	\$351,423	0.00%	0.28%
484 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	1612.74	88	\$142,921	0.00%	0.29%
485 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	1330.51	48	\$64,664	0.00%	0.29%
486 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,476.35	26	\$29,385	0.00%	0.30%
487 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,022.39	36	\$39,806	0.00%	0.30%
488 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,722.47	19	\$22,726	0.00%	0.30%
489 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,148.19	24	\$26,556	0.00%	0.31%
490 ALL OTHER PROCEDURES, AGE 0-1 W/O C.C.	11,428.94	17	\$19,291	0.00%	0.31%

DRG NUMBER	AVG COST	DISCHARGES	TOTAL COST	% OF TOTAL	CUMULATIVE %
380 ABORTION W/O D+C	\$1976.53	23	\$22,460	0.00%	99.99%
384 OTHER ANTEPARTUM DIAGNOSES W/O MEDICAL COMP	\$1,638.25	13	\$21,297	0.00%	99.99%
396 RED BLOOD CELL DISORDERS AGE 0-17	\$2,009.44	9	\$18,044	0.00%	100.00%
52 CLEFT LIP + PALATE REPAIR	\$1,826.33	9	\$16,436	0.00%	100.00%
381 ABORTION WITH D+C	\$520.04	30	\$15,871	0.00%	100.00%
370 CESAREAN SECTION WITH C.C.	\$2,595.17	6	\$15,571	0.00%	100.00%
378 ECTOPIC PREGNANCY	\$1,110.67	18	\$15,035	0.00%	100.00%
391 NORMAL NEWBORNS	\$857.30	12	\$10,287	0.00%	100.00%
374 VAGINAL DELIVERY WITH STERILIZATION AND/OR	\$1,110.67	9	\$9,996	0.00%	100.00%
91 SIMPLE PNEUMONIA + PLEURISY AGE 0-17	\$1,266.83	7	\$8,867	0.00%	100.00%
190 OTHER DIGESTIVE SYSTEM DIAGNOSES AGE 0-17	\$1,153.29	7	\$8,073	0.00%	100.00%
382 FALSE LABOR	\$419.08	14	\$5,867	0.00%	100.00%
379 THREATENED ABORTION	\$469.17	12	\$5,630	0.00%	100.00%
298 NUTRITIONAL + MISC. METABOLIC DISORDERS AGE	\$789.29	7	\$5,525	0.00%	100.00%
372 VAGINAL DELIVERY WITH COMPLICATING DIAGNOSE	\$1,709.00	3	\$5,127	0.00%	100.00%
184 ESOPHAGITIS, GASTROENTERITIS + MISC. DIGEST	\$973.00	5	\$4,865	0.00%	100.00%
383 OTHER ANTEPARTUM DIAGNOSES WITH MEDICAL COM	\$1,359.00	3	\$4,077	0.00%	100.00%
376 POSTPARTUM DIAGNOSES W/O O.R. PROCEDURE	\$845.75	4	\$3,383	0.00%	100.00%
422 VIRAL ILLNESS + FEVER OF UNKNOWN ORIGIN AGE	\$645.00	5	\$3,229	0.00%	100.00%
26 SEIZURE + HEADACHE AGE 0-17	\$1,044.00	3	\$3,132	0.00%	100.00%
362 LAFAROSCOPIC TUBAL INTERRUPTION	\$655.00	4	\$2,620	0.00%	100.00%
279 CELLULITIS AGE 0-17	\$451.60	5	\$2,258	0.00%	100.00%
322 KIDNEY + URINARY TRACT INFECTIONS AGE 0-17	\$706.00	3	\$2,118	0.00%	100.00%
351 STERILIZATION, MALE	\$288.00	6	\$1,728	0.00%	100.00%
330 URETHRAL STRICTURE AGE 0-17	\$0.00	0	\$0	0.00%	100.00%
343 CIRCUMCISION AGE 0-17	\$0.00	0	\$0	0.00%	100.00%
340 TESTES PROCEDURES, NON-MALIGNANT AGE 0-17	\$0.00	2	\$0	0.00%	100.00%
375 VAGINAL DELIVERY WITH O.R. PROC EXCEPT STER	\$0.00	2	\$0	0.00%	100.00%
377 POSTPARTUM DIAGNOSES WITH O.R. PROCEDURE	\$0.00	1	\$0	0.00%	100.00%
388 PREMATUREITY W/O MAJOR PROBLEMS	\$0.00	2	\$0	0.00%	100.00%
385 NEONATES, DYED OR TRANSFERRED	\$0.00	0	\$0	0.00%	100.00%
387 PREMATUREITY WITH MAJOR PROBLEMS	\$0.00	0	\$0	0.00%	100.00%
417 SEPTICEMIA AGE 0-17	\$0.00	3	\$0	0.00%	100.00%
393 SPLENECTOMY AGE 0-17	\$0.00	0	\$0	0.00%	100.00%
405 LYMPHOMA OR LEUKEMIA AGE 0-17	\$0.00	1	\$0	0.00%	100.00%
433 SUBSTANCE USE + SUBST INDUCED ORGANIC MENTA	\$0.00	0	\$0	0.00%	100.00%
446 MULTIPLE TRAUMA AGE 0-17	\$0.00	0	\$0	0.00%	100.00%
451 TOXIC EFFECTS OF DRUGS AGE 0-17	\$0.00	2	\$0	0.00%	100.00%
448 ALLERGIC REACTIONS AGE 0-17	\$0.00	0	\$0	0.00%	100.00%
327 KIDNEY + URINARY TRACT SIGNS + SYMPTOMS AGE	\$0.00	2	\$0	0.00%	100.00%
314 URETHRAL PROCEDURES, AGE 0-17	\$0.00	0	\$0	0.00%	100.00%
282 TRAUMA TO THE SKIN, SUBCUT TISS + BREAST AG	\$0.00	1	\$0	0.00%	100.00%
220 LOWER EXTREM + HUMER PROC EXC HIP, FOOT, FEMU	\$0.00	0	\$0	0.00%	100.00%
212 HIP + FEMUR PROCEDURES EXCEPT MAJOR JOINT A	\$0.00	0	\$0	0.00%	100.00%

