

## **chapter** three

# **Understanding DRGs and DRG-based hospital payment in Europe**

***Wilm Quentin, Alexander Geissler, David Scheller-Kreinsen and Reinhard Busse***

### **3.1 Introduction**

Despite the fact that diagnosis-related groups (DRGs) have been adopted in an increasingly large number of countries around the world (Kimberly et al., 2008), understanding of DRG systems and DRG-based hospital payment systems remains surprisingly limited. On the one hand, there is no good overview of alternative options for designing these systems because systematic comparisons of the specific system characteristics in different countries are extremely rare (France, 2003). Consequently, there is no agreed consensus on how best to design DRG systems and DRG-based hospital payment systems, because the differences between countries' systems remain poorly understood. On the other hand, despite the existence of numerous studies concerning the effects of DRG-based hospital payment systems on hospital efficiency, quality and technological innovation, these effects remain relatively unclear (Brügger, 2010) – also because the specific design features in different countries are rarely taken into account.

Nevertheless, a thorough understanding of international experiences with DRG systems and DRG-based hospital payment systems could inform countries when developing and optimizing their national systems. In addition, in a context of growing patient mobility facilitated by the European Union (EU) *Directive on the Application of Patients' Rights in Cross-Border Healthcare* (European Parliament and Council, 2011), an increasingly important issue relates to whether there is scope for harmonization of DRG systems within Europe. This is because if harmonization is not possible, it will remain difficult (or at least not transparent) to pay hospitals in one EU Member State for care provided to patients from another EU Member State. Furthermore, cross-border comparisons of hospital prices and performance – which are increasingly being conducted in

## 24 Diagnosis-Related Groups in Europe

attempts to improve the understanding of differences in terms of efficiency and costs (see, for example, Chapko et al., 2009 or Busse et al., 2008) – will continue to be complicated by the lack of a common basis for comparison.

The first part of this book aims to contribute to a better understanding of DRG systems and of how they are used for hospital payment in Europe by (1) systematically comparing DRG systems and DRG-based hospital payment systems across 12 European countries; and (2) by providing an overview of the effects of these systems on hospital efficiency, quality, and on the adoption and use of technological innovation. This chapter develops a framework for comparing DRG systems and DRG-based hospital payment systems in Europe. It presents the main building blocks of DRG-based hospital payment systems and introduces some of the assumed effects of these systems on hospital efficiency, quality and on the adoption and use of technological innovation. It highlights certain key concepts and raises a number of questions that should be considered when developing or optimizing DRG systems and DRG-based hospital payment systems. The six chapters that follow (chapters 4 to 9) develop these points in more detail. The scope for harmonization of DRG systems – or at least for more cooperation – in Europe is a cross-cutting issue that is discussed in several of the chapters. Chapter 10 picks up the questions raised here and draws conclusions from all the chapters in Part One.

