

CASEMIX INFORMATION IN THE UNITED STATES: FIFTEEN YEARS OF MANAGEMENT AND CLINICAL EXPERIENCE

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ABSTRACT

Uncontrolled health care cost inflation spurred U.S. policymakers to turn to casemix-based payment in the 1980s. Those policymakers used Diagnosis Related Groups (DRGs) and fixed national prices for patients covered by Medicare to create economic incentives for hospitals to become more efficient. Today, U.S. hospitals are treating only the most seriously ill patients; simpler surgeries are being performed outside the hospital; nursing care is increasingly moved to intermediate-care facilities or is given during home visits; and recuperation is occurring outside the hospital, where patients and families have more responsibility in the recovery process. This paper describes the DRG experience, how hospitals and physicians changed the use of hospitals, the successes and failures of that experience, and improvements needed for enhanced use of casemix information in the future.

Keywords: Casemix, Hospital Casemix, Diagnosis Related Groups, Drgs, Hospital Payment, Hospital Management, Hospital Expenditures, Clinical Management, Medicare Reimbursement, Medicare Prospective Payment System (PPS), U.S. Health Care Data.

INTRODUCTION

The pioneers of health care measurement began in the 1970s to collect, categorise, and interpret data related to the types of cases treated by health care professionals. Such casemix data held the promise that, some day, managers would be able to define their products, measure their productivity, and assess the quality of their services. At the door of the millennium, we assess: How far have we come? Has

casemix information promoted better management of health services? Has it improved health care?

The system of Diagnosis Related Groups (DRGs) is the most notable U.S. experiment in using casemix information. This paper draws lessons from the DRG experience for managing health care services and discusses the underlying infrastructure of health data needed to manage health care services. The paper also explores improvements needed in health data to manage more effectively than we do today and reviews changes on the horizon for U.S. health care data. For this paper, I used two sources of information: first, the vast scientific literature that evaluated empirically the effects of DRGs and, second, the popular and trade press that chronicled the management changes resulting from the incentives of a payment system based on Diagnosis Related Groups.

THE STAGE FOR CASEMIX PAYMENT

After World War II, the U.S. experienced a surge in health insurance coverage. In 1940, only 9 percent of the U.S. population were covered by private health insurance. By 1950, 50 percent of the population had health insurance, mostly as a benefit of employment.¹ In 1965, the U.S. government passed a law providing health care coverage for two segments of the population not covered by employee benefits. A Federal program called "Medicare" covered the population over the age of 65 and a joint federal-state program called "Medicaid" covered certain categories of people with little or no income. Today, about 85 percent of the U.S. population have some coverage for health care services.²

Health care costs in the U.S. spiralled upward after World War II. In 1940, the U.S. spent \$4 billion on health.³ By 1996, the U.S. spent \$1.035 trillion on health care.⁴ This growth of almost 26,000 percent over 56 years outpaced by 25 to 1 the general inflation rate.⁵ Hospitals led the expansion. From 1946 to 1982, the number of community and specialty hospitals increased by 32 percent, the number of beds by 115 percent, the number of admissions by nearly 170 percent,⁶ and spending on hospital services by over 800 percent after adjustment for general inflation.⁷ Over the same period, the U.S. population grew at a rate of less than 70 percent.⁸ The result today is that the U.S. spends more of its gross domestic product (GDP) on health (13.6 percent in 1993) than any other country in the world. The U.S. spends 30 percent more than the next biggest spender, Germany.⁹

Until 1983, U.S. hospitals set prices for their services to cover whatever costs they incurred plus a mark-up to expand their capacity. Insurers paid these prices and year-after-year prices rose and hospital services expanded. This approach to payment was known as "cost reimbursement."

IMPLEMENTATION OF CASEMIX-BASED PER-CASE PAYMENT

October 1, 1983 marked the start of a new method of payment intended as a national price for a hospital stay based on the reason for the stay. This was the first time that a price for a specific type of care in community hospitals was fixed on a national scale by a party outside the hospital. The Health Care Financing Administration (HCFA) of the U.S. Department of Health and Human Services imposed this first set of nation-wide prices for the public Medicare program.