HEALTH CARE FINANCING ADMINISTRATION BUREAU OF DATA MANAGEMENT AND STRATEGY 6-21-82
 1979 20% SAMPLE DISCHARGES BY DIAGNOSIS RELATED GROUP ADJUSTED SAMPLE COST IS \$3,291,791,275 FOR 1,766,107 DISCHA

DRG NUMBER	AVG COST	DISCHARGES	TOTAL COST	% OF TOTAL	CUMULATIVE %
255 FX, SPFRNS, STRNS + DISL OF UPARM, LOWLEG EX FO	\$.00	0	\$0	0.00%	100.00%
252 FX, SPFRNS, STRNS. + DISL OF FOREARM, HAND, FOOT	\$.00	0	\$0	0.00%	100.00%
456 BURNS, TRANSFERRED TO ANOTHER ACUTE CARE FA	\$.00	0	\$0	0.00%	100.00%
465 AFTERCARE WITH HISTORY OF MALIGNANCY AS SEC	\$.00	0	\$0	0.00%	100.00%
30 TRAUMATIC STUPOR + COMA <1 HR AGE 0-17	\$.00	0	\$0	0.00%	100.00%
33 CONCUSSION AGE 0-17	\$.00	1	\$0	0.00%	100.00%
54 SINUS + MASTOID PROCEDURES AGE 0-17	\$.00	0	\$0	0.00%	100.00%
48 OTHER DISORDERS OF THE EYE AGE 0-17	\$.00	0	\$0	0.00%	100.00%
41 EXTRAOCULAR PROCEDURES EXCEPT ORBIT AGE 0-1	\$.00	0	\$0	0.00%	100.00%
70 OTITIS MEDIA + URI AGE 0-17	\$.00	2	\$0	0.00%	100.00%
60 TONSILLECTOMY AND/OR ADENOIDECTOMY AGE 0-17	\$.00	0	\$0	0.00%	100.00%
62 MYRINGOTOMY AGE 0-17	\$.00	0	\$0	0.00%	100.00%
58 T+A PROC EXCEPT TONSILLECTOMY +/-OR ADENOIDE	\$.00	0	\$0	0.00%	100.00%
3 CRANIOTOMY AGE <18	\$.00	0	\$0	0.00%	100.00%
186 DENTAL + ORAL DIS. EXC EXTRACTIONS + RESTOR	\$.00	0	\$0	0.00%	100.00%
195 TOTAL CHOLECYSTECTOMY WITH C.D.E. AGE >69 A	\$.00	0	\$0	0.00%	100.00%
196 TOTAL CHOLECYSTECTOMY WITH C.D.E. AGE <70 W	\$.00	0	\$0	0.00%	100.00%
163 HERNIA PROCEDURES AGE 0-17	\$.00	0	\$0	0.00%	100.00%
156 STOMACH, ESOPHAGEAL + DUODENAL PROCEDURES A	\$.00	0	\$0	0.00%	100.00%
137 CARDIAC CONGENITAL + VALVULAR DISORDERS AGE	\$.00	1	\$0	0.00%	100.00%
103 HEART TRANSPLANT	\$.00	0	\$0	0.00%	100.00%
98 BRONCHITIS + ASTHMA AGE 0-17	\$.00	1	\$0	0.00%	100.00%
81 RESPIRATORY INFECTIONS + INFLAMMATIONS AGE	\$.00	0	\$0	0.00%	100.00%
74 OTHER EAR, NOSE + THROAT DIAGNOSES AGE 0-17	\$.00	0	\$0	0.00%	100.00%
121 CIRCULATORY DISORDERS WITH AMI + C.V. COMP.	\$.00	0	\$0	0.00%	100.00%
104 CARDIAC VALVE PROCEDURE WITH PUMP + WITH CA	\$.00	0	\$0	0.00%	100.00%
106 CORONARY BYPASS WITH CARDIAC CATH	\$.00	0	\$0	0.00%	100.00%

