chapter four

DRG systems and similar patient classification systems in Europe

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4.1 Introduction

The idea of any patient classification system(s) (PCSs) is to combine the confusingly large number of different patients, all appearing to be unique, into a limited number of groups with roughly similar features. Diagnosis-related group (DRG) systems are PCSs that have four main characteristics: (1) *routinely collected data* on patient discharge are used to classify patients into (2) a *manageable number* of groups that are (3) *clinically meaningful* and (4) *economically homogeneous*. In addition, all DRG systems are at least remotely related to the original DRG system that was developed by a group of researchers including Robert Fetter at Yale University during the 1970s (Fetter et al., 1980; Fetter, 1999).

Today, DRG systems are the most widely employed PCS in Europe. They are used in eight countries (Estonia, Finland, France, Germany, Ireland, Portugal, Spain and Sweden) out of the 12 countries covered in this book. Only Austria, England, the Netherlands and Poland have introduced PCSs that do not originate from the original United States Health Care Financing Administration (HCFA-)DRG system (Fischer, 2008). However, most of the self-developed systems are similar to DRG systems in that they share the basic characteristics. Only the Dutch PCS differs to a great extent from the DRG approach (see Chapter 23 of this volume). All PCSs of countries included in this book are referred to as ‘DRG-like patient classification systems’.

Yet, in spite of many similarities in the basic characteristics of different DRG-like PCSs, each country’s system is unique, and thus defines patient groups or hospital products in a different way. On the one hand, it is very likely that this ability to adapt DRG systems to country-specific needs was one of the reasons for their success and their widespread application in European countries. On the other hand, in a context of increasing patient mobility and growing interest in cross-border comparisons of hospital performance, the lack of a common definition of hospital products is starting to become problematic (European Parliament and Council, 2011). Therefore, this chapter intends to provide a systematic overview of the similarities and differences between DRG-like PCSs in Europe.

The chapter is organized as follows: the next section (4.2) first describes the historical origins of DRG-like PCSs in the countries included in this book. Section 4.3 provides an overview of some of the main characteristics of these systems and compares major diagnostic categories (MDCs) or similar categories that play an important role in most systems across the countries concerned. Section 4.4 presents the coding systems for diagnoses and procedures that form the basis of all PCSs. Subsequently, section 4.5 describes the classification algorithms of the systems, before section 4.6 looks in more detail at the specific classification variables used. Section 4.7 describes current trends in European DRG-like PCSs and last, but not least, the final section (4.8) concludes the chapter with a discussion of the opportunities and requirements for the harmonization of DRG-like PCSs in Europe.

4.2 Historical origins of DRG-like PCSs in Europe

Figure 4.1 illustrates the historical origins of DRG-like PCSs used in the European countries included in this book. It shows that all currently existing DRG systems are at least remotely related to the original HCFA-DRGs, while this is not true for the other '*DRG-like*' PCSs (shown at the far right of Figure 4.1) (Fischer, 2008). The first DRG system, Yale DRG, developed at Yale University and introduced in the late 1970s was initially intended as a tool to measure hospital resource utilization. However, recognizing the potential of a system that enabled assessment of hospital production, the United States' HCFA adapted the system for the purpose of monitoring and reimbursing hospital care delivered to elderly patients insured under Medicare (the federal tax-funded old-age insurance in the United States) (Fischer, 1997; Chilingerian, 2008).

In 1986, France modified the HCFA-DRG system and developed its own national DRG system called *groupes homogènes des malades* (GHMs) (ATIH, 2010), translated as 'homogeneous groups of patients'. Later, in 1988, 3M™ Health Information Systems adapted and extended HCFA-DRGs in order to better reflect the pathologies of non-elderly populations (3M, 2005). The resulting All Patients (AP-)DRG system was widely applied in the United States and, subsequently, updated versions of AP-DRGs were adopted in various European countries, such as Spain and Portugal, as well as influencing the development of national DRG systems, such as those of France and Australia. AP-DRGs were later refined by changing the determination of severity levels in order to respond to demands for more accurate assessment of case severity and differences in resource intensity, thus leading to the All Patient Refined (APR-) DRGs (3M, 2003). Together, AP-DRGs and APR-DRGs formed the basis for the