A. The casemix system

HCFA selected the Diagnosis Related Groups (DRGs) casemix classification system as the base of the payment system. A team of researchers at Yale, led by Robert Fetter and John Thompson, developed DRGs initially to improve hospital management and quality, and subsequently, to serve as a basis for prospective payment for hospital services. As such they had to include all hospital services – thousands of diagnoses and procedures, account for the multiple diseases and treatments of individual patients, differentiate high- and low-cost care, and develop clinically meaningful categories and a reasonable number of groups.

Critics pointed to the shortcomings of the first attempt at casemix-based payment:

- DRGs did not reflect adequately the severity of illness of many patients, which could lead hospitals to avoid the most severely ill.
- DRGs used treatments – specific surgeries and medical treatments – to identify groups, and that could create an incentive for the use of the more profitable treatments, rather than the most appropriate or cost effective.
- DRG relative weights were based on data that were unreliable and questionable at best and as a result the care of patients could be in jeopardy.
- DRGs could not keep pace with the change in medical treatment and technology and the quality of U.S. health care would likely suffer in the future.

Despite these objections and warnings, the Medicare Prospective Payment System and its Diagnosis Related Groups were instituted as planned. The classification system was only the underpinning of the payment system. Understanding DRGs meant evaluating the combined effect of the classification and payment systems together.

B. The payment system

The Medicare Prospective Payment System (PPS) initially covered only the direct costs of services to inpatients. The national DRG-based prices were adjusted with

hospital-specific add-ons for high-cost "outlier" patients, medical education, and care of the poor. These were enormously important and lucrative adjustments for hospitals that received them – usually hospitals of academic medical centers. Hospitals also received differentials for urban-rural location and community wage differentials. To ease the transition to PPS for hospitals, payments initially were a blend of the new national rates and the old hospital-specific costs per average case. In 1987, the new national fixed rates were in full effect. In 1992, prospective per-case rates also were increased for capital costs (depreciation on physical assets and interest on debt). Today, one national price per DRG is set (with the hospital-specific add-ons and the location and area-wage adjustments).

Another important dimension of PPS was the mechanism for payment adjustment. With HCFA's enactment of Medicare PPS, the U.S. Congress also established, independent of HCFA, the Prospective Payment Assessment Commission (ProPAC). ProPAC's mandate was to assess the condition of hospitals and the Medicare system annually and to recommend changes in payment rates for the next year.¹⁰ ProPAC was a check against the strong regulatory powers held by HCFA to administer hospital prices for Medicare beneficiaries. ProPAC's recommendations for payment adjustments focused on several dimensions. Usually recommendations included adjustments:

- upward for inflation in the market basket of hospital inputs (labor, supplies, and services),
- upward for scientific and technological advances,
- downward for about half of aggregate productivity gains,
- downward for casemix increases caused by coding, and
- upward or downward to correct for the prior year's forecasting errors.

ProPAC's recommendations were not always followed by the Secretary of Health and Human Services, who is responsible for administering the Medicare payment program. Sometimes the U.S. Congress passed additional laws to allow or require the Secretary to modify Medicare PPS policy.

The DRG definitions themselves were a continual focus of ProPAC and HCFA. New diseases, new technologies, and significant changes in medical practice were reviewed to determine whether revisions to the DRG system were needed. Revisions were made frequently in the early years. The willingness of the U.S. government to modify and create categories for especially costly conditions, such as burns, was a signal to health care providers that the system would be equitable. And, providers had a chance through public meetings of the ProPAC to influence the classifications if they found unintended effects on patient care.

An important feature of the payment system was that hospitals were allowed to keep the excess of payments over costs. The price structure, based on the type of case treated, was a revolution in thinking about hospital care in the U.S. It not only fixed

Medicare prices, but even more importantly changed the way hospital administrators and physicians thought about producing health care services. As a result the incentive for hospitals changed from expanding and increasing services to controlling costs so that earnings would grow to support the expansion of services.

