

## International Perspective of Case-mix Based Evaluation

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### Abstract

Over the past 20 yr, many countries have introduced case-mix evaluation system. Some of them have fully used it for case based payment for hospital, and others partially used it for hospital payment in combined with regional health planning. The NHS countries have introduced it mainly for improving the efficiency of health system. On the contrary most of the social insurance countries have introduced it in order to control the medical expenditures, even though such expectations have not been always realized. The introduction of DRGs must be considered from the viewpoint of managerial innovation. The introduction of case-mix system has apparently changed the way of thinking and behavior of hospital managers, physicians and policy makers as well as relationships among them. The continuous innovation of information technology will further influence the case-mix based management system. This will make it possible to cover all range of health services by case-mix system in nearly future.

**Key words:** case-mix, DRG, DPC, managerial innovation

### ❖ Introduction

Over the past 20 yr, many countries have introduced case-mix evaluation system. Some of them have fully used it for case based payment for hospital, and others partially used it for hospital payment in combined with regional health planning. Besides the differences in case-mix use, it is important to recognize that case-mix evaluation system has introduced both transparency and operational efficiency at hospital as well as national level. In this article, the author would like to overview the historical development of case-mix system and its influences for health care management from an international point of view.

### ❖ Historical Development of Case-mix Families

Case-mix system was developed by a research group at Yale university under the direction of Robert Fetter around 1980<sup>1)</sup>. Originally this system was developed to evaluate quality and utilization of hospital services. However, at a moment in time when there was increasing concern in the American Congress about the rapid increase of hospital cost, the hospital were not able to justify higher costs simply by asserting their patient were sicker than other hospital's without concrete evidences. The method classified each patient according to similarity of resource consumption pattern that were theoretically estimated by the combination of diagnosis and procedures. As this method would ameliorate the transparency of clinical process and resource use, the Health Care Financing Administration (HCFA; Today's Centers for Medicare & Medicaid Services: CMS) adopted Diagnosis Related Groups (HCFA-DRGs, renamed as CMS-DRG after the reorganization of HCFA in 2001) for its hospital payment under Medicare system. Fetter's team and associated companies such as 3M have continued to refine the grouping logic in order to adapt the expanding coverage services and

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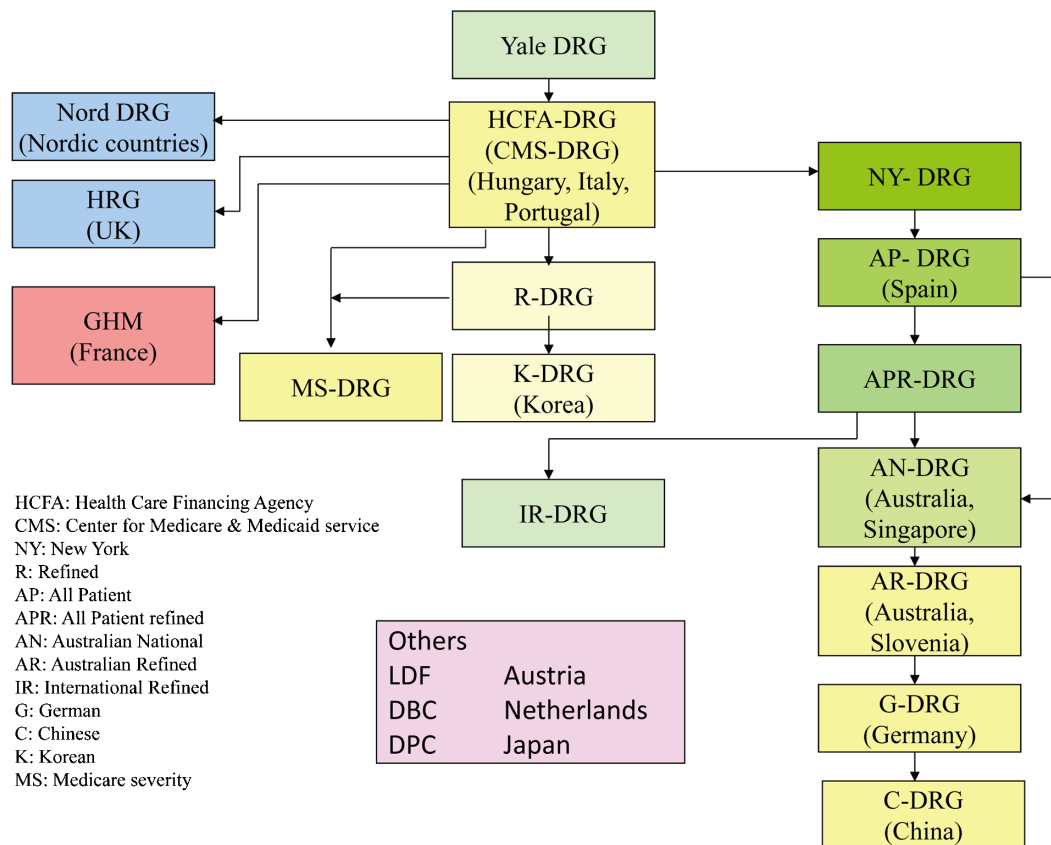


