Development and localisation of casemix applications for inpatient hospital activity in EU member states

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Abstract

The successful infiltration of casemix techniques across geographical, systemic and cultural boundaries provides an interesting and timely example of the translation of research evidence into health policy development. This paper explores the specifics of this policy development by reviewing the application of casemix techniques within the acute hospital systems of European Union member states. The fact that experimentation with or application of casemix measures can be reported for the majority of European Union member states would suggest that the deployment of these measures can be expected to continue to expand within these health systems into the new millennium.

Introduction

Given the dynamic nature of the health care sector, there is an ongoing need to review systems as needs, services, technology and the scope of diagnostic and treatment facilities expand. Together with addressing these issues, the increasing pressure on health expenditure experienced by many European countries through the 1980s and early 1990s constituted an additional factor which contributed to the proliferation of more substantial reform initiatives for health systems in this region at this time (OECD 1992, 1994). As the hospital sector constitutes a major component of health expenditure in the majority of countries, this area has been specifically targeted by many of these reform initiatives. The fact that many proposals for hospital sector reform have featured the development of some form of casemix application would suggest an increasing acceptance of these techniques in the European context.

While the term *casemix* would not have been common parlance within European health or hospital systems at the beginning of the last decade, current discussions on such diverse issues as hospital financing, planning, manpower management and so on can hardly be advanced without serious attention to the casemix factor. The successful

infiltration of casemix techniques across geographical, systemic and cultural boundaries provides an interesting and timely example of the translation of research evidence into health policy development. The specifics of this policy development will be explored in this paper, which reviews the application of casemix techniques within the acute hospital systems of European Union member states.[1]

To place this discussion in context, this paper first reviews the resourcing of both the health and hospital systems in these countries in recent years. Against this background, it considers approaches to casemix applications and localisation. The paper then outlines the specifics of the approach adopted by the majority of European Union member states which incorporate a casemix adjustment within a range of different hospital financing models. It also explores the extensive process of localisation of casemix techniques being pursued by a substantial group of countries. The fact that experimentation with or application of casemix measures can be reported for the majority of European Union member states would suggest that the deployment of these measures can be expected to continue to expand within these health systems into the new millennium.

Setting the scene: Health and hospital expenditure trends for European Union member states

To provide a picture of current levels of expenditure in European Union member states, Figure 1 presents the proportion of gross domestic product (GDP) devoted to health for 1995 and 1996. For both years, Germany and France are consistently the biggest spenders, with close to 10% of GDP committed to health expenditure. At the bottom end of the scale, four countries, namely, Greece, Ireland, Luxembourg and the UK, spend 7% or less of GDP on health. The share of GDP devoted to health between 1995 and 1996 increased in Sweden, Spain, Portugal, Luxembourg, Italy, Greece and Germany; dropped in the Netherlands, France, Finland and Belgium; and remained stable in the United Kingdom, Ireland, Denmark and Austria.

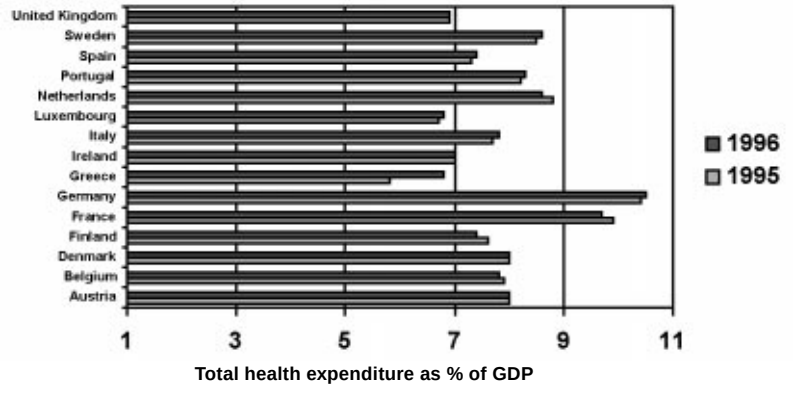

Figure 1: Total health expenditure as a percentage of GDP for EU member states, 1995 and 1996

While a cross-sectional view of health expenditure levels provides a useful perspective on relativities between countries, it does not provide much insight into developmental trends. To provide some insight into health expenditure trends historically in these countries, Table 1 presents the percentage change in the share of GDP allocated to total health expenditure for the periods 1980–85, 1985–90 and 1990–96. The graphic presentation in Figure 2 summarises the magnitude of the change in this indicator over the time periods reviewed.