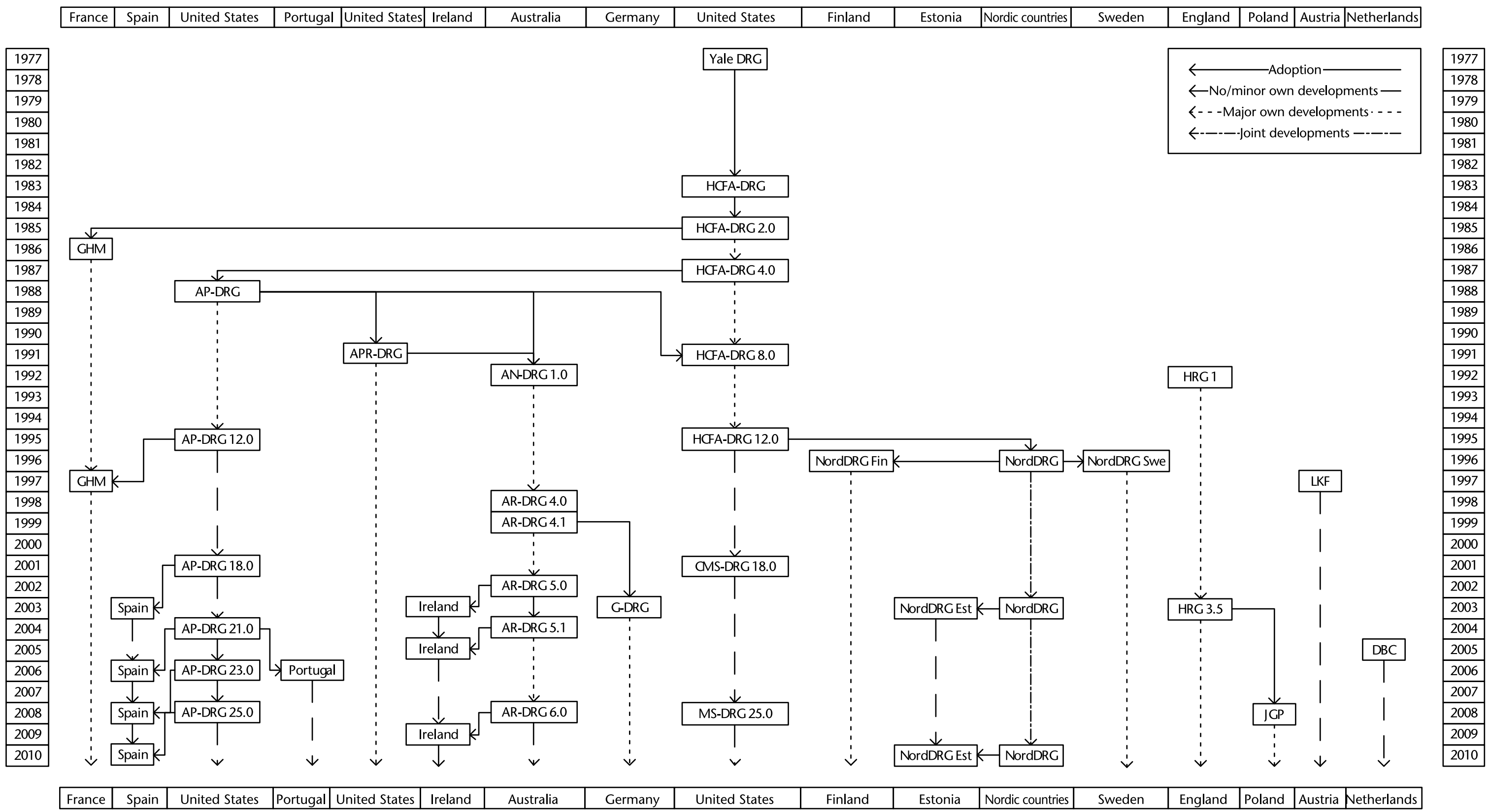

Figure 4.1 Historical development

Sources: Authors' own compilation, based on Fischer, 2008; Schreyögg et al., 2006; and information provided in ATIH, 2010; 3M, 2005; Australian Government, 2004; InEK, 2009; NHS Information Centre for Health and Social Care, 2010; and the relevant country-specific chapters in Part Two of this volume.

* Discontinued developments are not shown, such as the use of HCFA-DRGs in Ireland and Portugal or the flat-rate/additional payment (*Fallpauschale/Sonderentgelt*) approach in Germany.

Australian National (AN-)DRG system, which was renamed to Australian Refined (AR-)DRGs after further modifications had been introduced into the system (Australian Government, 2004). In 2003, Ireland adopted AR-DRGs (see Chapter 15 of this volume), while Germany used AR-DRGs as the basis for developing its own German (G-)DRG system (see Chapter 14).

The Nordic countries are special in that they started to collaborate in 1996 in order to develop a common Nordic DRG system, called NordDRG – a PCS based on HCFA-DRGs. NordDRGs are jointly updated and then imported by each country before country-specific modifications are added to each new version of NordDRGs (see Chapter 16 of this volume). Of the countries covered in this book, Sweden and Finland are using NordDRGs. In addition, Estonia adopted NordDRGs in 2003 and has continued to use the same version of the system until the first update in 2010 (see Chapter 17). Unless otherwise explained, the term 'NordDRG' refers to the common Full NordDRG system that is jointly developed among the Nordic countries.

England, Austria and the Netherlands decided to develop their own PCSs. In 1992, the English Healthcare Resource Group (HRG) system was developed, and was later adopted by Poland, with a number of modifications. This led to the emergence of the *Jednorodne Grupy Pacjentów* (JGP), which can be translated (like the French GHMs) as 'homogeneous groups of patients'. In Austria a national self-developed PCS, described as a performance-oriented hospital financing system (*Leistungsorientierte Krankenanstaltenfinanzierung*; LKF) has been used since 1997 (see Chapter 11 of this volume). The Netherlands developed its own – very special – system of diagnosis–treatment combinations (*Diagnose Behandeling Combinaties*; DBCs), which has been in use since 2005 (see Chapter 23).

4.3 DRG-like PCSs in Europe: Overview

As illustrated by the historical origins of DRG-like PCSs in Europe, current PCSs are either self-developed or have their (remote) origins in various successors of the original Yale DRG system. Table 4.1 describes some basic characteristics of nine DRG-like PCSs. First, the systems differ in the number of groups they define: most systems contain between 650 and 2300 groups. The Polish JGP system defines fewer groups than all other systems (only 518), while the Dutch DBC system is an extreme outlier, comprising about 30 000 DBCs in the 2010 version.

In all HCFA-derived DRG systems, DRGs are organized within MDCs. Even the DRG-like PCSs – HRGs and JGPs – categorize their groups into 'chapters'; only in LKF and DBC is this technique of subdivision not used. The chapters/MDCs cover certain parts of the body or certain disease entities and are similar across all systems. While the total number of DRGs differs greatly across PCSs, the number of chapters/MDCs is around 25 for all systems, except the JGP system, which eliminated a number of chapters when adopting the English HRGs. Since in most systems, each MDC/chapter represents one organ system, the MDC/chapter structure of PCSs parallels the structure of medical specialties.

Table 4.1 Basic characteristics of DRG-like PCSs in Europe (based on 2008)

	AP-DRG	*AR-DRG*	*G-DRG*	*GHM*	*Nord-DRG*	*HRG*	*JGP*	*LKF*	*DBC*
Groups	679	665	1 200	2 297	794	1 389	518	979	≈30 000
MDCs/Chapters	25	24	26	28	28	23	16	–	–
Partitions	2	3	3	4	2	2*	2*	2*	–

Source: Authors' own compilation based on data provided by the Nordic Casemix Centre (2011), as well as information contained in the relevant chapters of Part Two of this volume.

* HRG, JGP, and LKF do not define partitions per se, but distinguish between treatment- and diagnosis-driven episodes.

Furthermore, all DRG-like PCSs except the DBC system define 'partitions' to further divide cases into more homogeneous groups. These partitions are defined by the kind of treatment, namely 'surgical' (or 'operating room' (OR)) versus 'medical' treatment. In addition, in some systems, partitions distinguish between OR procedures and non-OR procedures. Only the French GHM contains a fourth partition in certain MDCs, whereby the classification process does not check for the type of procedure (ATIH, 2010).

Figure 4.2 presents a graphical illustration of the distribution of DRG-like groups into MDCs (or chapters). On the left-hand side of the figure is a list of the MDCs as currently used in Medicare Severity (MS-)DRGs (the successor to HCFA-DRGs), which served as the reference for this comparison. Since MDCs are not used in the LKF system, LKF groups were mapped to MS-DRGs on the basis of the LKF group names. The Dutch DBC system was excluded from this comparison, since no mapping seemed feasible. Each cell represents one MDC in a PCS. The letters within the cells are the codes that are used in the different PCSs as names for each category. The ordering of the codes demonstrates that in all countries almost exactly the same categories are used to form MDCs, and that they follow in almost exactly the same order. Even the self-developed HRG system uses similar categories in a similar order. However, some MDCs are only used by a specific PCS. This is the case for 'Vascular disease' (JGPs), 'Breast problems' (NordDRGs) and 'HIV infection' (AP-DRGs, G-DRGs, GHMs). These are highlighted in Figure 4.2.