The Combined Hospital Wage Index

The Combined Hospital Wage Index used to adjust the weights is intended to reflect variation in hospital unit labor costs across geographic areas. It is constructed from the data obtained from the Bureau of Labor Statistics. For each SMSA or non-SMSA (State) area, the county total wages and employment data are summed separately over all of the constituent counties in the area. Total area wages are divided by total area employment to obtain the area average wage. Thus, in each area the average wage is employee weighted. To convert area wage levels to an index, we compute the national average of the area wage values over all SMSA and non-SMSA areas and divide each area wage by the national average hospital wage rate. Thus, the index is area weighted. (See following pages for listing of wage indexes for urban and rural areas.)

- WAGE INDEX FOR URBAN AREAS

SMSA Area	Wage Index
Abilene, TX.....	.8360
Akron, OH.....	1.0997
Albany, GA.....	.8712*
Albany-Schenectady-Troy, NY.....	.9645
Albuquerque, NM.....	1.0380
Alexandria, LA.....	.9619
Allentown-Bethlehem-Easton, PA-NJ.....	1.0506
Altoona, PA.....	1.0463
Amarillo, TX.....	.9449
Anaheim-Santa Ana-Garden Grove, CA.....	1.2853
Anchorage, AK.....	1.5992
Anderson, IN.....	.9850
Anderson, SC.....	.8712
Ann Arbor, MI.....	1.2883
Anniston, AL.....	.8882
Appleton-Oshkosh, WI.....	.9620
Arecibo, PR.....	.6481
Asheville, NC.....	1.0033
Athens, GA.....	.8811
Atlanta, GA.....	.9418
Atlantic City, NJ.....	1.0417
Augusta, GA-SC.....	.9462
Austin, TX.....	1.0158
Bakersfield, CA.....	1.1813
Baltimore, MD.....	1.1352
Bangor, ME.....	.9421
Baton Rouge, LA.....	.9906
Battle Creek, MI.....	1.0366
Bay City, MI.....	1.0658*
Beaumont-Port Arthur-Orange, TX.....	.9407
Bellingham, WA.....	.9181*
Benton Harbor, MI.....	.8639
Billings, MT.....	.9762*
Biloxi-Gulfport, MS.....	.8379
Binghamton, NY-PA.....	.9463
Birmingham, AL.....	1.0023
Bismarck, ND.....	.9430
Bloomington-Normal, IL.....	.9168
Bloomington, IN.....	.9100*