Table 1: Percentage change in share of GDP devoted to health (health %) and public expenditure on inpatient care (hospital %) as a proportion of total health expenditure

	1980–85		1985–1990		1990–95	
	Health %	Hospital %	Health %	Hospital %	Health %	Hospital %
Austria	– 12.99	20.5	7.46	– 10.2	11.11	– 6.1
Belgium	12.31	– 1.3	2.74	– 0.4	5.33	9.3
Denmark	– 5.75	– 3.1	0.00	– 2.4	– 2.44	3.5
Finland	12.31	– 6.8	9.59	– 0.2	– 5.00	– 12.7
France	11.84	– 2.7	4.71	– 6.3	11.24	– 0.2
Germany	5.68	2.1	– 6.45	2.8	19.54	2.3
Greece	11.11	12.7	5.00	18.5	38.10	
Ireland	– 9.20	20.9	– 15.19	– 6.8	4.48	4.5
Italy	1.43	– 0.2	14.08	– 3.8	– 4.94	– 0.7
Luxembourg	– 1.61	1.2	8.20	– 3.1	1.52	21.1
Netherlands	0.00	– 0.6	5.06	– 12.5	6.02	5.1
Portugal	8.62	– 14.9	3.17	29.4	26.15	13.9
Spain	0.00	3.4	23.21	– 6.2	5.8	– 1.9
Sweden	– 4.26	– 22.0	– 2.22	– 6.7	– 3.41	– 15.9
United Kingdom	5.36	– 13.3	1.69	– 6.6	15.00	– 4.1

Source: OECD Health Data 1998.

Between 1980 and 1985, five countries show a reduction in the proportion of GDP allocated to health expenditure, with the biggest reduction shown for Austria at 13%, followed by Ireland at 9%. This contrasts with increases of over 11% for Belgium, Finland, France and Greece over the same period. Between 1985 and 1990 only three countries show a reduction in this indicator. The biggest reduction of 15% in the proportion of GDP devoted to health is estimated for Ireland, with reductions of 7% and 2% respectively for Germany and Sweden. For the same period, the largest increase

is shown for Spain at over 23%, followed by 14% for Italy. The period 1990–95 showed substantial and contrasting changes, with Finland, Italy, Sweden and Denmark reporting reductions of between 2% and 5% in the levels of GDP devoted to health. The largest increases for this period are estimated for Greece, Portugal, Germany and the United Kingdom, with health expenditure as a proportion of GDP shown to have risen by 38%, 26%, 20% and 15% respectively. (The unification of Germany must be acknowledged as an important factor contributing to the increased levels of health expenditure for Germany over this period.) When the whole 1980–95 period is assessed, only three European Union member states show a reduction in the allocation to total health expenditure, with by far the biggest reduction of 20% estimated for Ireland, followed by Sweden at 10% and Denmark at 8%.

