

# Hospital financing reform and case-mix measurement: An international review

by Miriam M. Wiley

*A review of reforms in the financing of hospital services in eight European countries and Australia reveals a commitment to a common objective of relating resource use to hospital workload by means of a standardized case-mix framework in the pursuit of greater efficiency. While this objective is also shared with the U.S. prospective payment system (PPS), it is*

*noteworthy that the majority of countries reviewed favor a global budgeting approach to financing hospital services. Ongoing evaluation of these reforms should facilitate an assessment of the merits of case-mix adjusted global budgeting relative to the patient-based alternative.*

## Introduction

As experience with Medicare's prospective payment system (PPS) matures and is the subject of extensive evaluation, questions arise regarding the lessons which may be drawn from this experience for future health care reform in the United States. In this article, it is proposed to broaden this perspective into the international arena and assess the influence that the implementation of PPS has had beyond the United States. Too often, technology transfer is taken to refer to items of capital equipment that can be crated and shipped overseas. Recent experience would suggest, however, that certain concepts, tools, and techniques may also travel well, particularly if they are amenable to adaptation to the local environment. One such experience will be presented here and will involve tracing the extensive journey taken by a technique developed and applied in the United States through the continents of Europe and Australia.

Two critical elements of PPS as introduced within the Medicare program can be differentiated: retrospective, charge-based reimbursement was replaced with a prospectively determined pricing system; the pricing system was applied within a standardized case-mix framework. These two components of the program were not mutually dependent. Prospective pricing could have been introduced using an alternative unit of measurement, like the discharge or the patient bed day. Similarly, the application of a standardized case-mix measure did not have to take place within a reimbursement program, but could have been applied as part of a program like utilization review, as originally intended.

Although an indepth evaluation of the rationale behind the combination of both of these elements within PPS is beyond the scope of this article, it seems reasonable to conclude that, at its most simplistic, the decisionmaking sequence would have recognized that:

- A pricing system works best if based on a transparent and comprehensive definition of the product.

- A case-mix classification system provides a means of defining the product of the hospital.
- A pricing system applied within a case-mix framework offers the best opportunity for the application of an administered pricing approach for hospital services.

Again, while these responses are interrelated, they are not necessarily interdependent.

This series of responses is not, however, unique to any one set of problems or, indeed, any particular health system. What we will try to show here is how different health systems have adopted a similar pattern of response within a variety of organizational settings to a range of problems. Because of the necessity to be selective in this review, only those health systems outside of North America that have come closest to implementing a reform incorporating a case-mix adjustment have been included. The specific reforms, proposed or implemented, will therefore provide the focus of interest, while comprehensive accounts of the overall economic performance and organizational framework of these health systems are available elsewhere (Schieber and Poullier, 1989; Schieber, Poullier, and Greenwald, 1991; Organization for Economic Cooperation and Development, 1992, to be published [a]).

In the next section, a brief summary will be provided of initiatives in the area undertaken by the major international bodies with interests in health policy. The relevant reforms proposed or implemented in the countries of Europe and Australia will then be reviewed. The discussion that follows draws together common trends emerging from this review with the concluding section identifying directions for future development indicated by international experience.

## Initiatives by international organizations

The adoption of the diagnosis-related groups (DRGs) by the U.S. Medicare program as the case-mix measure for application within PPS was an important factor in focusing international interest in case-mix measures and applications in general on DRGs, in particular. The essence of the DRG approach is effectively summarized by Fetter, Thompson, and Averill (1981) as identifying

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in the acute care setting “a set of case types, each representing a class of patients with similar processes of care and a predictable package of services (or product) from an institution.”

The factors influencing the choice of DRGs for use by Medicare, including stage of development, ease of application, data requirements, validity, reliability, etc., also came to feature as important issues in research outside of the United States on the range of available case-mix measures.

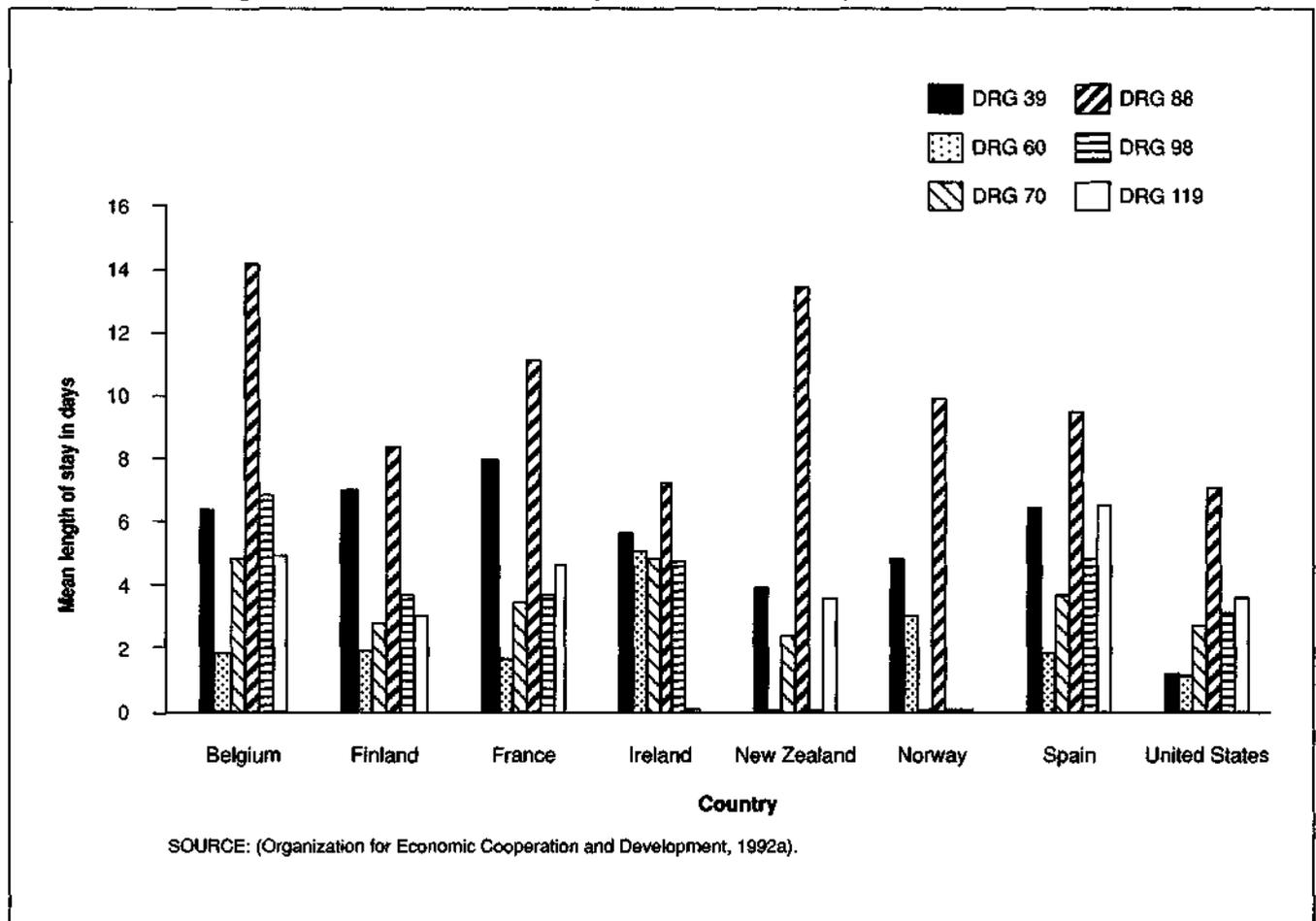
In 1985, the Organization for Economic Cooperation and Development (OECD) was the first to publish international comparisons of mean lengths of stay by DRG (Organization for Economic Cooperation and Development, 1985). This practice has been continued by the Organization, and in a forthcoming publication average lengths of stay for selected DRGs will be published, where available, for member countries for the 1984-89 period (Organization for Economic Cooperation and Development, 1992). To illustrate the type of information available in this international data base, Figure 1 presents mean lengths of stay for eight OECD member countries for six DRGs in 1988: DRG 39 (lens procedures); DRG 60 (tonsillectomy and/or adenoidectomy, age 0-17); DRG 70 (otitis media and