THE RESULTS OF CASMIX-BASED HOSPITAL PAYMENT

How did the DRG-based casemix and reimbursement system influence the management of U.S. hospitals? How did hospital managers react? How did physicians react? What was the effect on hospital costs for the Medicare program and on health care costs generally?

A. Hospital reactions

This new scheme changed the way hospital administrators thought about their services. Hospitals started to think and act more like businesses. For example:

- Hospitals improved medical coding departments. These departments became the key source of information about the hospital's business¹¹ – the definition of the business products (DRGs) and the key to accurate, complete, and optimal collection of clinical information for reimbursement. Coding managers decreased physicians' delinquency rates on chart completions by using reminder systems and peer pressure. Some medical record departments led broad activities in the hospital, co-ordinating with clinical services, utilisation review, and finance to improve recordkeeping and the bottom line of the hospital. These efforts could be seen in national statistics. Econometric studies revealed that about half of the 4 to 6 percent increase nationally in the Medicare casemix index in the first 2 years of PPS was due to coding adjustments, rather than increases in the real severity of cases treated in the hospital.¹²
- Hospitals improved their management information systems. At the end of 1993, one half of U.S. hospitals had integrated their financial and clinical information systems and one-third had integrated systems across clinical departments.¹³ Investment by hospitals in management information systems continues today.
- Hospital administrators directed high-cost departments to lower costs and increase revenues. The Medical Laboratory Observer chronicled annually this management shift through surveys of laboratory managers.¹⁴ Those managers cut staff and increased automation to cut internal operating costs. They eliminated routine tests, which had been performed for all patients who entered the hospital. They eliminated easy check-off lists for tests and required write-in orders to make physicians think before ordering tests. They monitored physicians' test-ordering patterns over all patients or by DRG and disseminated the results to physicians. They instituted automatic follow-up

testing for DRGs where follow-up was essential. These changes decreased costs, unnecessary testing, and turnaround time for test results.

- Hospital administrators also reduced costs by entering into new labor contracts. They reorganised staffing arrangements and put many nurses on as-needed, intermittent contracts. They sometimes put entire departments under contractual arrangements and separated them organisationally and physically from the hospital. These departments included emergency medicine, radiology and nuclear medicine, laboratories, housekeeping, food preparation, laundry, or nursing services.
- In addition to labor changes, hospitals entered into contracts with nearby institutions to share services where they had excess capacity such as in radiology, laboratory, or laundry services. They joined purchasing co-operatives, such as the Voluntary Hospitals of America, to increase their buying power and take advantage of economies of scale in large group purchasing of equipment and supplies.
- Some hospitals sought parent organisations and sold themselves to or affiliated with hospital chains. In 1985, 27 percent of community hospitals were part of hospital systems. In 1995, over 45 percent were members of such systems.¹⁵

Hospital managers made strategic decisions with respect to DRG reimbursement. While managers reduced costs and improved efficiency, they also focused strategies on providing services outside the hospital setting, because traditional cost reimbursement (without casemix adjustments) was still in effect outside the inpatient setting. Hospitals also lobbied the Congress for payment increases, got them, and then continued their investments in health care technology. These strategies are evident in national statistics:

- While the number of inpatient surgeries declined by about 7 percent across the period 1980 through 1993, the number of outpatient surgeries at hospitals swelled by 211 percent. In 1980, hospitals provided 1 of every 6 surgeries (16.3 percent) in outpatient settings. By 1996, they provided more than 1 of every 2 surgeries (60 percent) in outpatient facilities.¹⁶
- In 1979, 17% of community hospitals had a computerised tomography (CT) scanner; by 1986, 60% had purchased a unit; and by 1992, 75% had them.¹⁷ Two other technologies that predated PPS – open heart surgery and cardiac catheterisation – also showed continuing rates of increase – doubling or nearly doubling over the period and apparently unaffected by prospective payment.
- Magnetic resonance imaging (MRI), a 1 to 2 million dollar diagnostic device, grew from a 9% rate of diffusion among community hospitals in 1986 to 24% in 1992. One statistic gives perspective to the unchecked U.S. adoption of technology: In 1991, Minnesota (with a population of 4.4 million) had more MRI machines than all of Canada (population: 26.8 million).¹⁸