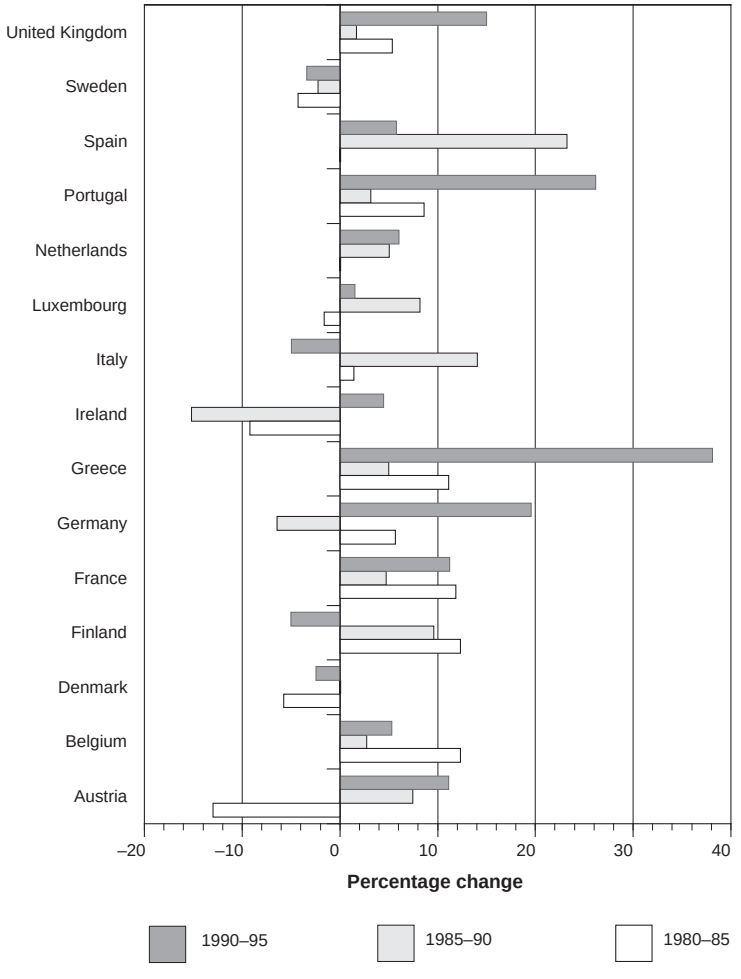

Figure 2: Percentage change in the share of GDP devoted to health expenditure for selected periods

Narrowing the focus from the macro level of total health expenditure to investment of public expenditure on inpatient care, a contrasting trend emerges. The presentation in Figure 3 of the proportion of total expenditure on health devoted to public expenditure on inpatient care shows a declining trend for the majority of European Union member states since 1980.[2] Notwithstanding this general tendency towards a reduction in the proportionate allocation to inpatient care, seven member states still devoted over 40% of total health expenditure to public investment in inpatient care in 1995.

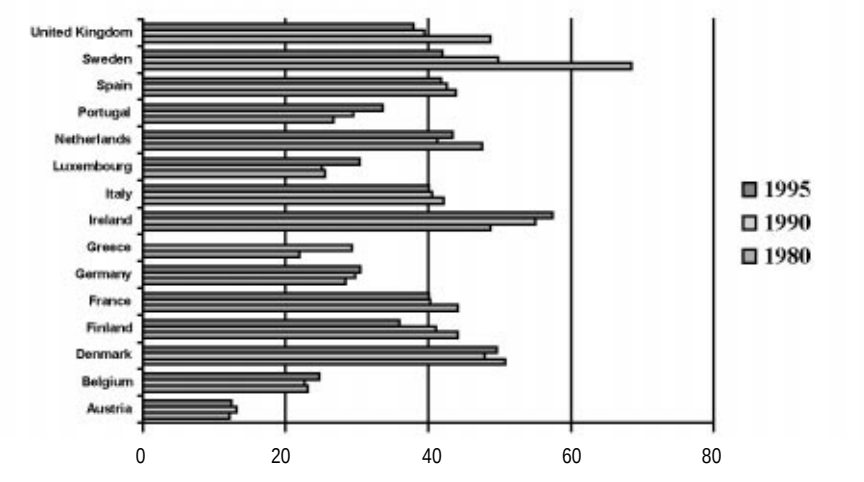

Figure 3: Public expenditure on inpatient care as a percentage of total expenditure on health

Table 1 and Figure 4 present more detail on the percentage change in this indicator for the periods 1980–85, 1985–90 and 1990–95. Throughout the 1980s, the general trend in evidence for European Union member states was for public expenditure on inpatient care to account for a declining share of total health expenditure. The 9 member states showing this decline in the period 1980–85 increased to 12 in the late 1980s. Over the whole decade of the 1980s, the European Union member states showing an overall reduction in the proportion of total health expenditure devoted to public expenditure on inpatient care include Belgium, Denmark, Finland, France, Italy, the Netherlands, Spain, Sweden and the United Kingdom. By the 1990–95 period this trend was beginning to be reversed, with investment in inpatient care increasing in the majority of member states.

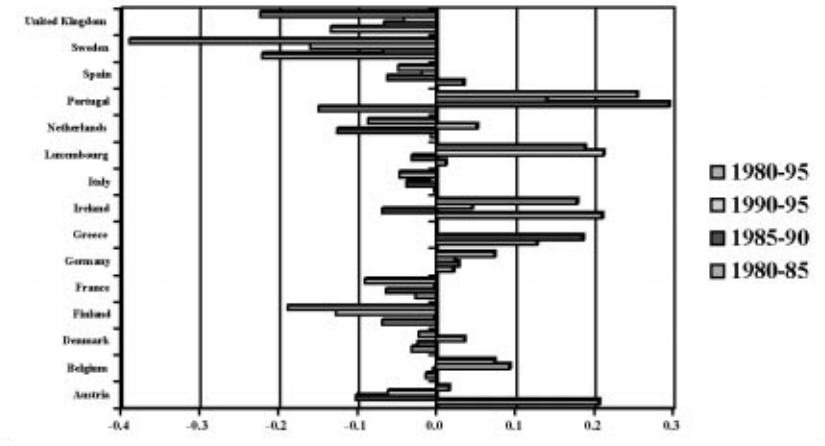

Figure 4: Percentage change in the proportion of total expenditure devoted to public expenditure on inpatient care