upper respiratory infection, age 0-17); DRG 88 (chronic obstructive pulmonary disease); DRG 98 (bronchitis and asthma, age 0-17); and DRG 119 (vein ligation and stripping).

In 1985, the Council of Europe undertook a study on *The Computerisation of Medical Data in Hospital Services, Including University Hospitals* (Rodrigues et al., 1988). This study involved a review of the status of hospital activity and cost data, coding practices, and case-mix measures under investigation for use in Europe. At that time, 11 countries in Europe reported experimenting with DRGs at some level, though at the time all but 1 of these countries had to translate locally used morbidity codes into *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) to test DRGs on national data. Two countries, Netherlands and England, reported that projects were being supported aimed at developing a local DRG system.

A number of research initiatives have been supported by the European Community (EC), including a concerted action on “The Use of Diagnosis Related Groups to Support Hospital Sector Management in the European Community (EURODRG, 1989-92)” and a number of exploratory actions within the “Advanced

**Figure 1**  
**Length of stay, by diagnosis-related group (DRG) for selected**  
**Organization for Economic Cooperation and Development Countries: 1988**



Informatics in Medicine (AIM) program, 1989-91." A new concerted action under the AIM program on "Case-Mix Applications for Resource Management" is currently at the planning stage. Essentially, these concerted actions provide resources for the coordination of research activities and findings between EC member States undertaking research on case-mix related issues.

The World Health Organization (WHO) has also been active in this area. WHO supported the investigation of options for systems of payment by type of service or patient and applications of DRGs to hospital budgeting and performance measurement (Leidl, 1990). More recently, WHO has taken the initiative in supporting research for case-mix variations in ambulatory surgery in the European region (Wiley and Devereux, 1992).

It is clear therefore, from this short overview, that the activities of international organizations active in the European context have been maintained and expanded since their initiation in the mid-1980s. The fact that these activities facilitate cross-national cooperation and collaboration in the investigation of areas of common interest has also, in turn, helped to advance local and national initiatives. It is to an examination of these national investigations and developments that we now turn.

## **Financing reforms: An international review**

Our task here is to attempt a synthesis of work in progress in selected European countries and Australia towards the development of case-mix-based applications within the respective health care systems. The inclusion of countries in this review is primarily determined on the basis of a stated or implicit objective of developing case-mix-based applications for financing and/or resource management purposes within the acute hospital sector. Although many countries are still at the point of considering a range of options before making a commitment to a particular policy direction, the inclusion of a report on "work in progress" here is not intended to prejudge the outcome of the decisionmaking process. Rather, it is hoped to provide an account of a range of issues that have assumed priority status internationally as many countries face similar problems in attempting to curtail health budgets while safeguarding access and ensuring the availability of high quality care. The countries included in the review which follows are Australia, Belgium, England, France, Ireland, Norway, Portugal, Spain, Sweden, and the United States.

### **Australia**

Since 1984, primary responsibility for the provision of health services in Australia has rested with Medicare, a program of universal public insurance under which public hospital treatment is available to all without charge. Primary responsibility for funding health services rests with the Commonwealth government,

with revenue being raised through general taxation and a targeted health insurance levy. The funding of hospital services is subsidized by the Commonwealth government by means of grants to the States and Territories that have responsibility for planning and delivering public hospital services.

States and Territories may differ in the specific approach adopted in the allocation of resources to hospitals, though there are some common features: Hospitals are funded on the basis of prospectively determined budgets that are capped for the budget period. Although hospital budgets have traditionally been determined on the basis of historic costs, there have been some recent changes in this approach. These changes have mainly arisen from a recognition that extensive interhospital variation in crude indicators like bed-day costs and per-patient costs must be reassessed with adjustments for the kinds of patients treated by each hospital if real interhospital variations in efficiency are to be estimated and addressed (Palmer, 1990).

With the objective of investigating this, and related issues, a considerable body of research concerned with identifying better approaches to allocating resources for hospital services has been developed, both at the State and Commonwealth levels (Duckett, 1988; Palmer et al., 1991; Scotton and Owens, 1990). Much of this research has been oriented towards the objective of relating hospital reimbursement to an agreed definition of the hospital product. Within this context, there has been widespread experimentation with case-mix classification measures, particularly DRGs.