Figure 1 Development of case-mix families

the medical innovation. In this way All Patient DRG (AP-DRG), Refined DRG (R-DRG), All Patient Refined DRG (APR-DRG), International Refined DRG (IR-DRG) and Medicare severity DRG (MS-DRG) have been developed in USA.

Introduction of DRG based prospective payment system (DRG/PPS) attracted much concerns from the health policy makers and health service researchers of other countries, especially those of European countries. In these countries it was a big problem how to control the rocket-shooting hospital expenditures. Thus many European countries started their feasibility study for the American DRG use. Some countries use the original American DRG classification with little modification (Hungary, Italy and Portugal for HCFA-DRG, Spain for AP-DRG). However, most of the countries have modified the original DRG classification according to the local condition. As the first of European countries, France modified HCFA system and developed their own system GHM in 1986, which, after influenced by AP DRG (introducing severity splitting) has become GHM/PPS system. The Nordic countries jointly developed Nordic-DRG based on

HCFA-DRG and apply it according to the local condition of each country (Norway, Sweden, Finland and Denmark). However, as Nordic countries have very decentralized administration systems, use of DRG system differs according to local governments. UK has developed its own casemix system so called HRG (Health Resource Groups) based on the social experiment for introduction of American DRG.

Of particular attention must be paid for Australia. They developed AN-DRG and later AR-DRG from AP-DRG and APR-DRG in close relationship with Australian clinician. As AR-DRG is a very fine tuned one and easy to be adapted to local condition, this case-mix system has been adopted by many other countries, i.e., Germany, Slovenia, China and Singapore (AN-DRG).

Other countries, such as the Netherlands (DBC), Japan (DPC), Austria (LDF) have developed their own classification system after the social experimentation about feasibility of the American system during 1980s and 1990s. Figure 1 shows the historical development of case-mix families.

Most of the countries modified the original US

Table 1 International comparison of case-mix system

Country	Year of Adoption	Origin of system	Name of Casemix currently used	Extent of System use	Hospital payment scheme
Australia	1993	Based on US model and adapted to Australian clinical data	AR-DRG	In-patient hospital care, Out-patient and emergency care (different PCS)	Payment per case/DRG(47%) + retrospective reimbursement (48%)
Denmark	2002	Based on Nordic DRG, Danish-specific version developed	Nordic DRG	All hospital activity	Prospective global budget (80%) + Payment per case/DRG (20%)
France	1994	Based on Yale system with modification and refinement	GHM	Acute in-patient care	Payment per case/DRG
Germany	2005	Based on AR-DRG and adapted to German procedure codes	G-DRG	All hospital activity	Global budget +Payment per case/DRG
Italy	1994	Based on US system	CMS-DRG	In-patient hospital care extends to nursing homes	Global budget +Payment per case/DRG
Japan	2003	Original system	DPC	Acute in-patient care	Payment par diem/DPC
Portugal	1897	Based on US system	CMS-DRG	Acute in-patient care	Prospective global budget based on DRG
Singapore	1999	Based on AN-DRG	IR-DRG	Acute in-patient care	Global budget +Payment per case/DRG
Sweden	1991	Nordic-DRG based on HCFA-DRG	Nordic DRG	Acute in-patient care + Psychiatric wards	Global budget +Payment per case/DRG (55%)
UK	1991	Based on HCFA-DRG with much refinement	HRG	In-patient hospital care, Out-patient, emergency care, chronic illness	Global budget (30%) +Payment per case/DRG (70%)
USA	1983	HCFA-DRG (origin)*, + APR-DRG, MS-DRG, APG, etc	Mainley CMS-DRG	In-patient hospital care, Out-patient, emergency care, chronic illness	Payment per case/DRG