Figure 4.2 can be interpreted thus: the wider a column is, the higher the total number of groups of this DRG-like PCS in comparison to the others. The higher a cell is, the higher the share of groups in this system's MDC. For example, the column representing the GHM system is more than four times wider than the column representing the JGP system. Comparing the height of the cells shows that the distribution of DRGs into MDCs/chapters is similar across all DRG-like PCSs. This illustrates that all systems need similar shares of their total groups to describe cases within a specific category of diseases. However, some minor differences exist: for example, the MDC 'Circulatory system' represents around 10 per cent of the total number of groups in most PCSs, but only 4.5 per cent of all groups in the HRG system. Furthermore, the category 'Pre-MDC' is defined either explicitly or only implicitly (for example, as 'Organ transplants' in the GHM system). However, as this analysis does not assess the specific groups

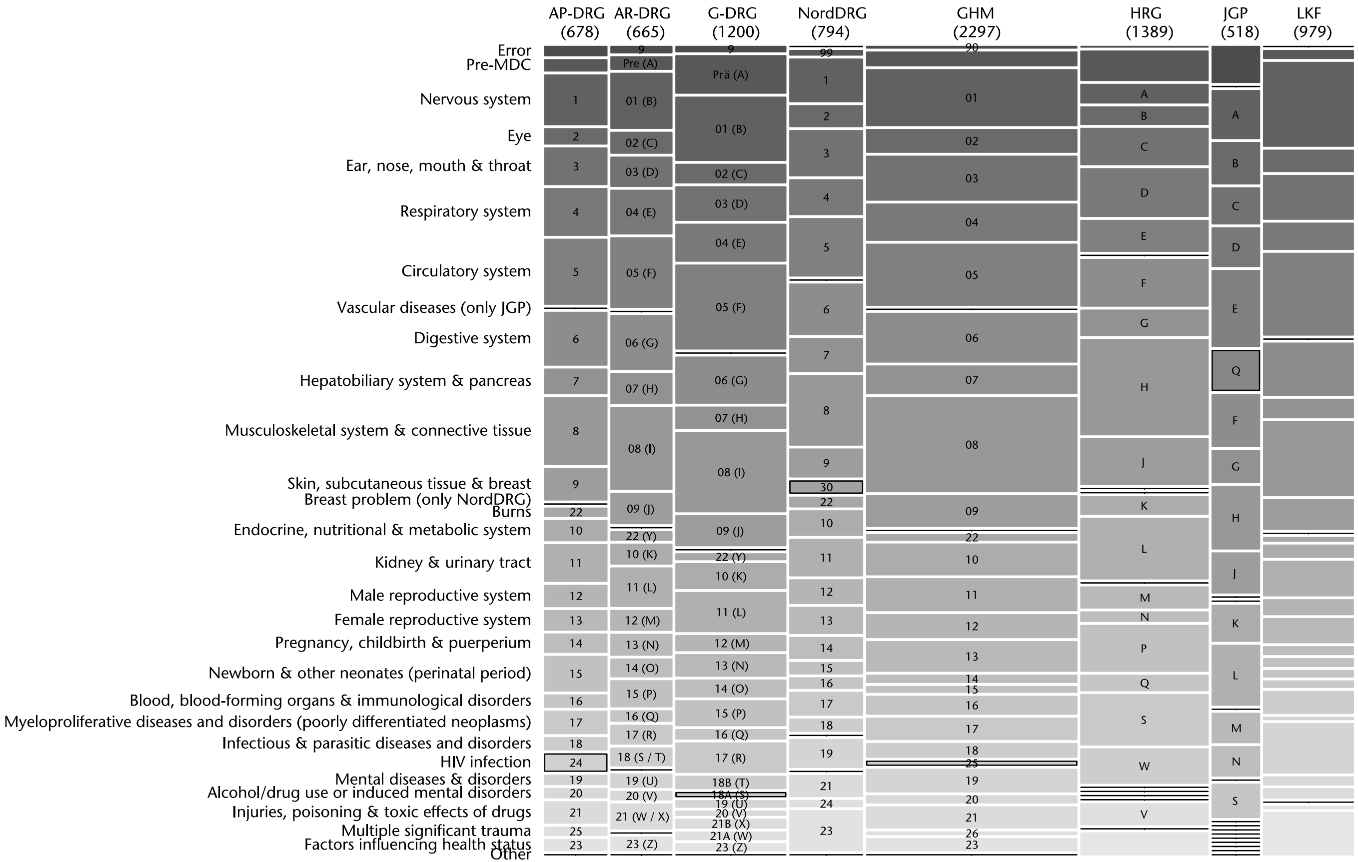

Figure 4.2 Comparison of MDCs across eight DRG systems and similar PCSs

Sources: Authors' own compilation based on information available in BMG, 2009; NHS Information Centre for Health and Social Care, 2010; ATIH, 2010; InEK, 2009; Australian Government, 2004; 3M, 2005; data provided by the Nordic Casemix Centre (2011); and information contained in Chapter 20 (Poland) of this volume.

included within MDCs/chapters in different PCSs, it cannot be ignored that differences in the distribution of groups might be either greater or smaller than they appear.

4.4 Data requirements: Coding of diagnoses and procedures

In all DRG-like PCSs, the coding of diagnoses and procedures is important, since this information forms the basis for the definition of patient groups. For coding of diagnoses, an international standard exists: most countries use the 10th revision of the WHO's International Classification of Diseases (ICD-10). Only in Spain and Portugal is the previous version of the ICD system (ICD-9) still in use because the AP-DRG system requires ICD-9 codes. However, even within the group of countries using the ICD-10 version, significant differences exist, since almost all countries are using ICD-10 codes with country-specific modifications (see Table 4.2). Country-specific modifications usually add a fifth digit to the general structure of ICD-10 codes, which allows for more detailed specification of certain conditions. However, sometimes country-specific modifications even deviate from the ICD-10 logic for specific conditions. For example, the German Modification ICD-10-GM does not contain the O84 code for multiple deliveries. Instead, Z37 codes are used, which specify the outcome of delivery (for example single birth, multiple births). Furthermore, each country has its own coding standards and guidelines.

Table 4.2 Coding of diagnoses and procedures

Country	*Diagnoses coding*	*Procedure coding*
Austria	ICD-10-BMSG-2001	Leistungskatalog
England	ICD-10	OPCS
Estonia	ICD-10	NCSP
Finland	ICD-10-FI	NCSP-FI
France	CIM-10	CCAM Classification Commune des Actes Médicaux
Germany	ICD-10-GM	OPS Operationen- und Prozedurenschlüssel
Ireland	ICD-10-AM	ACHI Australian Classification of Health Interventions
The Netherlands	ICD-10	Elektronische DBC Typeringslijst
Poland	ICD-10	ICD-9-CM
Portugal	ICD-9-CM	ICD-9-CM
Spain	ICD-9-CM	ICD-9-CM
Sweden	ICD-10-SE	KVÅ Klassifikation av vårdåtgärder (Swedish adaption of NCSP)
NordDRG	ICD-10	NCSP Nomesco Classification of Surgical Procedures

Sources: Authors' own compilation based on data provided by the Nordic Casemix Centre (2011), as well as information contained in the relevant country-specific chapters of Part Two of this volume.