Much of the expansion of technology was aided politically by recommendations of the Prospective Payment Assessment Commission (ProPAC), which annually recommended increases in the prospective payment rates to allow for increases in the cost and adoption of technology.¹⁹

Because of these dramatic changes and because of incentives which hospitals faced to lower costs of treating patients, DRGs heightened concerns about the quality of hospital care. Deteriorating quality of care was the single greatest worry of the designers of hospital prospective payment. Although there was early anecdotal evidence of negative consequences of DRG-based payment, when the experience was examined in generalisable studies there were almost no negative empirical effects of PPS on aggregate measures of quality of hospital care.²⁰ By almost any measure used – mortality within 30 days or one year of hospitalisation, readmissions across various time periods, transfers to other institutions, change in emergency room admissions – there was either no discernible change or only slight changes.

The only negative indication was greater instability of patients at discharge.^{21, 22} The decrease in stability was seen for all types of patients and all types of hospitals. It was a general change in practice patterns consistent with shortened hospital stays and growth in ambulatory surgery. However, no adverse consequences of earlier discharge were seen in the other aggregate measures.

While the quality of U.S. health care appeared to be unaffected by DRG-based prospective payment, the measures available to assess quality were relatively crude. Today, "managed care," which is credited with slowing the increases in health care costs in the U.S. since the early 1990s, has again heightened concerns and stimulated quality assessments. (Managed care refers to various approaches used by third party payers to control health care costs. The techniques include negotiating discounts, utilisation review, physician feedback on use of tests and procedures, second opinion surgery, capitation payments, incentive payments to physicians based on how they manage their patients, and other management techniques, related or unrelated to casemix information).

B. Physician reactions

By contrast with hospital reimbursement, the DRG-based payment system was not designed to affect physicians' incomes or behaviours. Despite this fact, physicians also changed their behaviour and did so quite dramatically.

Today, physicians use hospitals much differently than they did before DRG-based payments. Now, the typical patient under a physician's care:

- is less likely to be hospitalised;
- is more seriously ill when admitted;
- spends less time in the hospital even when severely ill, and
- receives more services outside the hospital and in the home.

Why U.S. physicians changed their care patterns is not well understood. Some of the changes were the result of technological advances (such as endoscopic instruments and safer anaesthesia) that made it possible to perform surgery safely outside the

hospital. Some of the changes may have been the result of physicians agreeing with hospital administrators that DRGs created a crisis for U.S. hospitals and that they both had to conserve hospital resources.

The culture of utilisation review, which had already penetrated hospitals by the time PPS started, combined with the threat of denied payments from Medicare and private insurers may have been the impetus for the downturn in hospital admissions that began in 1982, almost two years ahead of PPS. Many hospitals instituted their own utilisation review and pre-admission review activities to insure against later denial of payments. Physicians report that pre-admission review procedures changed their practice of medicine.²³ Furthermore, the decline continues. With increased managed care penetration in the U.S., hospital average length of stay hit an all-time low of 6.2 days in 1996, the most recent year of statistics available.²⁴

The rise in the Medicare casemix index – a measure of the average complexity of patients treated in hospitals – confirms that the clinical management of patients has changed dramatically. Even for the elderly, the sickest sub-population, conditions that had been diagnosed and treated in hospitals are now being handled without hospitalisation, and patients treated in the hospital leave sooner. Consequently, patients admitted to the hospital today are more severely ill and more complicated to treat.