- WAGE INDEX FOR URBAN AREAS

SMSA Area	Wage Index
Boise City, ID.....	1.0585
Boston-Lowell-Brockton-Lawrence-Haverhill, MA-NH...	1.1387
Bradenton, FL.....	.9296*
Bremerton, WA.....	.8993
Bridgeport-Stamford-Norwalk-Danbury, CT.....	1.1904
Brownsville-Harlingen-San Benito, TX.....	.9764
Bryan-College Station, TX.....	.8228
Buffalo, NY.....	.9939
Burlington, NC.....	.8785
Burlington, VT.....	.9554*
Caguas, PR.....	.6007
Canton, OH.....	.9637
Casper, WY.....	1.0632*
Cedar Rapids, IA.....	.9418*
Champaign-Urbana-Rantoul, IL.....	1.0359
Charleston, SC.....	1.0333
Charleston, WV.....	1.0869
Charlotte-Gastonia, NC.....	.9767
Charlottesville, VA.....	1.0694
Chattanooga, TN-GA.....	.9985
Chicago, IL.....	1.2013
Chico, CA.....	1.0813
Cincinnati, OH-KY-IN.....	1.0959
Clarksville-Hopkinsville, TN-KY.....	.8519
Cleveland, OH.....	1.2149
Colorado Springs, CO.....	1.0890
Columbia, MO.....	1.1961
Columbia, SC.....	.9874
Columbus, GA-AL.....	.9195
Columbus, OH.....	1.0803
Corpus Christi, TX.....	.9762
Cumberland, MD-WV.....	.9221
Dallas-Fort Worth, TX.....	1.0222
Danville, VA.....	.8960*
Davenport-Rock Island-Moline, IA-IL.....	.9804
Dayton, OH.....	1.1240
Daytona Beach, FL.....	.8804
Decatur, IL.....	1.0023*
Denver-Boulder, CO.....	1.1952
Des Moines, IA.....	1.0597
Detroit, MI.....	1.2516

- WAGE INDEX FOR URBAN AREAS

SMSA Area	Wage Index
Dubuque, IA.....	.9685
Duluth-Superior, MN-WI.....	.9252
Eau Claire, WI.....	.9102
El Paso, TX.....	.8765
Elkhart, IN.....	.9100*
Elmira, NY.....	1.0249
Enid, OK.....	.9247
Erie, PA.....	.9804
Eugene-Springfield, OR.....	.9554
Evansville, IN-KY.....	1.0438
Fargo-Moorhead, ND-MN.....	1.0057
Fayetteville, NC.....	.8618*
Fayetteville-Springdale, AR.....	.8155
Flint, MI.....	1.1849
Florence, AL.....	.8223
Florence, SC.....	.8445
Fort Collins, CO.....	.9121
Fort Lauderdale-Hollywood, FL.....	1.0830
Fort Myers, FL.....	.9389
Fort Smith, AR-OK.....	.9318
Fort Walton Beach, FL.....	.7921*
Fort Wayne, IN.....	.9222
Fresno, CA.....	1.2345
Gadsden, AL.....	.9316
Gainesville, FL.....	.9496
Galveston-Texas City, TX.....	1.0940
Gary-Hammond-East Chicago, IN.....	1.1438
Glens Falls, NY.....	.9078
Grand Forks, ND-MN.....	.8120
Grand Rapids, MI.....	.9905
Great Falls, MT.....	.9406*
Greeley, CO.....	1.0158*
Green Bay, WI.....	1.0100
Greensboro-Winston-Salem-High Point, NC.....	.9463
Greenville-Spartanburg, SC.....	.9802
Hagerstown, MD.....	1.0411
Hamilton-Middletown, OH.....	1.0706
Harrisburg, PA.....	1.0608
Hartford-New Britain-Bristol, CT.....	1.1760
Hickory, NC.....	.8509
Honolulu, HI.....	1.1867