It was against this background that in the negotiation of the 1988 Medicare agreement between the Commonwealth and the States that agreement was reached for an allocation by the Commonwealth government of A\$5 million per annum over a 5-year period for the development of case-mix-based information systems using DRGs. The Casemix Development Programme was subsequently established by the Commonwealth government which has resulted in funding being made available for a wide range of relevant projects concerned with the application of the DRG system to budgeting and planning for hospital service provision, and for the development and implementation of utilization review and quality assurance programs.

In addition to funding research and experimentation, incentive payments may also be made directly by the Commonwealth for the development of case-mix-based cost information systems. A number of States have begun implementing a case-mix adjustment in the approach to resource allocation for acute hospital services: in South Australia a proportion of each hospital's budget is determined on the basis of case mix and in New South Wales a case-mix adjustment factor is integrated into resource allocation for hospital services undertaken at the regional level. In pursuit of the related objectives of improving hospital information and costing systems, together with effectiveness of hospital resource use, the relevant agenda at the national level is currently oriented towards the adoption

of a case-mix funding approach for hospital services as part of the next round of Medicare negotiations in 1993 (Organization for Economic Cooperation and Development, to be published [b]).

While most research work to date has been based on the Health Care Financing Administration (HCFA) DRGs, a number of recent studies have been specifically targeted at the evaluation of alternative DRG groupers towards the objective of recommending one national standard. These evaluations have concentrated on HCFA DRGs, all patient DRGs, and refined DRGs (Palmer, Reid, and Aisbett, 1990). Based on the findings from these studies and input from other relevant groups, the Commonwealth government decided in 1991 to embark on a process of localizing DRGs in accordance with factors considered to be specific to the Australian hospital environment. The types of factors being considered in this process involve changes in DRG labels, reorganization of major diagnosis categories, and alteration of the comorbidities or complications lists (McGuire, 1992). It is planned to have the first version of the Australian National DRGs available for use before the end of 1992.

## Belgium

Health care in Belgium is provided within a compulsory health insurance system that provides coverage to the whole population for major risks, including hospital services. The insurance system is administered by five mutualities and one public fund, with funding being drawn from two sources: social security contributions provide more than one-half the revenue and State subsidies provide the remainder.

Most hospital operating costs are financed directly by the mutualities. Prior to 1982, nursing and accommodation costs were paid retrospectively on a per diem basis which, not surprisingly, provided incentives for ongoing increases in costs and length of stay. In 1982, a series of reforms in the hospital sector were announced by the government, including the introduction of prospective global budgets. Under the current system, both the budget and an agreed quota of bed days are fixed in advance for the hospital. When the hospital uses bed days in excess of the quota, a reduced per diem estimated to reflect variable costs is paid; if the hospital does not fill the bed-day quota, a per diem estimated to reflect fixed costs is paid (Organization for Economic Cooperation and Development, to be published [a]).

In addition to establishing bed-day quotas and capping budgets, the 1982 reform also recognized the importance of standardizing budgets across hospitals in accordance with case mix and other criteria considered critical to the financing of hospital services. There has been some advancement towards the achievement of this objective with the application of a case-mix adjustment for the budgets of laboratory services in 1990 and radiology services in 1992. Where these services are delivered to inpatients, a case-mix adjusted daily rate for these services now replaces the unadjusted daily rate which had previously been applied.

Progression towards greater standardization of hospital budgets for case-mix variations has been facilitated by the recent availability of the appropriate data under the medical registration scheme. Extensive research on the application of the HCFA DRGs to activity data from Belgian hospitals, together with the successful estimation of costs on a DRG basis for a number of hospital departments has facilitated the advancement of these proposals (De Moor, 1989; Closon and Roger-France, 1989). In conjunction with these recommendations, the fundamental obligation on providers to engage in continual assessment of patterns of clinical service and outcomes is also strongly emphasized. The facility that the DRG provides for the development of quality assurance techniques has thus been recognized as an asset within the Belgian hospital system (Willems, 1989).

## England

The National Health Service (NHS), financed mainly from general taxation, continues to provide the framework for health care provision in England. *Working for Patients*, published in 1989, presented a blueprint for reform of the way in which the NHS was organized, and legislation enacted in April 1991 has given legal effect to the main provisions of these recommended reforms.

With regard to the acute hospital sector, in particular, the most far reaching change is the separation of the roles of purchaser and provider of hospital services. There are a number of different ways in which this new type of relationship may be defined, though in each case the hospital fulfills the role of service provider within price and quality controlled service contracts agreed with the purchasing agent. District health authorities may act as the purchasing agent of hospital services and enter into contracts with designated service providers for a defined and costed range of services. In addition, general practitioners (GPs) in practices fulfilling particular conditions may choose to become "fundholders." This means that they adopt the role of purchaser on behalf of their patients and enter into contracts with hospitals for the provision of required services. Fundholding GPs have an incentive to secure contracts for hospital services at the lowest cost because any surplus earned on the budget assigned can be retained for improvements within the practice. Any budget overspend by GPs will result in the withdrawal of fundholding status from the practice. The final optional configuration within this purchaser/provider dichotomy is for particularly well managed public hospitals to withdraw from control by the district health authority and choose to become independent self-governing trusts. Trust hospitals will still, of course, have to enter into contract with purchasers like district health authorities and GP fundholders for service provision.

With the enactment of the reform legislation in April 1991, "57 NHS hospitals and units became self governing trusts, 306 GP practices became fund holders, all districts had separated their purchasing and

providing functions and most had finalised contracts with hospital providers" (Organization for Economic Cooperation and Development, to be published [a]). While there are current plans to expand the number of trust hospitals and GP fundholders in 1992, the emergence of problems for some large teaching hospitals in the London area led to an inquiry at the end of 1991 and the temporary suspension of setting up any further trusts in the area.

Many interesting issues are raised by this latest reform of NHS, some of which are dealt with in an extensive review by OECD (1992b). Of particular interest to the investigation here is the fact that, according to Sanderson (1991) "This new contracting environment has created the potential for a new role for case mix measures." An interest in this area is not unique to this recent reform as issues concerned with case-mix measurement and application have featured as an integral part of the Department of Health's resource management project since the early 1980s. In the intervening decade, extensive research activities have been supported and involved analysis and application of a range of case-mix measures, including DRGs. While the reported evidence "suggests that UK data can be successfully grouped into DRGs and that the resultant groups are medically valid and resource homogeneous" hospitals have complete discretion in the application of case-mix measurement and the case-mix measure of choice (Mills, 1989).