For procedure coding, the differences between countries are even greater, since no similar international standard exists. Almost every country has developed its own procedure coding system tailored to its needs. Consequently, these systems are very heterogeneous. They range from sequential numbered lists, such as the Australian Classification of Health Interventions (ACHI) to multi-axial procedure classifications, such as the French classification of procedures (*classification commune des actes médicaux*, CCAM), or the Austrian *Leistungskatalog*. In addition, granularity differs to a great extent. The LKF system includes only selected procedures and therefore contains only 1500 items. At the other end of the scale, the German procedure classification codes (*Operationen- und Prozedurenschlüssel*, OPS) – designed to include all procedures – contain more than 30 000 items; 20 times more than the Austrian system.

4.5 The classification algorithm in European DRG-like PCSs

DRG-like PCSs group patients into a manageable number of groups. In order to do so, they follow a certain classification algorithm. This is similar across all the DRG systems that are based on different modifications of the original HCFA-DRGs. In particular, diagnoses are the predominating classification criteria. The classification algorithm in other DRG-like PCSs (for example in England, Poland and Austria) differs in that procedures become more important at an earlier stage and diagnoses only play a subordinate role (NHS Information Centre for Health and Social Care, 2010; BMG, 2009). In the Netherlands, the medical specialty department forms the first step in the grouping process (see Chapter 23 of this volume).

The following subsections contain descriptions of classification algorithms in PCSs derived from the HCFA-DRG system and other DRG-like PCSs, and they describe both similarities and differences within and between these groups of classification systems.

4.5.1 PCSs derived from HCFA-DRGs

Figure 4.3 shows the general grouping algorithm of PCSs derived from HCFA-DRGs and DRG system-specific modifications of the basic algorithm. The Nord-DRG system is not mentioned explicitly in the diagram because its developments do not change the general grouping algorithm.

There are six major steps common to all systems. Before the actual classification starts, the data are (1) checked to exclude cases with incorrect or missing information. Then, (2) very high-cost cases (for example, cases with transplantations) are isolated from all other cases into a special category of groups called 'Pre-MDCs'. Subsequently, (3) cases are allocated to mutually exclusive MDCs based on the principal diagnosis (although some systems sporadically use other variables, such as age, to assign cases to a neonatal MDC).

In the next step, (4) the grouping algorithm checks whether or not an OR procedure was performed and separates patients into a 'surgical' or into a 'medical' partition. In addition, the AR-DRG, the (derived) G-DRG, and the GHM

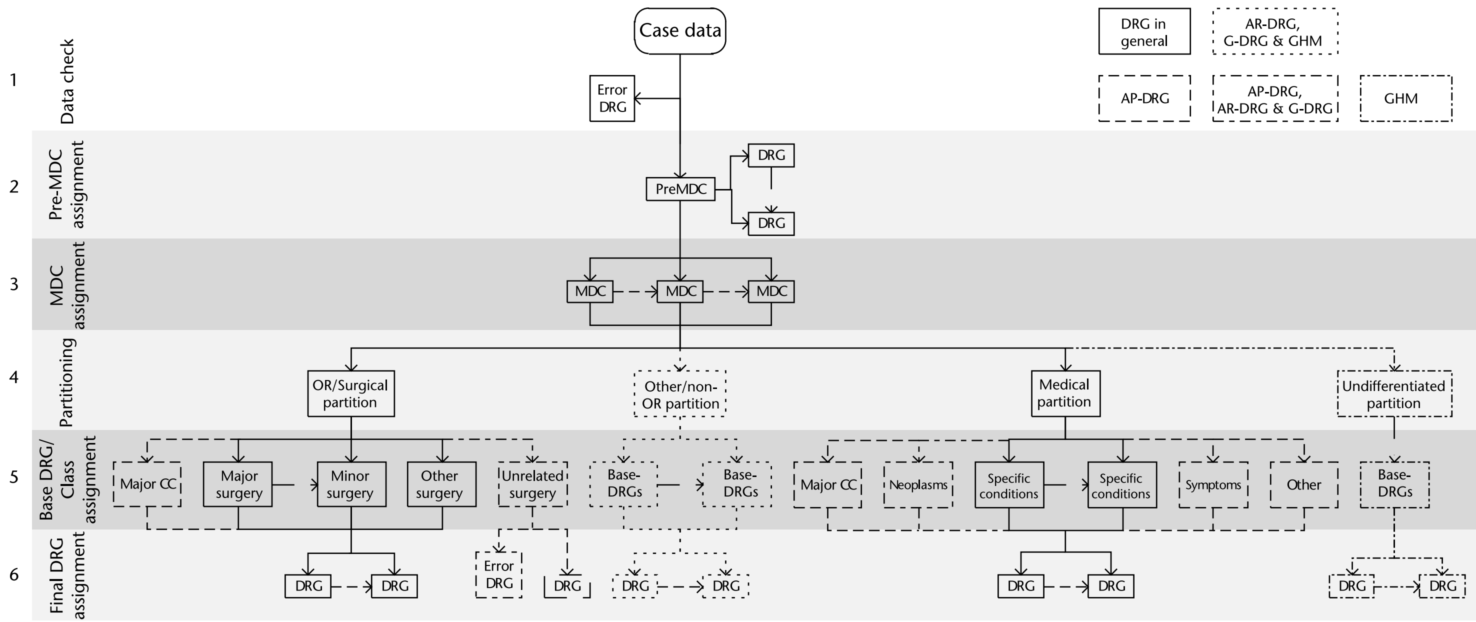

Figure 4.3 Classification algorithm of different HCFA-DRG derived PCSs, including system-specific modifications

Sources: Authors' own compilation based on information provided available in ATIH, 2010; InEK, 2009; Australian Government, 2004; 3M, 2005; and information contained in chapters 13 (France), 14 (Germany) and 15 (Ireland) of this volume.

systems differentiate between cases with relevant non-OR procedures (that is, relevant within a specific MDC), which are then assigned to the 'other'/'non-OR' partition. Consequently, the medical partition in NordDRG countries may contain cases which are found in other countries' systems within the 'other'/ 'non-OR' partition; the actual name varies according to the system. A particularity of the GHM system is that an undifferentiated partition exists within certain MDCs (see Chapter 13 of this volume).

After assignment of the partition, (5) all DRG systems check for further characteristics of the case (complexity of the principal and sometimes secondary diagnoses, type of procedures, combinations of both, and sometimes age, length of stay or treatment setting) in order to assign it to a class (in the AP-DRG system) or to a 'base-DRG' (in other systems). The algorithm usually checks first for more complicated procedures or conditions in order to make sure that patients are classified into the base-DRG/class that best reflects resource consumption of the case (illustrated by the arrow between base-DRGs/classes in Figure 4.3).