- WAGE INDEX FOR URBAN AREAS

SMSA Area	Wage Index
Houston, TX.....	1.1222
Huntington-Ashland, WV-KY-OH.....	.9534
Huntsville, AL.....	.8827
Indianapolis, IN.....	1.0551
Iowa City, IA.....	1.1812
Jackson, MI.....	1.0561*
Jackson, MS.....	.9192
Jacksonville, FL.....	.9777
Jacksonville, NC.....	.9059*
Janesville-Beloit, WI.....	.8912
Jersey City, NJ.....	1.1350
Johnson City-Kingsport-Bristol, TN-VA.....	.8975
Johnstown, PA.....	1.0642
Joplin, MO.....	.8965
Kalamazoo-Portage, MI.....	1.2181
Kankakee, IL.....	.9784
Kansas City, MO-KS.....	.9846
Kenosha, WI.....	1.1136*
Killeen-Temple, TX.....	.9185
Knoxville, TN.....	.9087
Kokomo, IN.....	1.0083
LaCrosse, WI.....	.9406*
Lafayette, LA.....	1.0077
Lafayette-West Lafayette, IN.....	.9257
Lake Charles, LA.....	.9204
Lakeland-Winter Haven, FL.....	.8993
Lancaster, PA.....	1.0762
Lansing-East Lansing, MI.....	1.0718
Laredo, TX.....	.8631
Las Cruces, NM.....	.7733*
Las Vegas, NV.....	1.2134
Lawrence, KS.....	.9678*
Lawton, OK.....	.9619*
Lewiston-Auburn, ME.....	.8879*
Lexington-Fayette, KY.....	.9328
Lima, OH.....	1.0392
Lincoln, NE.....	.9347
Little Rock-North Little Rock, AR.....	1.0469
Long Branch-Asbury Park, NJ.....	1.0278
Longview, TX.....	.8757
Lorain-Elyria, OH.....	1.0438

- WAGE INDEX FOR URBAN AREAS

SMSA Area	Wage Index
Los Angeles-Long Beach, CA.....	1.3174
Louisville, KY-IN.....	1.0632
Lubbock, TX.....	.9036
Lynchburg, VA.....	.8747
Macon, GA.....	.9431
Madison, WI.....	1.0454
Manchester-Nashua, NH.....	.9762*
Mansfield, OH.....	.9359
Mayaguez, PR.....	.5902
McAllen-Pharr-Edinburg, TX.....	.8269
Medford, OR.....	.9967
Melbourne-Titusville-Cocoa, FL.....	.9652
Memphis, TN-AR-MS.....	1.0594
Miami, FL.....	1.1623
Midland, TX.....	1.0057*
Milwaukee, WI.....	1.0561
Minneapolis-St. Paul, MN-WI.....	1.0099
Mobile, AL.....	.9490
Modesto, CA.....	1.0548
Monroe, LA.....	.9324
Montgomery, AL.....	.9885
Muncie, IN.....	.9595*
Muskegon-Muskegon Heights, MI.....	.9808
Nashville-Davidson, TN.....	1.0498
Nassau-Suffolk, NY.....	1.2886
New Bedford-Fall River, MA.....	.9922
New Brunswick-Perth Amboy-Sayreville, NJ.....	1.0618
New Haven-Westhaven-Waterbury-Meriden, CT.....	1.0904
New London-Norwich, CT.....	1.0930
New Orleans, LA.....	.9842
New York, NY-NJ.....	1.3979
Newark, NJ.....	1.2061
Newark, OH.....	.9595*
Newburgh-Middletown, NY.....	1.0483
Newport News-Hampton, VA.....	.9259
Norfolk-Virginia Beach-Portsmouth, VA-NC.....	1.0327
Northeast, Pennsylvania.....	1.0447
Ocala, FL.....	.9418*
Odessa, TX.....	.9296*
Oklahoma City, OK.....	1.0161
Olympia, WA.....	1.0540*

- WAGE INDEX FOR URBAN AREAS

SMSA Area	Wage Index
Omaha, NE-IA.....	.9859
Orlando, FL.....	.9890
Owensboro, KY.....	.8803*
Oxnard-Simi Valley-Ventura, CA.....	1.4050
Panama City, FL.....	.8856*
Parkersburg-Marietta, WV-OH.....	1.0064
Pascagoula-Moss Point, MS.....	1.1283*
Paterson-Clifton-Passaic, NJ.....	1.0829
Pensacola, FL.....	.9236
Peoria, IL.....	1.1136
Petersburg-Hopewell, VA.....	.9327
Philadelphia, PA-NJ.....	1.1941
Phoenix, AZ.....	1.1383
Pine Bluff, AR.....	.7832*
Pittsburgh, PA.....	1.1494
Pittsfield, MA.....	1.0335
Ponce, PR.....	.7832
Portland, ME.....	1.0113
Portland, OR-WA.....	1.1208.
Portsmouth-Dover-Rochester, NH-ME.....	.8549
Poughkeepsie, NY.....	1.1148
Providence-Warwick-Pawtucket, RI.....	1.0384
Provo-Orem, UT.....	.9408
Pueblo, CO.....	1.0859
Racine, WI.....	.8987
Raleigh-Durham, NC.....	1.0364
Reading, PA.....	1.0092
Redding, PA.....	1.0671
Reno, NV.....	1.3337*
Richland-Kennewick, WA.....	.9678
Richmond, VA.....	.9379
Riverside-San Bernardino-Ontario, CA.....	1.2201
Roanoke, VA.....	.9948
Rochester, MN.....	1.0438
Rochester, NY.....	1.0571
Rockford, IL.....	1.0550
Rock Hill, SC.....	.9181
Sacramento, CA.....	1.2130
Saginaw, MI.....	1.1289
St. Cloud, MN.....	.8638
St. Joseph, MO.....	1.0264