Following on the application of HCFA DRGs within the resource management program, a series of projects have subsequently been undertaken with the objective of modifying DRGs "to reflect English clinical practice more clearly" (Sanderson, 1991). This exercise has been focused on the specialty, with the intention of reflecting the work of the clinical directorates which is also specialty based. The results of this investigation have been consolidated to produce the first version of the health resource groups (HRGs) which are now being tested in a number of centers. The HRGs are most clearly described by Sanderson (1991):

"In principle the groupings are similar to DRGs (and in a number of cases are actually the same as DRGs) in that they are based upon readily available items of information (diagnosis, procedure, age, discharge status and specialty). They number just over 500 and are also intended to be resource homogeneous in terms of length of stay. The key difference is that for surgical DRGs the grouping is largely driven by the procedure rather than the primary diagnosis."

Following pilot testing of HRGs, it is expected that further modifications will be undertaken, with particular attention being paid to an assessment of the resource homogeneity of the groups.

Irrespective of the approach adopted to case-mix classification, medical audit is to be a requirement for hospital practice within NHS. A specific concern with the assessment of severity in the inpatient setting has been the focus of a project on the application of the disease staging methodology by a research team at the London School of Hygiene and Tropical Medicine in the past year (McKee and Petticrew, 1991). The

proposed implementation of specially designed audit programs will involve consultants auditing the process and outcome of the service they provide, and the Royal Colleges are being encouraged to make satisfactory audit a precondition for the recognition of clinical training programs (Schneider et al., 1991).

## France

Although the French health care system is composed of a complex set of components, it is essentially grounded in a universal national health insurance model. It must, however, qualify as a modified model, incorporating supplementary insurance options and a policy of cost sharing. The health insurance system is part of the social insurance scheme which has achieved close to total coverage of the population and is funded by income-related contributions from employers and employees. The social insurance system contributes more than 70 percent of total health expenditure, other insurers contribute 8 percent, the public sector contributes 4 percent, and out-of-pocket payments contribute approximately 17 percent (Centre de Recherche, d'Etude et de Documentation en Economie de la Santé, 1989).

Under the national health insurance system, the patient is eligible to receive services in both public and private hospitals, with the copayment rate fixed in each case. While doctors services are paid on a salary basis in public hospitals, they are paid on a fee-for-service basis in private hospitals.

The payment of hospital services also differs between the public and private hospitals. Most private hospitals are paid on a per diem basis for inpatient care. However, the per diem based approach for the payment of services in public hospitals was replaced by the use of prospective global budgets in 1984-85. This reform arose from a recognition of the inflationary potential of the per diem based approach in the public sector and the potential which a budgeting approach offered for greater control over hospital costs.

To date, the determination of global budgets has been based on historic expenditure levels, with any rate of increase centrally determined and applied across all hospitals. Budgets are intended to cover operating costs and include depreciation and interest on capital. Because hospitals treat patients covered by a number of different insurers, the budget share required of each insurer is determined on the basis of the number of bed days used by the insurer's catchment area (Organization for Economic Cooperation and Development, to be published [a]).

With the introduction of budgets for public hospitals in the mid-1980s, it was government policy to move towards the application of a standardized measure of workload as part of the budgeting process. Advancement towards the achievement of this objective has had to await the enactment of a more recent reform in 1991 which indicated that the process of determining the hospital budget should, in the future, incorporate a discussion of medical activity (Republique Francaise, 1991). The form that this review of medical activity

should take is not specified and will, presumably, be a matter for agreement between the budget negotiators.

In 1991, the French Ministry of Health also produced an updated version of the case-mix system called Groupes Homogenes de Malades (GHM). GHM is essentially based on the HCFA DRGs, with some local modifications and an integrated mapping facility from local codes to ICD-9-CM. GHM was one of a number of developments to emerge from the Programme for Medicalisation of Information Systems, which got under way around 1982, and was among the first European initiatives to investigate case-mix measurement and costing within the acute hospital sector. In addition to case-mix measurement, this project was also involved in the development of a standardized system for collecting and coding activity data in acute hospitals.

It is against this background that commentators have noted that "The availability of data on medical information and the utilisation of resources have stimulated the progress of utilisation review" (Boulay, 1988). A further update of GHM to incorporate a more recent version of the DRGs is currently under active consideration.

Current indications are that the process of reform of the acute hospital sector in France towards the achievement of the objective of greater efficiency and improved performance has not yet been completed. As the debate on the relative merits of different options continues, it is likely that the process of a series of modest reforms, rather than major modification, will be continued.

## **Ireland**

The Irish health care system has two main components: a predominant public health system financed from general taxation and a small private sector based on a system of voluntary health insurance. Approximately 85 percent of total health expenditure comes from government sources with the remainder coming from the private health insurance system.

The whole population is entitled to hospital services within the public health system. A small per diem charge is levied with a fixed upper ceiling and people under a predefined income limit are exempt from this charge. Public hospitals are financed on the basis of prospectively determined global budgets which are determined primarily on historic expenditure, adjusted for inflation, pay awards, projected changes in service provision, and government policy on overall public expenditure.

The approach to health service financing and funding was critically reviewed by the Commission on Health Funding in a report published in 1989. The Commission attributed the main weakness in the prevailing approach to the financing of hospital services to the fact that "it sustains, over time, the cost differences between efficient hospitals and resource-wasting ones" (Stationery Office, 1989). The main recommendation proposed by the Commission in response to this problem was that "hospitals should receive global

budgets for the provision of an agreed service level. The calculation of these budgets should be based on an assessment of the activity level implied by the hospital's agreed role and catchment area, and the case-mix based cost of meeting this."

A study of activity and costs in Irish hospitals that tested the application of HCFA DRGs to Irish data came to a similar conclusion in recommending the application of a case-mix adjustment within a prospective global budgeting approach to resource allocation for acute hospital services (Wiley and Fetter, 1990). The recent commitment by the Department of Health in Ireland to "developing a resource allocation system which would link hospital budgets to the type and volume of services to be provided" is consistent with the direction proposed in the recommendations emerging from these studies (Stationery Office, 1990).