The summary of the proportionate changes in these health and inpatient expenditure indicators presented in Figure 5 for the periods 1980–85 and 1985–90 shows some interesting divergences in these trends. In general, any reductions in the share of GDP devoted to total health expenditure over these periods are only in evidence for a minority of European Union member states, while the majority of countries show a decline in the proportion of total health expenditure allocated to public expenditure on inpatient care. Such large-scale changes in complex systems will always be multi-causal and closely connected with the operation of national health systems and economic developments nationally and internationally.

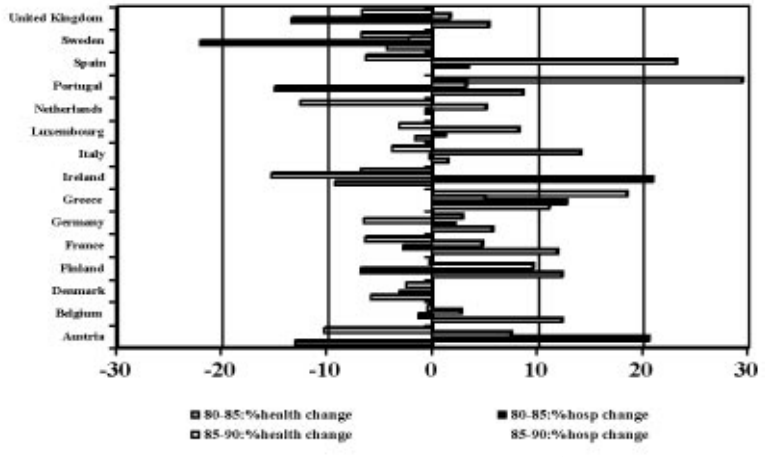

Figure 5: Percentage change in health as a proportion of GDP, and public hospital expenditure as a proportion of total health expenditure, 1980–85, 1985–1990

While a detailed analysis of the factors underlying this development in European Union member states is outside the scope of this paper, what is of particular interest is the approach to the development and localisation of casemix-based applications for the acute inpatient sector in these countries over this period. The way in which initiatives in this area may or may not have influenced the developments at a macro level is open to question. However, what is becoming increasingly apparent is that the development of casemix applications has been associated with the development of tools and techniques which have facilitated advancements in efficiency assessment and performance within the acute hospital sector of many European countries.

Casemix applications and localisation within the acute hospital sector

While originally developed in the United States for the purpose of facilitating hospital management by providing a system that would allow the measurement and evaluation of hospital performance, the diagnosis related group (DRG) system has increasingly been applied within a range of different approaches to financing hospital services (Fetter 1991). The application of DRGs within the United States prospective payment system in 1983 generated considerable international interest in the system and the first national project in Europe began in France in the same year (Rodrigues et al. 1998). Interest in the DRG system specifically, and casemix measurement in general, rapidly expanded to other European countries throughout the 1980s. Most of the economies in the region were in recession at this time and cost containment was becoming a priority for European health systems. The substantial pressure on the financing of health systems, in particular, is indicated by widespread reforms initiated at this time in the majority of these countries (OECD 1992, 1994).

As the acute hospital sector generally constitutes a major component of health expenditure, it was almost inevitable that this area would come under scrutiny and be subjected to specific pressure to contain expenditure during times of restraint. The pursuit of a range of economic objectives, including improvements in efficiency, resource allocation and cost containment within the inpatient sector, constituted the driving force for many of the European casemix projects initiated throughout the 1980s (Wiley 1998). It must also be recognised that non-economic objectives such as the reduction of waiting lists and improvements in quality of care also featured among the objectives for many of these projects.