- WAGE INDEX FOR URBAN AREAS

SMSA Area	Wage Index
St. Louis, MO-IL.....	1.0367
Salem, OR.....	1.0834
Salinas-Seaside-Monterey, CA.....	1.2317
Salisbury-Concord, NC.....	1.0402
Salt Lake City-Ogden, UT.....	.9370
San Angelo, TX.....	.8521
San Antonio, TX.....	.9595
San Diego, CA.....	1.2334
San Francisco-Oakland, CA.....	1.3337
San Jose, CA.....	1.3264
San Juan, PR.....	.6806
Santa Barbara-Santa Maria-Lompoc, CA.....	1.1107
Santa Cruz, CA.....	1.1223
Santa Rosa, CA.....	1.4336
Sarasota, FL.....	1.0096
Savannah, GA.....	.9740
Seattle-Everett, WA.....	1.0487
Sharon, PA.....	1.0046
Sheboygan, WI.....	.8920
Sherman-Denison, TX.....	.8879
Shreveport, LA.....	1.0540
Sioux City, IA-NE.....	.9975
Sioux Falls, SD.....	.9242
South Bend, IN.....	.9157
Spokane, WA.....	1.1020
Springfield, IL.....	1.1235
Springfield, MO.....	.9079
Springfield, OH.....	1.0412
Springfield-Chicopee-Holyoke, MA.....	1.0298
State College, PA.....	1.1383*
Steubenville-Weirton, OH-WV.....	.9905
Stockton, CA.....	1.3466
Syracuse, NY.....	1.5182
Tacoma, WA.....	1.0720
Tallahassee, FL.....	.9462*
Tampa,-St. Petersburg, FL.....	1.0066
Terre Haute, IN.....	.8856
Texarkana-TX-Texarkana, AR.....	1.1761
Toledo, OH-MI.....	1.1421
Topeka, KS.....	1.0783
Trenton, NJ.....	1.0906

- WAGE INDEX FOR URBAN AREAS

SMSA Area	Wage Index
Tucson, AZ.....	1.0495
Tulsa, OK.....	1.0220
Tuscaloosa, AL.....	1.0384
Tyler, TX.....	.9893
Utica-Rome, NY.....	.9977
Vallejo-Fairfield-Napa, CA.....	1.6758
Victoria, TX.....	.8608
Vineland-Millville-Bridgeton, NJ.....	1.0070
Visalia-Tulare-Porterville, CA.....	1.4467
Waco, TX.....	.8347
Washington, DC-MD-VA.....	1.1908
Waterloo-Cedar Falls, IA.....	.8884
Wausau, WI.....	.9566*
West Palm Beach-Boca Raton, FL.....	.9821
Wheeling, WV-OH.....	.9953
Wichita, KS.....	1.0412
Wichita Falls, TX.....	.8576
Williamsport, PA.....	.9890
Wilmington, DE-NJ-MD.....	1.1092
Wilmington, NC.....	.9005
Worcester-Fitchburg-Leominster, MA.....	.9943
Yakima, WA.....	.9682
York, PA.....	1.0110
Youngstown-Warren, OH.....	1.1351
Yuba City, CA.....	1.1283