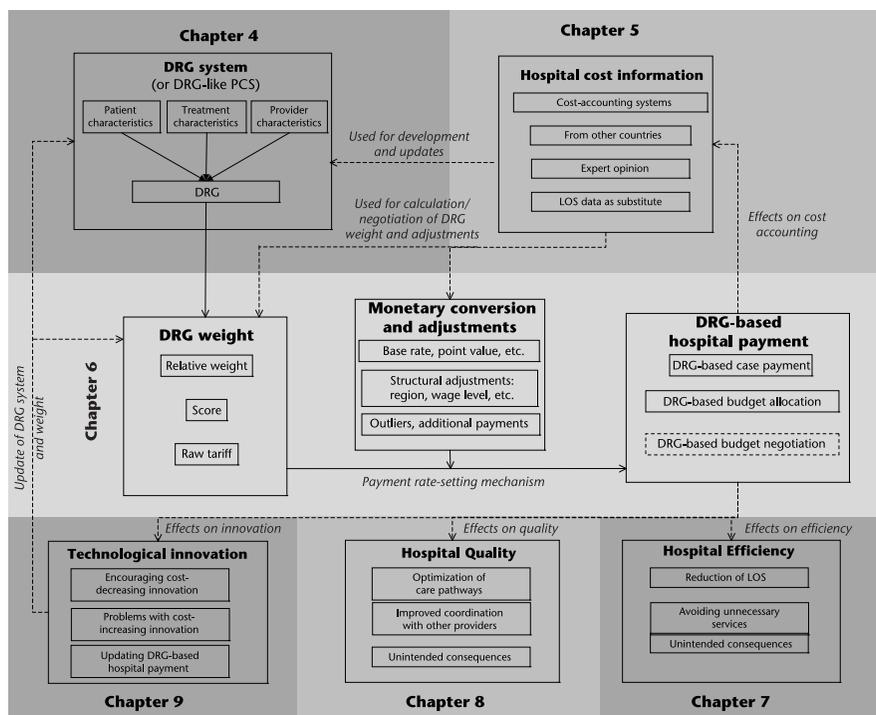
### **3.2 How to understand DRG systems and DRG-based hospital payment systems in Europe**

Trying to understand DRG systems and how they are used for hospital payment across countries requires a common framework. Without one, it is easy to get lost in the specificities of each country's system and confused by the diversity of terms that are used for describing similar things in different countries. Figure 3.1 presents a framework that we developed to guide the reader through the chapters of the first part of this book. All countries included in this book have a DRG system (Chapter 4), a system to collect cost information from hospitals (Chapter 5), and they use DRGs for hospital payment (Chapter 6). These building blocks are presented in more detail in subsection 3.2.1. Understanding each of these building blocks and how they interact is essential for understanding the effects of DRG-based hospital payment systems on efficiency (Chapter 7), quality (Chapter 8) and innovation (Chapter 9), which are introduced in subsection 3.2.2. The effect of DRG systems on transparency of service provision is not discussed in a separate chapter. However, increased transparency resulting from the use of DRGs is thought to contribute to both improved efficiency and quality of service provision.

#### **3.2.1 Understanding the building blocks**

##### *DRG systems (Chapter 4)*

A DRG system is a patient classification system (PCS) that has four main characteristics: (1) *routinely collected patient discharge data* (mostly concerning



**Figure 3.1** Framework for navigating through the book

patient, treatment and provider characteristics) are used to classify patients into (2) a *manageable number* of groups (that is, DRGs), which are intended to be (3) *clinically meaningful* and (4) *economically homogeneous*. DRGs summarize the confusingly large number of different (individual) patients treated by hospitals into a manageable number of clinically meaningful and economically homogeneous groups, thus providing a concise measure of hospital activity or, in other words, they define hospital products. Consequently, they facilitate comparisons of hospital costs, quality and efficiency, and contribute to increased transparency in hospitals.

When introducing DRG systems, two alternative options exist: DRG systems can either be adopted from abroad or they can be developed from scratch. Many countries originally adopted DRG systems from abroad and later used these systems as the basis for further developing their own systems (Chapter 4). Consequently, eight countries included in this book (Estonia, Finland, France, Germany, Ireland, Portugal, Spain and Sweden) use DRG systems that are at least remotely related to the Health Care Financing Administration (HCFA-) DRG system originally introduced in the United States in the early 1980s; two of them (Germany and Ireland) via the Australian Refined (AR-)DRG system. Austria, England, and the Netherlands have developed their own systems from scratch, while Poland used the English version to develop its own system. Although these self-developed systems do not define DRGs in the strictest sense

## 26 Diagnosis-Related Groups in Europe

of the word (that is, groups are not necessarily diagnosis-related), this book uses the term DRG system for all PCSs that share the above-mentioned four main characteristics.