While the 1980s were very much devoted to research and experimentation with casemix measures in a European context, the 1990s have been characterised by greater advancement with application and implementation. The more recent developments are the subject of this review and will be summarised here. While the approach adopted by each European Union member state is specific to the prevailing approach to health system organisation, for ease of presentation and review, the initiatives reviewed have been loosely grouped together according to some shared characteristics. In the first grouping, those countries using a casemix adjustment within a prospective budgeting

model either at the regional or national level will be reviewed. The Nordic countries as a group will then be considered, as the decentralisation of their administrative and health systems is an important characteristic shared by these countries. Finally, the approaches being adopted by a number of countries with regard to experimentation and the localisation of casemix measures will be presented.

Casemix-adjusted prospective budgeting

At some level, a DRG-based casemix adjustment is applied as part of the process of financing hospital services in a substantial number of European countries, including Belgium, France, Ireland, Portugal, Italy and Spain. Whether the adjustment is applied at the national or regional level depends very much on the structure of the country's health system. This means that, for example, as the financing of hospital services in countries like Ireland and Portugal is very centralised, the casemix adjustment will be applied at the national level. For a country like Spain, where there is substantial autonomy at the regional level for local health services, the choice of casemix measure and approach to application will be primarily determined at this level.

A revised hospital financing system has been the subject of ongoing development in Belgium since 1987. The objectives of this reform include the identification of patient needs and the reduction of costs, together with the improvement in the quality of care and incentives for efficiency in addition to increasing equity in resource allocation between hospitals (Closon et al. 1996). In 1994, for the first time, AP-DRGs were integrated into the financing system to standardise for morbidity when making length of stay comparisons. The casemix adjustment now has an increased effect as all patient-DRGs are used routinely to standardise the length of stay distribution. For any hospital found to have an average length of stay between 2% and 10% above the standardised national mean length of stay, 50% of the budget corresponding to the extra bed-days is not allocated, with the allocation dropping to 25% when the observed length of stay exceeds the national average by more than 10% (Closon et al. 1996). A substantial reallocation of funds between hospitals may result from the application of this procedure, so the potential impact on the system may be considerable.

Since the mid-1980s a number of reforms have been introduced with the objective of rationalising the French health care system and improving cost containment controls. Public hospitals and private non-profit hospitals affiliated to the public sector have been financed on the basis of prospective global budgets since 1984–85. The most important recent health care reform in France, however, was introduced in the spring of 1996 and has been progressively implemented in subsequent years. This reform addressed a wide-ranging agenda and the specific objectives have been summarised by Rodrigues (1996) as follows:

- the progressive implementation of a universal health insurance system
- comprehensive regional hospital management systems
- the extension of medical information systems, including reporting of DRG data for all types of hospitals

- mandatory accreditation and quality of care assessment
- the application of medical information systems, accreditation certificates and quality of care assessment for planning and funding decisions
- population needs assessment and equity of resource allocation within and between regions, together with experimentation of new hospital payment methods and a unified regional management by a new health authority, Agence Regionale de l'Hospitalisation (ARH)
- cost containment procedures for fee-for-service payment to private physicians, together with incentives for experimentation with new payment methods
- experimentation with new health care delivery organisational arrangements.

Since 1997 acute inpatient budgets for French hospitals have been partly based on casemix measured by DRGs (Groupes Homogenes de Malades – GHM) (Rodrigues et al. 1998). With this procedure, hospital budgets are partly based on hospital-specific costs, together with an adjustment based on the regional casemix index. In 1996 GHM was used in the determination of 0.5% of hospital budgets and it is planned to gradually increase the impact of casemix on budget determination over time. While budgets for public and private for-profit hospitals have been determined separately, it is intended to include all hospitals within the regional budget framework.

Within the acute hospital sectors in both Ireland and Portugal, the approach applied to casemix adjustment within a global budget model is very similar. When this adjustment was implemented in Portugal in 1990, this represented the first application of casemix for budgeting purposes in a European context (Urbano, Bentes & Vertrees 1993). When the Irish Department of Health and Children decided to implement a similar adjustment in 1993, they were able to build on the Portuguese experience of this system. Applying the casemix adjustment within these systems essentially involves estimating the relative costliness of hospital casemix using DRGs (Wiley 1995). In this context, the relative costliness of the hospital's casemix is assumed to indicate relative efficiency. An agreed proportion of the hospital's budget is then determined on the basis of the casemix adjustment. This adjustment may be negative or positive depending on the efficiency of the hospital relative to others in the reference group. The deployment of additional funds gained as a result of this process may be at the discretion of the hospital.