A particularity of the AP-DRG system is that a list of secondary diagnoses is checked in order to identify cases with major complications and co-morbidities (major CCs), which are then collected in a specific major-CC class (3M, 2005). This is different from other DRG systems, where CCs are usually only considered in the last step of the grouping algorithm (although exceptions to this rule exist, for example in the G-DRG system). Furthermore, the AP-DRG system has explicit classes for symptoms and 'other' conditions that do not exist in other DRG systems. Yet, the AP-DRG is similar to the AR-DRG and G-DRG systems, in terms of their approach to identifying cases with surgery unrelated to the MDC. For example, cases with hip surgery within the nervous system MDC are classified into the unrelated surgery class/base-DRG, which will determine an Error DRG in the final AR-DRG and G-DRG assignment process.

In the last step of the classification algorithm, (6) each case is grouped into the final DRG. Often, the class/base-DRG is split into several DRGs (the arrows between the DRGs in Figure 4.3 indicate that there may be more than two) in order to reflect different levels of resource consumption. Other classes/base-DRGs are not split if the group of patients within the base-DRG is relatively homogeneous. In these cases, the final DRG is identical to the base-DRG/class. The assignment to the final DRG is based on classification variables, which differ across systems. Most systems consider secondary diagnoses, procedures, age, and type of discharge (including, for example, death) in order to assign the final DRG. The section that follows (4.5.2) explores these variables in more detail.

4.5.2 Self-developed DRG-like PCSs in England, Poland and Austria

Figure 4.4 illustrates the basic structure of the classification algorithm for the self-developed DRG-like HRG, JGP and LKF systems. Since JGPs were derived from an earlier HRG version, it is not surprising that a number of similarities exist between these two systems (see Chapter 20 of this volume). The grouping

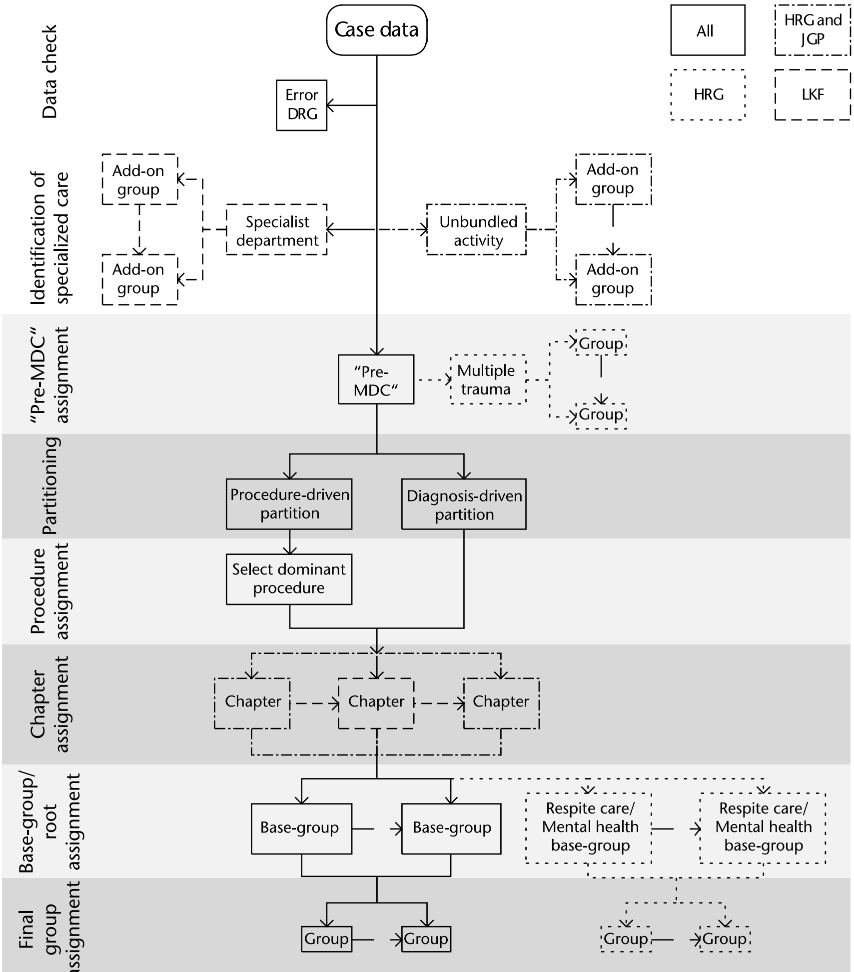

Figure 4.4 Classification algorithm in self-developed DRG-like PCSs (HRG, JGP and LKF)

Sources: Authors' own compilation based on information available in BMG, 2009; NHS Information Centre for Health and Social Care, 2010; and information contained in chapters 12 (England) and 20 (Poland) of this volume.

algorithm of all three systems consists of between five and seven consecutive steps, similar to those shown in Figure 4.4. However, the steps do not necessarily coincide, and the most important difference in comparison to the PCSs derived from HCFA-DRGs is that procedures play the dominant role in the grouping algorithm, while diagnoses are less important.

In the first step, all three systems identify whether the patients in each case received certain well-defined specialized services, for example computerized tomography (CT) scans, intensive care unit (ICU) treatment or chemotherapy. If patients received specific procedures (in the HRG and JGP systems), or if they were treated in specialist departments (for example, geriatrics in the LKF system) the PCSs classify patients into certain add-on groups that are assigned in addition to the final groups. The idea is to separate services that are provided to heterogeneous groups of patients (but not necessarily to all patients within these groups) from all other services, in order to increase the ability to define homogeneous groups of patients. In PCSs derived from HCFA-DRGs, similar mechanisms exist to identify certain well-defined specialized services and to reimburse them separately (see section 4.8 and Chapter 6), but these are not always directly integrated within the grouping algorithm.

The second step, which is similar to Pre-MDC assignment, exists only in the HRG system: cases with procedures that indicate trauma of more than two sites of the body are separated as multiple trauma cases into a type of Pre-MDC category and are assigned to HRGs. In the next step, all systems separate cases with significant procedures into a procedure-driven partition, while cases with no significant procedures are assigned to a diagnosis-driven partition. Subsequently, the HRG and JGP systems determine the most important (dominant) procedure, either using a rank list of procedures (in the HRG system) or according to the decision of the provider, who can manually select the dominant procedure (in the JGP system). In both systems, this is followed by the assignment of cases to chapters and sub-chapters, which represent medical specialties similar to those of MDCs in systems derived from HCFA-DRGs.

In the penultimate step of the grouping algorithm, the LKF system differs again from the HRG and JGP systems. Within the procedure-driven partition in the HRG and JGP systems, the highest ranked procedure determines the 'base-group'/root to which each case is assigned. For major procedures, which are identified through a procedure rank above a certain threshold, base-groups/roots are determined directly. In contrast, for cases with procedures of a rank below the threshold, the principal diagnosis is also checked. In the Austrian LKF system, no explicit ranking of procedures takes place. Instead, for all procedures, the score of the corresponding group is calculated. The one with the highest score is then selected. In the diagnosis-driven partition, the base-group is always determined by the principal diagnosis.