\*: Today's CMS DRG. Source: Kimberly, de Pouvourville and D'Aunno (2008) modified by the author. Cylus J and Irwin R (2010) modified by the author.

classification according to the local condition. Table 1 summarizes the variation in case-mix system adoption among the main countries<sup>2,3</sup>. Some countries, such as Australia, UK and USA have developed the case-mix system that covers non-acute in-patient services, i.e., rehabilitation care, chronic illness, out-patient care and psychiatric care.

### ❖ Factors Associated with Adoption Style of Case-mix System

As explained in the previous section, case-mix system has been introduced into many countries. But

their goal and purpose, as well as modality of application vary importantly. For example, France and UK use case-mix based information for both payment and regional hospital planning. On the contrary, Sweden uses case-mix system for partial payment only.

What are the factors associated with these differences? The introduction process of case-mix system must be analyzed in the context of wider health system reforms of each country, an increasing need to deal with technological innovation and the increasing complexity of cases along with population graying.

The health system can be grossly classified into the following three types; national health system based

on taxation (UK, Nordic countries, Australia, Canada and Singapore), social insurance scheme (France, Germany, the Netherlands and Japan) and private insurance scheme (USA). In the case of NHS countries, as the health expenditures are controlled by budgeting, it is relatively easy to control the health expenditures. However, there has been a problem of inefficiency of service delivery such as a long waiting list. In this case, the main purpose of case-mix introducing is to increase the transparency of clinical activity and to realize a proper distribution of necessary resources.

For the countries with social insurance scheme, the increasing health expenditure has been the most important issue for the policy maker. They have introduced the case-mix based lump-sum payment in order to reimburse hospitals based on the approximate costs of treating certain types of patients assuming standardized efficient practices. This is the same (or original) aim for private insurers (especially those of USA). However, it is not clear if the case-mix payment could reduce the total cost. For example, Serden *et al.* found that the introduction of case-mix based payment in Sweden led to a comparatively greater increase in the number of secondary diagnosis for up-coding among hospitals paid under prospective payment system<sup>4</sup>). Furthermore, the use of DRGs can lead to separation of hospitalization. In fact, the increase of admission cases and medical expenditures are observed in most of the countries with case-mix based payment. So it becomes an urgent task for system designers to develop appropriate methods of risk-adjustment and quality monitoring systems.

## ❖ Conclusion

Besides above mentioned problems, it is no doubt that case-mix based evaluation system will continue to advance. As Kimberly and de Pouvourville indicated, the introduction of DRGs is a kind of managerial innovation<sup>5</sup>). The introduction of case-mix system has apparently changed the way of thinking and behavior of hospital managers, physicians and policy makers as well as relationships among them. The hospital managers must have a skill to treat the case-mix related data and to reflect the analyses results to hospital management. This requires a negotiation or communication skill with in-hospital physicians. As physicians often respond well to data-driven argument about the need for changes to improve their per-

formance, it is very important for hospital managers to have a data management skill.

Furthermore, case-mix data give local and regional health system managers a tool to improve planning and monitor resources. This is the case for the French Regional Agency of Health and the Canadian Institute for Health Information. In order to fully use case-mix data for regional health planning, it becomes an important issue how to integrate various methodologies for case-mix data usage into under- and post-graduate education system. This is very behind for Japan.

It is clear that this rapid expansion of case-mix use around the world have been supported by the innovation of information technology. The continuous innovation of information technology will further influence the case-mix based management system. Transparency will be more required by the patients and insurers. The quality indicators will be opened in order to respond such a request. Furthermore, it is expected that we will be able to connect the health information of all range that covers out-patient care, acute in-patient care and chronic in-patient care. Under this condition we will be able to evaluate the clinical activities for each episode basis. The Dutch DBC system has such a purpose. It will be very important to view the case-mix development from the viewpoint of innovation.

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