One of the startling results of the constraining effects of DRG-based hospital payments was expansion of the post-acute long-term-care and home-care businesses. Some astounding statistics for the period 1990 to 1995 reveal that:

- The number of Medicare beneficiaries using home health care services jumped from 1.9 million to 3.4 million.
- Home care visits per home care patient per year grew from 34 to 69, and
- The number of home health care businesses grew from 5,718 to 9,147.
- Nursing home and home care expenditures under Medicare have been expanding more rapidly than any other category of personal health expenditures, including hospital and physician services.²⁵
- Home health care, in particular, has been growing at incredible rates of 20 to 25 percent per year.²⁶

DRGs focused hospital management on clinical product lines and reorganised both hospital managers' and physicians' thinking about hospital services. DRGs set the stage for managing health care by product line related to the disease and treatment of the patient.

C. Health care costs

DRG-based payment has had an effect on hospital costs for Medicare. Over the last 15 years, the rate of increase of spending on hospital services for Medicare patients (the oldest and sickest sub-population, which has been increasing in size) slowed over this period. While double-digit rates of increase were common through the mid-1980s, they became single-digit rates for years after 1985. In 1980, inpatient care accounted for 67 percent of total Medicare payments. In 1995, it accounted for only 49 percent. It is unlikely that such restraint would have occurred over this period without the financial incentives of DRGs.

Was the DRG casemix management system effective in reducing overall health care spending in the U.S.? The answer is – no. While *increases* in *total* U.S. health care spending have slowed somewhat, this slowdown is generally attributed more to the managed care activities of payers than to the introduction of DRG-based payment.²⁷ This is because the slowdown in total spending lagged substantially behind the introduction of DRGs and was aligned with the increased penetration of managed care insurance in the early 1990s.

Furthermore, excess capacity remains in U.S. hospitals – beds and physical plants continue in excess supply. Occupancy rates (the average daily census of patients relative to the number of beds) were 75 to 80 percent prior to PPS. In 1996, the average occupancy of U.S. hospitals was only 61 percent and in some types of hospitals the rate was much lower. In addition, hospitals have been very reluctant to rein in high-tech, high-cost medicine. Only very recently have reports surfaced that hospital investment in high-tech equipment has slowed as a result of revenue constraints from private insurers. But now, high-tech treatments have been proliferating in the home setting.

Not surprisingly, DRGs and hospital perspective payment for Medicare did not solve the overriding health care cost problem in the U.S. A payment system designed only for hospital services and one payer cannot solve runaway spending in the total health care system. One of the lessons from this era in U.S. health care is that until casemix management systems focus on the totality of patients' health care, we cannot effectively manage health care costs. Private sector attempts to manage health care services for individual patients appear to be slowing health care spending, but this result cannot be attributed solely to casemix information systems.

THE U.S. CASEMIX INFORMATION INFRASTRUCTURE

Part of the difficulty in managing health care and its costs more effectively with casemix information is the paucity of clinical information available for casemix payment or quality assessment tools. Clinical data is essential for measuring the need

for and motivating change in the health care sector. This section assesses the current state of information tools and data that are in use in the U.S. today and new developments on the horizon of the U.S. health data infrastructure.

A. Casemix software systems

There are at least 18 patient classification systems in use in the United States.²⁸ Researchers have analysed many of these systems with respect to the percent of variation of length of stay, charges, or mortality that the different systems explain. The results are highly variable. Even systems that explain similar levels of variation in outcome measures do not identify the same institutions or providers as best or worst performers. Systems also perform differently depending on the purpose for which they are used.

The primary shortcoming of these systems is that nearly all of them must be operated on databases that contain too little clinical information. Until the widespread availability of the computerised medical record, these systems will be hampered by scant clinical information.

B. Data

In the U.S., over 400 different insurers, public and private, have designed information systems for their administrative processes. Those systems are often inadequate for identifying the health status and the clinical condition of the patient. Administrative data systems, which have been developed to process claims for reimbursement, contain rudimentary clinical data – often only the diagnosis and procedure related to one encounter.