Since 1990, the Voluntary Health Insurance Board in Ireland has been using HCFA DRGs to analyze claims on a case-mix basis for the private hospitals. Case-mix reports are now produced on a quarterly basis and are provided to each major private hospital showing the length of stay for the top categories of admission and comparing the results for peer group hospitals on an anonymous basis. A case-mix adjustment is also built into payment agreements with a number of major private hospitals to enable adjustments to be made for substantial changes in case-mix intensity over the period of the agreement.

The Irish government attaches a high priority to ensuring that an acceptably high standard of care is delivered through the health services. This is indicated by the fact that a recent national agreement between all the social partners included a commitment to the establishment of a performance audit unit within the Department of Health "to assist the Minister in assessing the efficiency and effectiveness of the health services" (Stationery Office, 1991).

## **Norway**

There are three levels of organization within the hospital system in Norway: regional, county, and district. The majority of hospitals are public and owned by the counties, though there are a small number of national hospitals. Hospitals are funded on the basis of global budgets which are prospectively determined annually by the county council. This budget has traditionally been determined on the basis of historical information without adjustment for past or projected activity. The hospital is paid for outpatient services on the basis of fixed prices agreed with the national insurance system. The counties raise income from local taxes, in addition to receiving a global budget from the State to cover 35 percent of county health expenditure.

With the objectives of increasing both efficiency and productivity within the hospital sector, the Norwegian Government has made a commitment to reforming the approach to funding hospital services. In so doing, particular emphasis has been placed on the development of an incentive structure that can facilitate the achievement of the dual goals of promoting cost

consciousness in treating patients and ensuring that the most appropriate treatment option is chosen. The reform proposed is based on a two-part payment system for the hospital: a fixed budget component combined with a variable case-mix-based component. The fixed budget component would constitute the largest part of the hospital's income and continue to be determined at the beginning of each year. The variable case-mix component would be based on activity projected by DRG for the payment period. The payment of this part of the hospital budget would be adjusted according to the activity level supported by the hospital: Where the hospital supports a lower level of activity than that projected on a DRG basis, the hospital's funding would be reduced accordingly. At the hospital level, departments that earn a surplus with increased productivity/reduced costs would be able to keep a share of the surplus, while departments earning a deficit will have funding reduced (Hogsnes, 1991).

A range of objectives have been proposed for the pursuit of this reform, including the following: to provide an incentive to hospitals to treat patients with the minimum necessary use of resources; to utilize the capacity within hospitals to treat more patients; and to motivate clinicians to use DRGs in monitoring and evaluating their performance on a clinical level (Aas, 1985; Aas et al., 1989; Slattebrekk, 1991).

A pilot project to test the proposed reform has been in place since January 1, 1991, in four hospitals and will continue until December 31, 1992. For this test, 60 percent of the budget for the hospitals will be allotted in the traditional way, while 40 percent will be estimated on the basis of activity projected on a DRG basis. The HCFA DRGs have been adopted for use in Norway after being extensively tested on local hospital data (Aas et al., 1989). Norwegian DRG cost weights have also been estimated and published and constitute the basis for calculating the DRG component of the hospital budget.

In this pilot project, it is recognized that in addition to the introduction of the appropriate incentives, the achievement of project objectives will also require improvements in the information systems, particularly the financial systems, operating in the hospitals. To safeguard quality of care within the new funding arrangements, a central peer review group has been established with a mandate to detect possible poor quality of care and to ensure that hospitals perform in accordance with the intentions of the project (Slattebrekk, 1991).

Following the completion of the pilot test, external evaluators will be asked to report on achievements in productivity, quality, and management in the test sites. On the basis of this evaluation, a decision will be made by the Norwegian government on the expansion of this reform throughout the hospital system.

## Portugal

Portugal has a centralized health care system that is primarily financed from tax revenues. As dominant payer and provider of hospital services, the government

provides 87 percent of hospital revenues and owns 80 percent of all hospital beds (Bentes et al., 1991). Inpatient care provided under NHS is funded on the basis of prospectively determined budgets allocated to hospitals on an annual basis.

In 1981, the Portuguese Government made a commitment to the principle of output-based funding for hospital care within the constraint of overall budget neutrality. An important concern underlying this commitment was "to rationalize the process of distributing a central budget to hospitals, which is determined by a political and social process largely external to the health sector itself" (Bentes et al., 1991). The pursuit of this objective led the Ministry of Health in 1984 to study the feasibility of using the DRG system as a framework for the definition of the hospital product. Encouraging results from this study resulted in the study being extended to all public acute care hospitals, and in 1987 a plan was developed to undertake major revisions in the funding of hospital care (Bentes et al., 1989).

Following an extensive research and development program involving the development of hospital information systems, the updating of coding systems, and the introduction of training and education programs, a resource allocation model within which a designated proportion of the hospital budget is estimated on a case-mix, DRG, basis, was put in place in 1990 (Bentes et al., 1991). The model applied may be summarized as follows:

"Appropriations for each hospital for inpatient care under the National Health Service are determined by multiplying its expected number of cases times its case-mix index and times its base-rate which is partly related to the hospital's specific costs. Adjustments to the budget allocations are applied to account for outlier and transfer cases and to ensure overall neutrality of the NHS budget" (Bentes and Gonsalves, 1992).

Key features of this model, therefore, include: projecting hospital activity, estimating the case-mix index and the base rate, and determining adjustments for outliers, transfers, and budget neutrality.

With regard to activity projections, hospital-specific trends were used to forecast discharge levels for 1992. For small hospitals, the accuracy of projections was improved by using a blend of hospital-specific rate of change with the rate of change nationally. Projections for outlier and transfer cases are expressed in terms equivalent to inpatient discharges so an adjustment is applied in terms of discharge equivalents.

Hospital case mix is measured using HCFA DRGs and it is planned to use DRG grouper HCFA 9.0 from 1992. The base rate applied is a blend of hospital-specific and national average costs. The blended rate has progressed from 90 percent hospital-specific in 1990, to 85 percent in 1991, and 80 percent in 1992. Although the second component of the blended rate was based on national average costs in 1990 and 1991, this approach was modified in 1992. This change was implemented in response to a perceived bias against particular types of hospitals under the previous system.