In the final step of the grouping algorithm, which is similar to that of PCSs derived from the HCFA-DRG system, patients are classified into the final group. Base-groups are either split into several final groups, in order to differentiate between different levels of resource consumption, or they remain unsplit. In the HRG and JGP systems, it depends on the chapter as to whether specific CCs are considered to be relevant in the grouping algorithm or not. In the LKF system, age is used most often to separate groups.

4.5.3 The Dutch DBC classification

The DBC classification system is very different from all the other systems. In most cases it consists of four dimensions: (1) the first dimension specifies one of 27 medical specialties, under which the patient was treated. Then (2) one of five types of care is determined (for example, regular inpatient care or ICU treatment). Subsequently (3) the diagnosis of the patient is considered, before finally (4) the treatment dimension differentiates between the treatment setting (inpatient versus outpatient) and the type of care (conservative treatment, type of surgery). For certain medical specialties, a fifth dimension exists, which identifies whether certain conditions existed that are expected to result in higher-than-average resource consumption (such as age < 11 years or requirement for a second surgeon). Any specification can be chosen for each dimension, resulting in a very high number of groups (Warners, 2008; see also Chapter 23 of this volume).

4.6 Classification variables and severity levels in European DRG-like PCSs

This section provides more details regarding the variables considered in the classification process, with an emphasis on the final split into DRGs or DRG-like groups. In addition, differences in the number of severity/complexity levels per base-group are explored and the approaches to using CCs are explained.

4.6.1 Classification variables

All DRG-like PCSs in Europe use routinely collected patient discharge data in order to classify patients. Table 4.3 provides an overview of clinical, demographic/administrative and resource-consumption variables used in European DRG-like PCSs. Clinical information (relating to diagnoses and procedures) is used as classification variables in all systems. In addition, all PCSs except the Netherlands' DBC system use the concept of one principal diagnosis as the highest ranked diagnosis for hospital discharge. However, the definition of what constitutes the principal diagnosis differs. In some countries the principal diagnosis is defined as the 'main reason' for a hospital stay (in, for example, the AR-DRG, G-DRG and LKF systems). In other countries, where the hospital discharge is aggregated based on several departmental discharges (the GHM or HRG systems, for example), a diagnosis hierarchy is used to determine the most important diagnosis. Procedures are also used, in all systems, but their importance in the classification algorithm varies – even between similar systems. For example, procedures play a more prominent role in the classification algorithm in the G-DRG system than in the AR-DRG system, on which the German system was originally based (InEK, 2009). In the self-developed HRG, JGP and LKF systems, information about procedures actually dominates information about diagnoses (see section 4.5.2).

Demographic and administrative variables, especially age and discharge type (for example, death or transfer) are frequently used variables in all systems, except the DBC system. Gender is a relevant classification variable only in the NordDRG system, although many systems use it to verify consistency of data (for example, where obstetric diagnosis codes are accepted only for female patients).

Similarly, resource-consumption variables are used in many DRG-like PCSs. Length of stay is the most frequently used explicit resource-consumption variable. However, even if systems do not explicitly include resource-consumption

Table 4.3 Classification variables and severity levels in European DRG-like PCSs

Systems	*AP-DRG*	*AR-DRG*	*G-DRG*	*GHM*	*NordDRG*	*HRG*	*JGP*	*LKF*	*DBC*
Classification variables									
Clinical variables									
Diagnoses	×	×	×	×	×	×	×	×	×
Procedures	×	×	×	×	×	×	×	×	×
Neoplasms/Malignancy	×	×	×	–	–	–	–	–	–
Type of care	–	–	–	–	–	–	–	–	×
Administrative/demographic variables									
Admission type		–	–	–	–	×	×	–	–
Age	×	×	×	×	×	×	×	×	–
Birth weight (newborn)	×	×	×	×	–	–	–	–	
Discharge type	×	×	×	×	×	×	×	–	–
Gender	–	–	–	–	×	–	–	–	–
Mental health legal status	–	×	×	–	–	–	–	–	–
Resource consumption variables									
LOS/Same-day status	–	×	×	×	×	×	×	–	–
Mechanical ventilation	–	–	×	–	–	–	–	–	–
Setting	–	–	–	×	–	–	–	–	×
Stay at specialist departments	–	–	–	–	–	–	–	×	–
Medical specialty	–	–	–	–	–	–	–	–	×
Demands for care	–	–	–	–	–	–	–	–	×
Severity/complexity levels	3*	4	not limited	5**	2	3	3	not limited	–
Aggregate case complexity measure	–	PCC	PCC	×	–	–	–	–	–

Sources: Authors' own compilation based on ATIH, 2010; InEK, 2009; Australian Government, 2004; 3M, 2005; BMG, 2009; NHS Information Centre for Health and Social Care, 2010; Warners, 2008; data provided by the Nordic Casemix Centre (2011), as well as information contained in the relevant country-specific chapters of Part Two of this volume.

*Not explicitly mentioned (major CCs at MDC level plus 2 levels of severity at DRG level)
** 4 levels of severity plus one GHM for short stays or outpatient care

variables, such as mechanical ventilation, these variables are regularly considered in the classification algorithms by other means. For example, while the G-DRG system explicitly considers duration of mechanical ventilation, other systems use procedure codes for tracheostomy in order to identify cases with mechanical ventilation.

4.6.2 Severity levels

Table 4.3 also shows the number of severity levels in different DRG-like PCSs. Most countries limit the number of possible severity levels. For example, the number of severity levels is restricted to only two in NordDRG systems and to three in the HRG system. The same logic of splitting base-groups only when necessary is also used in other systems (AR-DRG and HRG systems). However, in GHM, if a base-group is split, it is almost always split into four levels, plus one additional group for short stays or day cases. At the other end of the scale, the G-DRG and LKF systems do not limit the number of severity levels. They subdivide base-groups into as many final groups as necessary in order to achieve relative homogeneity of resource consumption within each group. The DBC system is the only system that does not split base-groups during the final step of the grouping algorithm.

4.6.3 Dealing with CCs

In all systems, except for the DBC and LKF PCSs, secondary diagnoses determine to a large degree the classification of cases into the appropriate level of severity or complexity. In most DRG-like PCSs, lists of secondary diagnoses are defined that represent CCs. The same CC list usually applies to all cases, except in the HRG system, which has one specific CC list for each chapter. However, even systems with global CC lists always define certain exclusion criteria – mostly usually principal diagnosis, for which specific secondary diagnoses are not considered a CC. Depending on the number of severity/complexity levels of the PCS, CC lists specify different levels of severity for each CC.