* Approximate value for area

- WAGE INDEX FOR RURAL AREAS

Non-SMSA Area	Wage Index
Alabama.....	.8167
Alaska.....	1.4136
Arizona.....	.9100
Arkansas.....	.7921
California.....	1.0662
Colorado.....	.8515
Connecticut.....	1.0658
Delaware.....	.9406
Florida.....	.9059
Georgia.....	.8586
Hawaii.....	1.2652
Idaho.....	.8991
Illinois.....	.8965
Indiana.....	.8826
Iowa.....	.8290
Kansas.....	.8205
Kentucky.....	.8506
Louisiana.....	.8515
Maine.....	.8960
Maryland.....	.9928
Massachusetts.....	1.0870
Michigan.....	1.0471
Minnesota.....	.8264
Mississippi.....	.8118
Missouri.....	.8479
Montana.....	.8803
Nebraska.....	.7245
Nevada.....	.9741
New Hampshire.....	1.0452
New Jersey.....	.9559
New Mexico.....	.9235
New York.....	.9070
North Carolina.....	.8810
North Dakota.....	.8203
Ohio.....	.9305
Oklahoma.....	.8525
Oregon.....	.9566
Pennsylvania.....	1.0428
Puerto Rico.....	.6438
Rhode Island.....	.9628*
South Carolina.....	.8184

TABLE III B. - WAGE INDEX FOR RURAL AREAS

Non-SMSA Area	Wage Index
South Dakota.....	.7733
Tennessee.....	.7987
Texas.....	.8149
Utah.....	.8006
Vermont.....	.8808
Virginia.....	.8484
Washington.....	.9453
West Virginia.....	.9296
Wisconsin.....	.8291
Wyoming.....	.9782

*Approximate value for area

GLOSSARY OF ACRONYMS

AMCS	Automated Medical Coding System
BLS	Bureau of Labor Statistics
CMI	Case mix index
CPHA	Commission on Professional and Hospital Activities
DRG	Diagnosis Related Group
DHHS	Department of Health and Human Services
HCFA	Health Care Financing Administration
HCRIS	Hospital Cost Report Information System
HI	Hospital Insurance
ICDA-8	International Classification of Diseases Adapted for Use in the United States - 8th Revision
ICD-9-CM	International Classification of Diseases - 9th Revision - Clinical Modification
IOM	Institute of Medicine
LOS	Length of stay
MDC	Major Diagnostic Category
OR	Operating room
PHS	Public Health Service
PPS	Prospective Payment System
PRO	Professional Review Organization
PSRO	Professional Standards Review Organization
SMI	Supplementary Medical Insurance
SMSA	Standard Metropolitan Statistical Area
SSA	Social Security Administration
TEFRA	Tax Equity and Fiscal Responsibility Act of 1982
UCR	Usual, customary and reasonable
UHDDS	Uniform Hospital Discharge Data Set

GLOSSARY OF TERMS

Ancillary services: Hospital services other than room and board and professional services. They may include X-ray, drug, laboratory or other services not itemized separately. See "Routine Inpatient Services."

Case-mix: The diagnosis-specific makeup of a hospital's work-load. Case-mix directly influences length of stays, and intensity, cost and scope of the services provided by a hospital.

Claim: A request to an insurer by an insured person or his assignee for payment of benefits under an insurance policy.

Cost-sharing: Provisions of a health insurance policy that require insured individuals to pay some portion of covered medical expenses. Several forms of cost-sharing are employed, particularly deductibles, coinsurance and copayments. A deductible is a set amount that a person must pay before any payment of benefits occurs. Coinsurance is payment of a set portion of the cost of each service. A copayment is a fixed amount to be paid with each service. Cost-sharing does not refer to or include the amount paid in premiums for the coverage.

Diagnosis: The commonly accepted term used to describe a disease.

Discharge abstract: A summary description of an admission prepared upon a patient's discharge from a hospital. The abstract records selected data about the patient's stay in the hospital, including diagnoses, services received, length of stay, source of payment and demographic information. The information is usually obtained from the patient's medical record and abstracted in standard, coded form.

Fiscal Intermediary: A public or private agency or organization selected by the providers of health care that enters into an agreement with the Department of Health and Human Services under the Hospital Insurance Program of Medicare in order to pay claims (and perform other functions) on behalf of such providers.

Hospital Insurance Program (Part A): The compulsory portion of the Medicare program that automatically enrolls all persons aged 65 and over entitled to benefits under the Old Age, Survivors, Disability and Health Insurance Program or Railroad Retirement Program, persons under 65 who have been eligible for disability for over two years, and insured workers (and their dependents) requiring renal dialysis or kidney transplantation. After various cost-sharing requirements are met, it pays for inpatient hospital, skilled nursing facility and home health care. The Hospital Insurance Program is financed from a separate trust fund funded primarily with a payroll tax levied on employees, employees and the self-employed.