In determining the allocation of resources to regional health boards and large hospitals in Ireland, hospitals are stratified according to teaching status (Wiley 1995). Currently, 15% of the casemix adjustment is based on the cost rating of the peer group hospitals, while 85% is based on the hospital's historical costs. It is planned that over time this ratio will change so that the peer hospitals' cost rating will have a greater impact on the budget adjustment than the hospital's historic costs. In Portugal, greater progress has been achieved towards this objective, with 30% of the casemix adjustment determined by the peer group hospitals and 70% determined by individual hospital costs (Bentes, do Ceu Mateus & da Luz Gonsalves 1996).

Within the Italian system, local health units financed on a capitation basis directly fund hospitals belonging to the unit. Following reforms in 1995, a tariff system has been introduced for funding cross-boundary activity and hospitals outside of the local health units. For these services, tariffs based on DRGs are set on a prospective basis within predetermined budget constraints. While cross-boundary activity is funded on the basis of DRG-determined prices, some discretion is left to the region as to how this tariff system is to be implemented. This could mean that the choice for regions might be based on a fee-for-service type system, or one where an episode of care is the basis for the currency unit. The essential objective for this initiative, however, is that hospitals are funded on the basis of the volume and quality of services actually delivered. As an additional incentive to promote increased efficiency, it has been proposed that local area units retain any budget surplus, to be deployed according to objectives agreed with the region.

While the autonomous regions of Spain can determine the precise approach applied to the financing of hospital operating costs, in general, hospitals are funded on a global budget basis. These budgets are essentially determined on the basis of historical costs, with annual adjustments for such factors as inflation and changes in service delivery arrangements. Increasingly, an adjustment for activity is being integrated within the budgeting process (Mossialos & Le Grand 1998). There are a range of applications for DRGs in all regions, with Health Care Financing Administration DRGs prevailing in Catalonia, Valencia and the Canary Islands and AP-DRGs being deployed in the remaining regions. Since 1997–98 a number of regional systems have begun incorporating a casemix adjustment within the budgeting process. Specifically, 30% of the inpatient budget in Catalonia is estimated on a DRG basis, while in Valencia a combination of capitation and DRG-based payment is used for referred patients. Work is under way to improve cost data at the DRG level, which will be required if more extensive application of casemix-based systems is to be pursued within a hospital budgeting context.

Nordic initiatives

There is some level of experimentation/application with casemix in all the Nordic countries. The casemix measure which has now been standardised for use in this group of countries is the Nordic DRG grouper. This grouper is compatible with Health Care Financing Administration DRGs version 12 and incorporates ICD-10 diagnosis codes and Nordic procedure codes. The application of casemix measures is probably most advanced in Norway, Sweden and Finland, with some experimentation in Denmark and Iceland. While Norway is not a member of the European Union, a brief review of the introduction of the DRG system in Norway is interesting because the original application was associated with reforms directed at reducing hospital waiting lists and improving efficiency. This approach contrasts with the casemix applications in the other Nordic countries, which are directed at such objectives as the provision of an improved basis for costing/pricing, resource allocation and contracting for hospital services. The Norwegian pilot scheme introduced in 1991 and expanded in 1993 tested an approach

to hospital service financing which involved the combination of fixed grants with a DRG-based, patient-related payment scheme. While hospitals continue to be jointly funded by the government and the county administration, the most recent financial reform involved an increase in the government's allocation. In 1997, 30% of average patient treatment costs was funded by the government on a DRG basis, with the level of this contribution intended to increase to the 45% level. As waiting lists continue to attract a high political priority, this reform is considered part of an important initiative to increase capacity for patient treatment (Lundgren, Kindseth & Magnussen 1998).

With the dawning of the era of cost containment for the Swedish hospital system in the 1980s, a recognition of the need for tighter control of hospital costs was associated with the introduction of a clinical budgeting approach in some counties. This involved the allocation of budgets to each hospital department, with the clinical departments using crude production targets like bed-days/admissions. With the reforms of the 1990s, however, there has been a general tendency towards the creation of internal markets for hospital services. The direction of reform has therefore been towards the development of a system whereby hospital departments are financed by activity-based revenues rather than fixed budgets. In pursuing this objective, the separation of the purchasing and service provision functions may be logically undertaken at the county council level, with the objective of increasing productivity by competition. In so doing, however, it is important to recognise that all purchasers and the majority of the providers of hospital services will still be part of the county council system. This means that most payments will still be internal transactions at the level of the county council, within which there are no legal barriers preventing retrospective 'renegotiation' of funding (Paulson 1995).