Furthermore, a number of approaches to dealing with multiple secondary diagnoses exist. While in the AR-DRG and G-DRG systems a cumulative measure (called Patient Clinical Complexity Level (PCCL)) of all secondary diagnoses is applied, in most other DRG systems it is the highest ranked secondary diagnosis that defines the severity. In the GHM system, another cumulative approach is used: the highest ranked secondary diagnosis together with age, length of stay and death during admission define the severity for a number of DRGs. In the Netherlands' DBC system, secondary diagnoses are not taken into account. Instead, a new DBC is allocated if patients are treated for additional diagnoses.

4.7 Trends

When analysing the developments of DRG-like PCSs over time, three main developments come to light: (1) DRG-like PCSs are progressively being applied to settings that are beyond the acute care hospital inpatient sector for which they were originally developed; (2) the number of groups has continued to increase in all systems; and (3) systems increasingly develop measures to ensure that specific complicated, high-cost services are adequately reflected.

4.7.1 Coverage of services

Since the early 1990s, researchers have tried to expand the concept of DRGs into settings other than inpatient acute hospital care (Goldfield, 2010.) Table 4.4 shows that the majority of countries are also using DRG-like PCSs for day care – or they are planning to do so. In order to use DRG-like PCSs for day care, countries have either extended their PCS (for example Finland, France and Sweden) or assigned different weights for DRGs in different settings.

Countries using the same PCS for inpatients and day cases should introduce additional algorithms into their classification systems in order to identify day cases. For example, the French GHM system splits base-DRGs according to the length of stay (LOS) in order to identify day cases as cases with a LOS = 0 (ATIH, 2010). In the Swedish and Finnish versions of the NordDRG system, a split is used in the grouping algorithm in order to separate day cases from inpatients according to the treatment setting (see Chapter 19 of this volume). In Austria, England and Germany, day cases are not identified explicitly as part of the grouping process. For reimbursement purposes, LKF groups, HRGs, and G-DRGs are adjusted for cases with a LOS = 0. In addition, the English HRG system identifies certain procedures as being only applicable to day cases (NHS Information Centre for Health and Social Care, 2010).

Furthermore, many countries are planning to develop DRG-like PCSs for psychiatric and rehabilitation care (see Table 4.4). For rehabilitation care, several PCSs have been proposed but heterogeneous duration and resource consumption – as well as the absence of dominant procedures – make it difficult to define homogeneous groups of patients. However, in contrast to acute hospital care, grouping can be used to classify cases or days (or weeks). The German Rehabilitation Treatment Groups (RBG) system (Neubauer & Pfister, 2008) or the American Inpatient Rehabilitation Facility Prospective Payment System (IRF-PPS) (MedPAC, 2009) classify cases. These systems take into account scores relating to impairment, possible co-morbidities and age. The French *Groupes homogène de journées* (Homogeneous groups of days, GHJ) (Metral et al., 2008) and the Swiss *Leistungsorientiertes Tarifmodell Rehabilitation* (Performance-oriented payment system for rehabilitation, LTR) (Fischer et al., 2010) classify days or weeks.

4.7.2 Number of groups

Figure 4.5 illustrates changes in the number of groups in different DRG-like PCSs in Europe over time. It shows that the number of groups has continued to increase in all systems. In most cases, there are only minor changes from year to year. However, in France (GHMs) and England (HRGs), major revisions of the

Table 4.4 Trends in coverage of services in DRG-like PCSs in Europe

Country	*Inpatient*	*Day cases*	*Psychiatry*	*Rehabilitation*
Austria	X	X[a]	–	–
England	X	X	in the process of extension	
Estonia	X	X[e]	–	–
Finland	X	X	X[b]	X[b]
France	X	X	in the process of extension	
Germany	X	X[a]	planned for 2013	–
The Netherlands	X	X	X	X
Ireland	X	X	–	–
Poland	X	X[a]	in the process of extension	
Portugal	X	X[a]	–[c]	–[c]
Spain	X	–[d]	–	–
Sweden	X	X	X	X

Source: Authors' own compilation based on information contained in the relevant country-specific chapters of Part Two of this volume.

Notes: [a] Not explicitly part of the grouping algorithm but day-case status is explicitly considered for payment purposes; [b] The DRG system is designed to cover such cases, but 'in all hospitals, psychiatric patients and patients requiring long-term intensive treatment (such as patients suffering from respiratory arrest) are excluded' from DRG billing (see Chapter 18 of this volume, subsection 18.5.1); [c] Studies have been undertaken regarding the possibility of including psychiatry and rehabilitation, but nothing concrete has come of this research; [d] Surgical day cases are grouped and financed using AP-DRGs in the same way as for inpatient care; Ongoing research is taking place regarding International Refined (IR-)DRGs; [e] Only surgical day cases are grouped and financed using DRGs.

grouping algorithm have taken place in recent years, and consequently the number of groups has more than doubled in both countries. The G-DRG system is the only PCS with large increases in the number of groups every year before 2010, when this trend was stopped.

There are several reasons for which the number of groups in DRG-like PCSs is increasing: first, most systems have tried to improve their ability to reflect differences in the complexity of treating different patients. In the G-DRG system, the number of final DRGs per base-DRG (reflecting case complexity) has continuously increased over time. In France, the recent revision of the coding algorithm introduced four severity levels for most base-DRGs; and in England, the increase in the number of groups can be mostly attributed to the introduction of more severity levels. Second, countries are increasingly moving to incorporating day care into their DRG-like PCSs. If day care is included within the same classification system, this may necessitate the creation of new groups to specifically reflect resource consumption of day cases. Third, new medical devices, drugs and medical knowledge become available, influence treatment patterns, and may necessitate separating certain cases of one group of patients into a new group, in order to assure medical and economic homogeneity of groups (see Chapter 9 of this volume). In addition, the underlying coding systems (for both diagnoses and procedures) are regularly updated in most countries. If the accuracy (granularity) of the coding systems is improved, this enables the creation of patient groups that better reflect specific characteristics of procedures or patients, and are thus more homogeneous. Finally, improved cost accounting