The alternative implemented in 1992 blends hospital-specific with group average costs, rather than national average costs. The hospital groups have been formed on the basis of such variables as specialization, size, and geographical location (Bentes and Gonsalves, 1992).

This output-based resource allocation model for acute hospital services will continue to be developed in line with ongoing assessments of the effectiveness of the system which has been put in place. While ambulatory services continue to be funded from the national budget on the basis of historic expenditure adjusted for inflation, the inclusion of this sector within a comprehensive output-based funding model is recognized as an important objective for future development. A partial response to the recognition that quality of care must be protected and enhanced under the new funding system is evident in the current application of a system of utilization review. The fact that morbidity coding is done by doctors in Portuguese hospitals would be expected to add a very valuable perspective to this process, particularly on such issues as data coverage and data quality. The long-term goals for system development are also concerned with facilitating a relationship between the regional resource allocation system and case level quality assessment and utilization review (Vertrees and Manton, 1991).

## Spain

The 1980s was a period of transition in Spain with the beginning of the devolution of responsibility for their respective health care systems to the autonomous regions at the start of the decade and the extension of compulsory health insurance to the whole population in 1986. The system is currently funded from general taxation and targeted social security contributions (Organization for Economic Cooperation and Development, to be published [a]).

Patients are entitled to receive inpatient care in the public sector without charge. Hospitals within the social security system are funded on the basis of prospectively determined global budgets for operating costs. Budgets are determined on the basis of historical costs and any savings generated by a hospital must be returned to the central social security fund. When the social security system contracts with hospitals outside the system for services, payment is made on the basis of per diem rates which are related to the hospital type.

The fact that the determination of budgets for hospitals in the social security system does not take account of activity within the system has been recognized as a problem by the Ministry for Health. This factor, together with the need to increase the efficiency of the health services, increased international experience with case-mix funding models, and the need to use management technology to optimize health care quality contributed to the Ministry of Health's decision to pursue the development of a new "resource assignment system" for the hospital sector (Esteban, 1992).

In 1991, a project for the development of a "process payment system" was set up with the objective of

producing a health product catalog, based on case-mix measurement, which may serve as a hospital planning, funding, and management tool. The project currently involves 13 hospitals throughout Spain in the collection of activity and cost data and testing analytical tools. HCFA DRGs and patient management categories (PMCs) are being tested as potential measures of case mix for inclusion in the new system. Recommendations to the Ministry are expected to be made before the end of 1992 on the approach to case-mix measurement and system design which will enable the development of a process payment approach for implementation in the acute hospital sector.

Catalonia was the first autonomous region with responsibility for health care. In a period of expenditure restraint in the mid-1980s, the objectives of improving hospital management and identifying solutions to recognized areas of inefficiency became a priority (Casas, 1989, 1991). It was in this context that the application of case-mix based approaches to resource management came to be developed and tested. HCFA DRGs have been used in Barcelona since the mid-1980s and this initiative has now advanced to the development of allocation models for the evaluation of relative efficiency and budget allocation between hospitals (Ibern, Bisbel, and Casas, 1991). In pursuing the development of these applications, the introduction of utilization review programs and training programs for managers and clinicians has been recognized as critical to ensure appropriate use of the information being produced and the techniques developed (Casas, 1989).

## Sweden

Health care provision in Sweden is organized according to a three tier system: regional, county, and local levels. The county councils and municipalities have responsibility for the organization and delivery of health services, together with entitlement to levy taxes to fund the health care bill. The county council tax may be considered as a universal public health insurance covering the individual's cost for medical care. About 65 percent of total health expenditure is raised from county council taxes, with the remainder being supported by grants from central government and the social insurance system fund (Organization for Economic Cooperation and Development, to be published [b]).

Financing for hospital services has been provided on the basis of prospectively determined budgets which include allocations for all expenditure areas, including doctors' fees. During the expansionary periods of the 1960s and 1970s, budget deficits were usually absorbed in the succeeding budget period. With the dawning of the era of cost containment in the 1980s, however, the need for tighter control of hospital costs was associated with the introduction of a clinical budgeting approach in some counties. This approach provided incentives to providers to maintain service levels at reduced cost because any surplus could be used for designated discretionary activities. This instrument proved to be

somewhat crude, however, for a number of reasons, including the fact that it did not facilitate an accurate estimate of the relationship between inputs used and outputs generated. In addition, the department budgets did not include a cost for the use of internal hospital services which meant that the total cost of service use by the department was underestimated.

It was against this background, therefore, that the drive for a more fundamental reform of the financing and organization of the hospital services, in particular, gained momentum towards the end of the 1980s. The structure of hospital service provision is currently being reorganized in a number of counties, with the separation of production and financing of services emerging as a key feature of this reorganization. A review of the reform in Stockholm's county council serves to illustrate the type of approach implemented or being considered in other areas.

Stockholm's county council has made a commitment to the development of an internal market for hospital services within which hospital revenues are to be generated by the sale of services to local health districts. HCFA DRGs are used as the measure of output on which prices are set prospectively (Hakansson, 1988; Paulson, 1990; Ljunggren and Fries, 1990). In January 1992, the first year of implementing the new system, a transitional margin was introduced whereby hospitals will not have to reduce costs by DRG by more than 15 percent, which means that the fixed DRG prices may not be achieved in all cases. Since January 1992, a set of DRG prices has been in use in the clinical departments of general surgery, obstetrics and gynecology, urology, orthopedics, and cataract surgery in all hospitals throughout the county (Organization for Economic Cooperation and Development, to be published [b]). Ambulatory surgery is also covered within the new system with same day surgery being reimbursed at 60 percent of the DRG price fixed for inpatient care. It is planned to introduce a DRG pricing system for all specialties in January 1993 and complete the implementation of the full internal market model by 1995.

## **U.S. Medicare prospective payment system**

In contrast to the majority of reforms presented in the countries just reviewed, which are currently being considered for implementation or have just been put in place for a period of some months, the prospective payment system (PPS) was introduced to the Medicare program in 1983. During Medicare's first 16 years of operation, hospitals were reimbursed retrospectively on the basis of actual costs incurred. Since the introduction of PPS, the most revolutionary change in the lifetime of the program, hospitals treating Medicare patients have been reimbursed on the basis of a prospectively determined payment for a specified product, defined on the basis of the hospital discharge (Russell, 1989). Rather than look at the background to the development of the program, or the expectations underlying its implementation, key findings emerging from recent

evaluations of the achievements during the period of implementation will be briefly reviewed here.