The specific approach to hospital financing varies between county councils, with some areas like Stockholm using DRGs to set service prices within prospectively determined expenditure constraints. In reviewing the reforms across a range of county councils, a generic model may be seen to emerge. This involves county councils entering into contracts with particular agencies or institutions for the delivery of a particular service package within defined resource constraints. This approach would seem to be attempting to combine the cost control advantages of the budget mechanism with the flexibility of service-related funding.

The decentralisation of the tax and administrative systems in Finland means that hospital districts differ in the type of agreements reached with municipalities for payment of services. Some hospital districts have introduced a form of prospective payment, while many districts bill municipalities on the basis of specialty-specific prices for services provided. There are a number of pilot projects under way in which hospitals and municipalities enter into contracts specifying the price and quantity of services to be provided within an agreed time period. Since 1993 there has been gradual movement towards DRG-based pricing by municipalities for the purchase of packages of hospital services (Mossialos & Le Grand 1998). Most hospital districts have agreed on a fund equalisation system whereby excessively high costs incurred in treating certain types of patients can be pooled between the municipalities in the district. Given continuing

economic difficulties, it is likely that the financing of hospital services in Finland will continue to be reviewed, with the objective of improving both cost containment and efficiency within the system.

Experimentation and localisation of casemix measures

A number of European Union countries are currently experimenting with available casemix measures or pursuing the development of local casemix measures specific to the national context. The experiments with DRG-based casemix measures in Germany have been advanced as part of a more widespread reform of the approach to financing hospital services. The accession of the German Democratic Republic to the Federal Republic of Germany in 1990 gave rise to a unique set of circumstances which had to be addressed in the reform of the health care system. The federal hospital financing law resulted from this process and came into force in the new German states in 1991. The Health Sector Act took effect on 1 January 1993 and was associated with the enforcement of an income-oriented policy on growth in individual hospital budgets (Leidl 1995). This approach has been further amended to involve the introduction of a 'flexible' budget mechanism based on different types of payment units, as the Health Sector Act has identified a greater role for payment options, such as special daily rates for hospital departments, special fees for high-cost services and case-based lump sum payments. The experimentation with casemix measures in this system in concerned with the specification of case types within which services can be more accurately priced. Some advancement has been made towards the implementation of the new system as a range of case definitions and special fees have been agreed within the framework of the hospital financing Act.

While projects in Austria, England and the Netherlands are pursuing the development of local casemix measures, the approaches being adopted are quite different. Against the background of continuing increases in hospital costs, the Austrian Ministry of Health has come to recognise the importance of developing new regulatory mechanisms for financing hospital services. In pursuing this objective, a new hospital financing system was introduced in 1997, involving replacing the old reimbursement system based on length of stay with a payment system based on case-groups defined by diagnoses and procedures. The case-group system developed in Austria is called Leistungsbezogene Diagnosefallgruppen (LDF) and, while based on a similar algorithm to that used to develop DRGs, this 'was extended by many features, like a hierarchy of the items, stability analysis of the solutions by bootstrapping etc' (Pfeiffer 1997). The switch from a financing method based on length of stay is considered to already have had positive effects, including substantial reductions in hospital length of stay. It is also accepted, however, that the LDF measure, together with the reformed financing system, will continue to need further refinement in the short to medium term (Pfeiffer 1997).

While AP-DRGs have been adopted for use in Wales and DRGs are also the subject of experimentation in Scotland, the National Casemix Office in England opted to modify DRGs in order to 'make them more appropriate to English clinical practice'

(Else 1998, p 7). This process resulted in the development of health resource group (HRGs), which are considered to share similarities with DRGs as both systems constitute 'a set of iso-resource groups based upon information held within the discharge data set and which can be identified as reasonably clinically homogeneous and also sufficiently few to enable analysis of a hospital's activity' (Else 1998, p 7).

In addition to using length of stay as the main resource variable, the development of HRGs has, wherever possible, also incorporated data from pilot costing studies (Sanderson 1996). HRG version 3 was released in 1997 and incorporates 571 groups. Implementation of the HRGs within the English National Health Service has been on an incremental basis and currently the system is mainly used to develop costs for use in contracting between service providers and commissioning agencies.