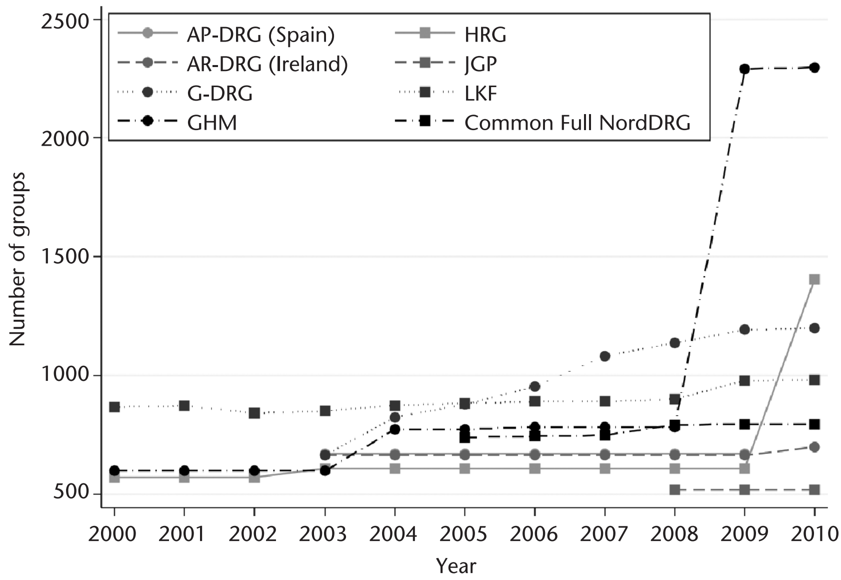

Figure 4.5 Trends in the number of groups in DRG-like PCSs in Europe

Sources: Authors' own compilation based on data provided by the Nordic Casemix Centre (2011), as well as information contained in the relevant country-specific chapters of Part Two of this volume and complemented by personal communications with the authors of those chapters.

in hospitals increases the ability of regulators to identify determinants of the costs of treating patients and to adapt the PCS accordingly (see Chapter 5).

The Dutch DBC system is not included in Figure 4.5, since the number of DBCs differs greatly from the number of groups in all other systems. However, it is interesting to note that the DBC system is reducing the number of groups with each revision of the system. Having started with about 100 000 DBCs in 2005, the number of groups was reduced to about 30 000 by 2010, and the intention is to define about 3000 DBCs, including severity levels similar to DRGs (Warners, 2008).

4.7.3 Specific high-cost services: Unbundling, séances*, and supplementary payments*

All DRG-like PCSs are faced with the problem of how to ensure that certain specific high-cost services required by heterogeneous patients belonging to different DRG-like groups are adequately reflected in the grouping process. In order to do so, the English HRG system has developed the concept of 'unbundling'. This separates a set of certain services, such as chemotherapy, radiotherapy, diagnostic imaging, renal dialysis, and high-cost drugs, from the core HRGs (NHS Information Centre for Health and Social Care, 2009). By separating these services, the economic homogeneity of core HRGs is improved and, at the same time, adequate reimbursement through supplementary payments can be guaranteed (see Chapter 6 of this volume). In the French GHM system, there is a category called 'sessions' (*séances*), which fulfils a similar purpose, also separating renal dialysis, chemotherapy and radiotherapy from other services. In Germany, an increasingly large number of supplementary payments exist (see Chapter 14), which are not directly part of the grouping process but still fulfil the same purpose as unbundling or *séances*.

Another trend in DRG-like PCSs internationally is that attempts are being made to differentiate better between co-morbidities on the one hand, and complications attributable to poor-quality care, on the other. However, until now only the United States MS-DRG system differentiates in this way, by requiring providers to assign codes revealing whether diagnoses were present on admission. If certain diagnoses that should not occur during hospitalization were not identified (coded) on admission, they are considered to reflect poor quality of care. How this information is used to adjust payment rates is discussed by Or and Häkkinen in Chapter 8 of this volume.

4.8 Conclusions: Likelihood of a common Euro-DRG system?

In the context of an emerging European hospital market, a common definition of hospital products through a common DRG-like PCS could be a major catalyst to facilitate cross-border movements of patients and payments. Therefore, establishing the likelihood of harmonization of DRG-like PCSs or, alternatively, the development of a common European DRG-like system is of high relevance for politicians and patients. In the introduction to this chapter, DRG-like PCSs were defined as systems that have four main characteristics. (1) *routinely collected data* on patient discharge are used to classify patients into (2) a *manageable number* of groups that are (3) *clinically meaningful* and (4) *economically homogeneous*. These points can also be used to guide discussion about the possibility of a common 'Euro-DRG' PCS.

Regarding the availability of routine data, section 4.6 discussed the fact that similar information is used to classify patients in all systems, and is readily available from hospital discharge summaries, while section 4.4 demonstrated that information is often coded in different ways. Therefore, an initial requirement for a common European DRG-like system would be to harmonize coding of diagnoses and procedures or to develop a mapping system that would allow the translation of codes from different coding systems into a common European coding system. The Hospital Data Project as part of the European Union (EU)'s Health Monitoring Programme has suggested a common format for hospital activity data, to improve comparability (Magee, 2003). For the coding of diagnoses, an agreement on a coding system should be relatively unproblematic, since the WHO ICD-10 system is already used for cause-of-death statistics in all countries and the next revision, ICD-11 is currently being developed.

A question that is changing over time relates to what is regarded as a manageable number of groups. Current developments of European DRG-like PCSs seem to indicate that a number of between 1000 and 1500 groups is necessary to describe the activity of hospitals. Since all countries use software tools to classify patients into groups, the manageability of a system depends mostly on the ability to reliably calculate average costs of patients within each group. In a European DRG-based system, the population basis for calculating average costs of patients within each group would be much larger. Therefore, it would be possible to develop a more detailed DRG system than currently exists in each individual Member State.

In order to define economically homogeneous groups of patients, the grouping algorithm of the DRG-like PCS needs to reflect the most important determinants of costs. If the determinants of costs are the same across European countries, it should be possible to classify patients using the same DRG-like PCS. Current research projects – such as the EU-funded EuroDRG project – aim to identify the most important determinants of costs in 11 European countries. The results of this project should be able to inform decisions about the feasibility of developing a common European DRG-based system. However, if such a system is to be developed, detailed cost-accounting information from a sufficiently large and representative sample of hospitals is essential (see Chapter 5 of this volume). In addition, mechanisms to ensure that the system is regularly updated must be developed (see Chapter 9).

As shown in section 4.2, all currently existing DRG systems originate from the original HCFA-DRG system, and even the self-developed DRG-like PCSs share many elements of these systems. The most likely scenario for developing a Euro-DRG system according to European needs seems to be that the existing systems will form the basis for this work. In order to ensure that these modifications do not change the principal of clinically meaningful groups, a process would need to be set up to incorporate consultation with medical professionals in developing and refining the DRG system.

In conclusion, while a European DRG system is unlikely to emerge within a medium- to short-term time frame, the development of such a system does not appear to be impossible. On the one hand, a number of requirements would need to be fulfilled, such as the development of common coding systems, cost-accounting systems, and consultation mechanisms. On the other hand, over a decade of experience using DRG-like PCSs in most countries has resulted in several highly refined DRG-like PCSs that could serve as the starting point for developing a new Euro-DRG system. Empirical analyses will be needed to identify the system that best reflects resource-consumption patterns in European hospitals. However, similar to the historical emergence of DRG-like PCSs as a result of political decisions, a common European PCS is only likely to emerge if there is sufficiently strong political will to support the emergence of a common European hospital market.

4.9 Note

1 The authors thank Wilm Quentin for his efforts in revising this chapter and Caroline Linhart for her work on the graphical representations.

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