In their review of the literature assessing the effects of PPS, Coulam and Gaumer (1992) conclude that, "PPS appears to have saved Medicare money without causing systematic, documented harm to patients or the health care industry." Specific changes in evidence during the period of PPS operation can be summarized for the following relevant areas within the acute inpatient sector (Prospective Payment Assessment Commission, 1991).

- **Expenditure.** The rate of growth of total and inpatient payments under Medicare slowed considerably after the implementation of PPS. Russell and Manning (1989) estimate that the introduction of PPS was associated with a reduction of 20 percent in hospital insurance expenditures in 1990.
- **Practice patterns.** Admission rates decreased, length of stay decreased, and case-mix intensity increased.
- **Quality of care.** While concerns have been raised about changes in stability at discharge during the PPS era, studies of quality of care using explicit and implicit process criteria have found that "the quality of hospital care has continued to improve for Medicare patients despite, or because of, the introduction of the prospective payment system" (Rubenstein et al., 1990).

In looking to the future, a report from HCFA (1991) notes with concern the increased rate of growth of Medicare benefit payments for inpatient hospital care in 1988 compared with previous years. Coulam and Gaumer (1992) suggest that such emerging trends are indicative of basic structural problems and propose that, "Insofar as PPS and PROs are consistent with the fragmented, payer-by-payer micromanagement of health care costs characteristic of current public and private initiatives, the continued growth of U.S. health care expenditures at least supports a speculation that more fundamental reform is needed, even if, standing alone, the direct and measurable effects of PPS point generally to the success of the PPS effort for the Medicare program."

## **Planning, management, and outcome measurement**

All of the countries reviewed up to this point share a common orientation towards the incorporation of an adjustment for case mix in the development of reforms for financing acute hospital services, though in no case is this the exclusive application being considered for this methodology. There are, however, other activities or interest in this area internationally that are not specifically directed at financing reforms and these will be briefly summarized in this section (Wiley and Leidl, 1989).

The drive for cost containment at the hospital and interhospital level has focused attention on the need to improve the efficiency of performance of internal hospital departments in Finland. It is this motivation

that has stimulated the development of a case-mix application for management techniques within the Finnish hospital sector (Brommels, 1988). A recent government reform providing for the provision of a population-based block grant to local authorities is now focusing attention on the facility which may be provided for the required product descriptions of hospital services by a case-mix classification scheme like the DRGs (Brommels, 1990).

The recognition that comparisons at the specialty or hospital level must control for the heterogeneity of patients treated was the starting point for a number of important studies of hospital case mix in Italy (Taroni, 1990; Taroni, Louis, and Yeun, 1992). The research conducted by Taroni and his colleagues has concentrated on examining the potential of measures like the DRGs and/or disease staging for estimating the relationship between resource use variables and key independent variables so that some support may be given to management within the hospital in correcting for observed deficiencies in performance.

While the development of effective tools for management support, including utilization review and quality assurance have assumed priority, the research emanating from the Netherlands has consistently emphasized the importance of flexibility in any patient classification systems used (Van Dijk and Voss, 1990). Experimentation with the DRG system has proceeded in association with the development of local schemes. A critical issue for the future, however, will be the development of appropriate patient classification models to enable hospital information to be consolidated and made available to managers within a meaningful and intelligible framework.

A detailed study of the potential for case-mix measurement and application in Switzerland, using DRGs, was published by Paccaud and Schenker (1989). This extensive analysis of hospital activity facilitates an advanced understanding of the integrity of this case-mix application within the Swiss health system. Schenker (1991) concludes that research to date with the HCFA DRGs indicates the suitability of a DRG-type case-mix system for resource planning and deployment at the hospital level.

## Discussion

It is evident from this review that there are a number of important international initiatives in hospital financing reform which parallel parts of the U.S. PPS along a number of critical dimensions. In attempting to get an overview of characteristics and developments which may be shared across these systems, Table 1 summarizes the main features identified with regard to financing, funding source, case-mix applications, and quality review.

It is interesting to note the consistency across the countries reviewed in terms of a number of characteristics, particularly the timeframe, application of case-mix measure, and quality assurance and assessment procedures. All of the countries reviewed report a preference for prospective rather than

retrospective financing of hospital services. Case-mix measures and quality assurance measures are also proposed, or in use, in association with reforms in the financing of hospitals in these countries. While the approach to quality assurance proposed as part of the reforms varies between countries, there is a high degree of consistency in the type of case-mix measure in use. The HCFA DRGs are used in all countries. Two countries, Australia and England, are currently undertaking a major DRG-based localization exercise to produce national case-mix measures, Australian National DRGs and Health Resource Groups, respectively. In France, a new version of the DRG-based system, Groupes Homogenes de Malades, is also at the planning stage. In addition, disease staging is being tested at the project level in Italy, England, and Spain, with Patient Management Categories (PMCs) also being tested in Germany and Spain (Neubauer, 1991).

With regard to the unit of payment, only the United States has indicated a preference for the exclusive use of patient-based payment for hospital services within PPS. Global budgeting is the predominant approach used for financing public hospital services in the countries of Europe and Australia reviewed here. In insurance-based systems, particularly, budgeting may be combined with other approaches to financing services in different sectors, such as the not-for-profit and private hospitals. The majority of countries report that health funding comes from a number of sources, primarily government and health insurance agencies.

The approach to financing hospital services tends to be a reflection of the prevailing health system model which is, in turn, an important determinant of the scope of data availability within the system. Where financing of health service provision is predominantly patient-based, the associated data bases will also tend to be specific to the patient level. Where financing is, however, pitched at a more aggregated level, then it is often the case that patient-specific data bases will not be very comprehensive.

The hospital systems for the countries reviewed here tend to fall into this latter group, and may also have the added problem of the absence of an adequate framework to facilitate the integration of patient discharge data with financial data. In other words, individual-based diagnostic and charge information, that are part of the administrative reporting requirements of the U.S. Medicare program and needed to establish DRG relative weights, are generally not a by-product of the payment systems of most European countries. Thus, the implementation of any reform based on the application of a case-mix adjustment within a global budgeting framework demands that this problem be resolved. The predominant approach used in the countries reviewed here to overcome this problem is the application of a cost modeling approach to estimate hospital costs on a case-mix basis (Wiley, 1992).