While the financing of health and hospital services in the Netherlands has been subjected to a number of reviews of a more or less radical nature through the 1980s and early 1990s, current policy originates from the commitment that hospitals should be funded on a product basis. Given this objective, the project Producttypering medisch specialistische ziekenhuiszorg (Product classification for medical specialist hospital care) was initiated in 1994, with financial support from the Ministry of Health, to define a system of product definitions for hospital care. This project is concerned with defining the episode of care covering services delivered in the inpatient and outpatient setting. The product specification based on the diagnostics and treatment is called diagnose behandelings combinatie (DBC). Originally the process began with an analysis of a database from six hospitals and the AP-DRG grouper. The next stages of this process involve each of the medical specialty organisations defining their own set of DBCs, which will be validated according to medical acceptance and cost homogeneity. There are four principal types of products, defined as follows:

- Type 1 – Integral care in an inpatient setting
- Type 2 – Integral care in an outpatient setting
- Type 3 – Regular outpatient care of chronic conditions
- Type 4 – Out patient diagnostics.

Each DBC will have a fee for the hospital costs and a separate fee for the medical specialist. The product registration for urology patients in early 1999 introduces the specification of the 'product' delivered to the patient by recording at a minimum the beginning and end of the treatment and the DBC code. From 1 January 2000 it is proposed that, for urology, the DBC will replace the existing parameters for calculating the hospital budget for this area. It is then proposed that the other specialties will introduce the DBC registration after 1 January 2000. The Dutch initiative is very significant in a European context and will undoubtedly be followed with great interest as it signifies an original approach to episode definition, which it is planned to ultimately integrate within the hospital budgeting mechanism.

Conclusion

Health systems internationally share many common difficulties, including contradictory pressures for expenditure constraint combined with expectations for expansion in service provision to cater for technological advancements and increasing consumer needs. Notwithstanding shared problems, the responses generally reflect the diversity in the organisation of national health care systems which have been developed in a specific historical, cultural, economic, political and societal context. What emerges from this review, however, is that while the design of a particular application may vary, health system reforms may draw from a cross-national pool of tools and techniques in the development of a response to a common problem.

Prior to the reform initiatives of the 1980s, the ever-expanding resource requirements of many European hospital systems were infrequently, if ever, questioned. It is interesting that, while the level of application varied between the countries reviewed here, the deployment of casemix measures has been positive in itself and contributed to the achievement of such objectives as the development of high-quality activity and cost information systems, technology transfer and software adaptation/development. While these achievements have some limitations, they can usefully inform responses to the ongoing challenges posed by efforts to improve the efficiency of resource deployment for hospital services at the national and international level.

The range of applications for casemix measures indicated in this review of European Union hospital systems is indicative of the flexibility which may be deployed in adapting this technique to the prevailing health system model, whether tax-based or insurance-based and financed through budgeting or contracting. When analysed from the perspective of improving the application of research evidence to health policy development, this experience would suggest that robust measures which are neutral with regard to health system environment are more portable and therefore more amenable to widespread application.

The majority of systems reviewed here have chosen to use available casemix measures, notwithstanding some minor adaptations such as the Nordic grouper or the GHM in France. Just three European Union countries have chosen to pursue a more or less extensive process of localisation of casemix measurement techniques on the basis that this is necessary to ensure that national clinical practice is adequately assessed. The approach to localisation being pursued in each case and the stage of development are quite different. Ongoing review of these initiatives and the scale of application ultimately achieved may, however, provide further evidence of the factors most influential in determining adaptability and portability of such measures at the international level. Given the dynamic nature of hospital systems in particular, and health systems in general, it would also be expected that if the application of casemix measurement techniques is to continue to expand, these measures must be subject to ongoing development and improvement to take account of advances in technology and information systems, continuing pressure on resources, together with the potential offered by the ongoing globalisation of service provision within the health sector.

Endnotes

1. This paper is specifically focused on the acute inpatient sector as this is the area of most widespread application of casemix measures. Given the absence of large-scale application or experimentation with casemix measures in Luxembourg and Greece, these countries are outside the scope of the review of the development and localisation of these measures within member states.
2. It is recognised that an assessment of investment in inpatient care which is limited to public expenditure is restrictive given that many countries, and particularly those with insurance-based systems, may use other classifications for substantial levels of investment in *public* inpatient care. This is, however, the only categorisation for which comprehensive information is available for all member states. The data are presented, therefore, on the basis that the assessment of this indicator over time indicates the direction of development in the respective systems.

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