U.S. encounter-level health care data systems are plagued by a number of shortcomings that make them difficult to assemble and use for national health policy purposes. These shortcomings include:

- absence of national health data standards for administrative transactions and for electronic (or paper) medical records;
- absence of unique nation-wide identifiers for providers, health plans, and individual patients;
- absence of indicators to identify when a comorbidity or complication developed;
- absence of laboratory results on national data sets;
- absence of prescription drugs (or any uncovered service) in Medicare (or any insurance) records;
- delayed availability of health data caused by the difficulties of assembling non-standard sources;

- inaccuracies in coding data elements that are not used for payment or accountability; and
- lack of privacy standards in private health data systems.

Monumental changes are on the horizon for administrative and clinical data systems in the U.S. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) contained a provision for administrative simplification of the U.S. health care system to increase its efficiency and effectiveness. The law requires: 1) development of national health data standards for electronic transactions between providers and health plans; 2) development of unique identifiers for health plans, providers, employers, and individual patients; 3) the protection of the privacy of health care data; and 4) the development of standards for the computerised patient record.

The U.S. Department of Health and Human Services (DHHS) will implement these provisions through Federal regulations. DHHS has published proposed rules for standards for health-claim and encounter transactions, national provider identifiers, employer identification numbers, and health data security requirements, which will apply to public and private organisations.²⁹ The transaction standards use the open database compliant architecture (approved by the American National Standards Institute) which is necessary for electronic data interchange where machines can talk to machines without human intervention. After public comment and publication of final rules, insurers will have 2 or 3 years, depending on their size, to implement the standards. All insurers and those providers who transact claims electronically must comply with the standards. It is anticipated that all electronic administrative transactions will use national data standards by 2002. Those who do not comply with the standards and those who wrongfully disclose personal health information will be subject to penalties. A standard computerised patient record is being planned for implementation in 2005 or later. One serious obstacle that policymakers face is overcoming the fear in the U.S. of a unique personal health identifier. The identifier is essential for a health care information system that can support efficient administration and research, but makes transmission of very sensitive personal information easier to pirate. The DHHS has decided to postpone the introduction of federal rules for personal health identifiers until the U.S. Congress adopts a health data privacy law that will fully protect health data.

CONCLUSION

There are many pitfalls to translating the U.S. experience into lessons for other countries. Health care and reimbursement systems differ, data systems vary, and providers and health care systems are likely to respond differently. However, this study of the use of casemix information in the U.S. leaves us with a sense of how casemix information can contribute to improving health care. Management with casemix information requires at least four things:

- classification systems that define clinically relevant groups,
- data systems that measure the clinical concepts,

- payment systems that encompass all settings, and
- incentives for providers to use casemix information to change their behaviour.

This last requirement is essential. While the DRGs were the organising concept around which per-case payments for Medicare patients were designed, the clinical detail underlying the classifications was weak. However, because the U.S. DRG system was grounded in financial incentives, DRGs influenced major changes in hospital and clinical management. As a result of this powerful shift in incentives, today,

- Hospitals are treating only the most seriously ill patients.
- Simpler surgeries are performed outside the hospital.
- Nursing care has been moved to intermediate-care facilities or is given during home visits.
- Recuperation is occurring outside the hospital, where patients and families have more responsibility in the recovery process.

In addition to financial incentives, better clinical information is necessary to enhance the effectiveness of casemix-based management. Patients rather than encounters must become the focus of administrative data collection and analysis. An infrastructure for health data that includes personal identifiers and standard record keeping is necessary. Clinical detail must expand significantly. When these improvements become a reality, great progress can be made in improving the management of and effectiveness of health care services.

The American experience should encourage countries that are not now using casemix for allocating resources because of their poor data systems. Sophisticated clinical information systems are not essential for starting casemix-based allocation systems. The U.S. DRG system was initially built with data that contained 1 or 2 diagnoses and 1 procedure. This was later increased to 4 and 3 for Medicare patients, but detail beyond diagnoses and procedures is rare. Even with seemingly inadequate databases, Medicare's casemix reimbursement has had profound effects. And, improvements in data systems can make possible even more dependable assessments of how health care is provided and how it can be improved.

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