The cost modeling approach is essentially a product line, or case-mix cost accounting model with the core

objective of estimating treatment costs for individual patients grouped on the basis of resource use. The costing process involves the disaggregation of the costs from the general ledger level, through the assignment to cost centers, and ultimately to the determination of average cost per patient in each patient group. As hospital costs within these health care systems generally include physician services, the resulting cost estimates and cost weights are also generally inclusive of physician services. While some countries, for example France and Norway, have based this case-mix costing exercise on a small number of hospitals, for other countries, like Portugal, many hospitals within the public health system have been involved. The areas where the absence of patient-level data have been most critical are for nursing resource use and the use of ancillary services (Wiley, 1992). Many countries have supplemented national data bases with U.S. data on relative value units for specific services and cost weights for specific DRGs to compensate for local data deficiencies. An important objective for the financing reforms proposed or in place, however, is the development of a comprehensive data base on hospital financing and activity to fulfill all local and national requirements.

Those countries outside of the United States that have implemented reforms in their approach to financing hospital services have, as yet, only limited or preliminary results available. It is premature, therefore, to make any comparisons with the PPS experience. The interesting question which arises in this regard, however, is whether such comparisons will, in time, be meaningful. This question arises because evaluations of the PPS experience tend to assess the combined effect of the range of changes introduced, while proposals for reform outside of the United States have tended to incorporate some of these changes, to the exclusion of others. The PPS patient-based approach is not shared by any other country, while the financing of hospitals on a prospective basis in these countries often predated the PPS change by many years. Where all of these countries and PPS do share common ground, however, is in the acknowledged objective of relating resource deployment to the return in investment by means of a standardized case-mix framework in the pursuit of greater efficiency within the acute care sector. It is possible that as the results of these financing reforms become available, these will, in turn, facilitate the attempt to disentangle the relationship between the different effects generated by the array of changes introduced with PPS at its inception.

## Conclusions

The fact that the developed industrialized nations share many similar goals for their health care systems, including more effective cost containment, greater efficiency and effectiveness in service delivery together with equity of access to care of high quality, has been well documented elsewhere (Schieber, Poulhier, and Greenwald, 1991; Organization for Economic Cooperation and Development, to be published [a], [b]).

What emerges from this review is that in addition to sharing objectives, many of these countries may now be coming closer to sharing similar approaches to the achievement of these goals.

In doing so, however, countries seem to be quite discerning in what is borrowed or adapted from elsewhere. While the U.S. PPS has not been transported in its entirety, the HCFA DRGs have earned a place on any technology transfer list after having been transported across many boundaries—geographical, institutional, conceptual, and ideological. The fact that the HCFA DRGs have withstood rigorous testing in 15 European countries and been retained with little or no amendment in the majority reflects both on the system itself and specific features about the European context (Wiley, 1990, 1991). The characteristics peculiar to the European environment that militate against the development of a specifically European case-mix measure include the fact that no one country is likely to have an adequate data base that is both comprehensive and exhaustive. There is considerable diversity in the coding schemes used for morbidity data, and the technology and expertise required for the processing and analysis of an appropriate data base are unlikely to be concentrated in one center. The fact that England and Australia are now engaged in the most extensive case-mix development exercise being conducted outside of North America is a source of interest to observers in many other countries. The impact of the English exercise outside of that country may, however, be limited by the fact that the coding scheme in use for procedures is unique to that system. The fact that the Australian project is based on an adaptation of the DRGs and uses ICD-9-CM, the most commonly used coding scheme for procedures currently in use in Europe, would be expected to generate international interest in the new system if it is made available outside of that country.

While the information currently available on the financing reforms for the hospital sector in the countries reviewed here does not permit any reasonable predictions on the possible effect such reforms may have on the economic health of these systems in the future, the most interesting conclusion may be found in the apparent convergence of these reforms along a number of critical dimensions. The most fundamental form of a generic model emerging from European and Australian research efforts and experimentation which have been fairly independent and pursued in different political, social, and economic environments is based on the continued pursuit of a global budgeting approach to funding hospital services. This approach is being pursued in conjunction with the application of an adjustment for hospital case mix to facilitate the measurement of interhospital efficiency, and provide an incentive for improved efficiency. The core objective ascribed to the application of this model is to facilitate advancement towards a more equitable system of resource allocation that rewards greater efficiency and effectiveness in the management of hospital resources.

As technology transfer can be a two-way process, one question which arises is whether any elements of this

Table 1

## Summary characteristics of financing reform, case-mix classification, and quality assurance for selected countries

Characteristic	Australia	Belgium	England	France	Ireland	Norway	Portugal	Spain	Sweden	United States
<b>Financing reform</b>										
Timeframe	Prospective	Prospective	Prospective	Prospective	Prospective	Prospective	Prospective	Prospective	Prospective	Prospective
Unit	Budget	Budget	Mixed	Mixed	Budget	Mixed	Budget	Mixed	Budget	Patient
Source	Mixed	Mixed	Government	Mixed	Mixed	Mixed	Government	Mixed	Mixed	Mixed
Status of reform	Phased implementation	Phased implementation	Phased implementation	Proposed	Proposed	Phased implementation	Full implementation	Proposed	Phased implementation	Full implementation
<b>Case-mix classification</b>										
Case mix in use	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Type of case mix	AN-DRG	DRG	DRG HRG	GHM	DRG	DRG	DRG	DRG	DRG	DRG
Quality measure	Quality assurance	Quality assurance	Audit	Clinical evaluation	Audit	Clinical evaluation	Quality assurance	Quality assurance	Clinical evaluation	Peer review organization

NOTES: AN-DRG is Australian national diagnosis-related group. HRG is health resource groups. GHM is Groupes Homogenes de Malades. DRG is diagnosis-related group.

SOURCE: Wiley, M.M., The Economic and Social Research Institute, Dublin, Ireland, 1992.

model could be usefully transported back to the United States, in reciprocation for the case-mix technology which has traveled so successfully outwards. The results of the current experimentation with a case-mix-based global budget model for financing hospital services in many countries in Europe and Australia might be usefully observed in the search for a possible candidate for inward transfer to the United States.

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