Hospital Insurance (HI) Trust Fund: One of two Medicare trust funds. Finances Part A primarily with payroll taxes on workers and their employers and on self-employed individuals in work covered by the Social Security Old-age, Survivors, and Disability Insurance Program.

International Classification of Diseases: A system for classifying diseases and operations for purpose of indexing hospital records. It was developed by the World Health Organization. Diseases are grouped according to the problems they present. For example, the major infectious and parasitic diseases are listed in one section and all malignant neoplasms in another

section. The ICD is revised every ten years. The official eighth version is known as ICDA-8 and the ninth version as ICD-9-CM (International Classification of Diseases, Ninth Revision, Clinical Modification). The latter, currently in use, underwent extensive review by clinicians during development.

Length of stay (LOS): The length of an inpatient's stay in a hospital, reported as the number of days spent in a facility per admission or discharge. A hospital's overall average length of stay is calculated as follows: total number of days in the facility for all discharges occurring during a given period divided by the number of discharges during the same period.

Medical Education: Those teaching activities, e.g., training programs for nurses, interns and residents, for which an appropriate part of their net cost is an "allowable" cost for reimbursement under the Medicare program. These educational activities must be licensed where required or have the approval from the recognized national professional organization for the particular activity.

MEDPAR: A HCFA data file of bills for a 20 percent sample of Medicare beneficiaries discharged from short-stay hospitals. Contains billed charge data and clinical characteristics such as principal diagnosis and principal procedures.

Outliers: Atypical hospital cases that have an extremely short or extremely long length of stay relative to most cases in the same diagnosis related group.

Principal diagnosis: The condition chiefly responsible for the admission of the patient to the hospital for care.

Principal procedure: That procedure most related to the principal diagnosis and one which was performed for definitive treatment, rather than one performed for diagnostic or exploratory purposes, or one necessary to treat a complication.

Professional Standards Review Organization (PSRO): A physician-sponsored organization charged with comprehensive and ongoing review of services provided under the Medicare and Medicaid and Maternal and Child Health programs. The purpose of this review is to determine for purposes of reimbursement under these programs whether services are: medically necessary; provide in accordance with professional criteria, norms and standards; and, in the case of institutional services, rendered in an appropriate setting.

Prospective Payment: Method of paying hospitals in which 1) full amounts or rates of payment are established in advance for the coming year, and 2) hospitals are paid these amounts or rates regardless of the costs they actually incur.

Retrospective Cost-Based Reimbursement: Method of paying hospitals, currently used in the Medicare program, in which 1) payment is made to the hospital for covered services rendered to beneficiaries during the preceding year(s), and 2) hospitals are reimbursed for the "reasonable costs" incurred in providing such services.

Routine inpatient services: Hospital room and board and those related professional services for which generally, there is no separate charge, e.g., nursing care. See "Ancillary Services."

Secondary diagnosis: Problems and important symptoms both related and unrelated to the principal diagnosis, which either exist at the time of the patient's admission or develop and are treated during hospitalization.

Section 223: A section of the Social Security Amendments of 1972 that requires the Department of Health and Human Services to establish limits on overall direct or indirect costs that will be recognized as reasonable under Medicare for comparable services in comparable facilities in the area.

Severity of Illness: Refers to the relative level of loss of function and mortality normally caused by a particular illness.

Supplementary Medical Insurance Program (Part B): The voluntary portion of the Medicare program in which all persons entitled to the Hospital Insurance Program (Part A) may enroll. About 95 percent of eligible people are enrolled. After deductible has been met, it pays for 80 percent of the reasonable charge for most covered services. Covered services include physician services, home health care, medical and other health services, outpatient hospital services and laboratory, pathology and radiologic services. The Supplementary Medical Insurance Program is financed on a current basis from monthly premiums paid by persons insured under Medicare and a matching amount from Federal general revenues.

Uniform Hospital Discharge Data Set (UHDDS): A defined set of data that give a minimum description of a hospital episode or admission. The UHDDS includes data on the age, sex, race and residence of the patient, length of stay, diagnosis, responsible physicians, procedures performed, disposition of the patient and source of payment.

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