The actual classification of patients into DRGs is almost always performed by computerized grouping software. Since diagnoses and procedures are the most important classification variables, an essential requirement for the operation of DRG systems is that diagnoses and procedures are coded in hospitals according to standardized classification systems, such as modifications of the International Classification of Diseases 10<sup>th</sup> revision (ICD-10) for diagnoses and country-specific classifications of procedures, such as the English Office of Population Censuses and Surveys (OPCS) Classification of Surgical Operations and Procedures. However, how this information is used for defining DRGs depends on the specific DRG grouping algorithm. While the general structure of many DRG systems is relatively similar (see Chapter 4), the precise definition of specific DRGs can be quite diverse (Quentin et al., in press).

Ideally, DRG systems should consider the most important determinants of resource consumption as classification variables; that is, they should define DRGs on the basis of those diagnoses, procedures or other classification variables that make treating one patient with (or without) a specific procedure more expensive than treating another patient with (or without) another procedure. Otherwise, if DRG systems fail to define economically homogeneous groups, performance comparisons on the basis of DRGs do not adequately control for differences of patients within DRGs. Further, DRG-based hospital payment may be inappropriate for a considerable number of patients – it can be either too high or too low. However, because hospitals may try to manipulate the classification of patients into DRGs by changing their coding or practice patterns (see Chapter 6), the selection of classification variables also needs to consider whether those variables are easy to manipulate or not.

In order to ensure that DRGs remain clinically meaningful and economically homogeneous, even when technological innovation or other factors lead to changes in practice patterns and costs, DRG systems need to be updated at regular intervals (see Chapter 9). Most countries use some kind of hospital cost information (see Chapter 5) to develop and update DRG systems, as illustrated by an arrow in Figure 3.1.

Furthermore, different alternatives exist in terms of the unit for which patients are classified into DRGs. For example, some DRG systems classify patients into one DRG per hospital admission; other systems classify patients into DRGs for every stay in a hospital department (see the Finnish system, described in Chapter 18); and still other systems classify patients into DRGs for a specific treatment related to a specific diagnosis, which may include several inpatient stays and outpatient visits (see Chapter 23 on the Netherlands). Finally, it is important to consider which patient groups are to be included in DRG systems. For some groups of patients, it may be more difficult to define clinically meaningful and economically homogeneous groups of patients. For example, psychiatric patients were originally excluded from DRG systems in most countries because it appeared to be more difficult to define economically homogeneous groups on the basis of diagnoses and procedures for this group of patients (Lave, 2003; McCrone & Phelan, 1994). However, several countries are

now also in the process of developing or introducing DRGs for psychiatric patients (see Chapters 4 and 10).

#### *Hospital cost information (Chapter 5)*

As illustrated in Figure 3.1, hospital cost information is used to (1) define DRGs and (2) determine (adjust) payment rates. The availability of high-quality hospital cost information is essential for developing and updating DRG systems and for ensuring fair DRG-based hospital payment systems. If hospital cost information does not allow differences to be identified between costs of individual patients, it is impossible to use a data-driven approach to develop economically homogeneous DRGs. In addition, if hospital cost information is imprecise, calculated weights for certain DRGs could be falsely estimated to be higher or lower than they really are and, consequently, hospitals will be over- or underpaid for specific DRGs. Therefore, the fairness of DRG-based hospital payment systems and the ability of these systems to encourage efficiency are to a large extent determined by the quality of the hospital cost information used to develop these systems and to calculate DRG weights.

Unfortunately, the availability of standardized and (therefore) comparable high-quality cost information is limited in many European countries. This is one of the reasons why some countries without high-quality patient-level cost information have imported DRG systems including weights from abroad (for example, Ireland, Portugal and Spain) and have only adjusted the imported DRG weights to the local cost context by using more aggregated cost-accounting figures, for example at the department level. Other countries have developed their own DRG systems on the basis of length-of-stay data as a proxy for costs, which makes it difficult to ensure that groups are economically homogeneous. Furthermore, hospital charges from fee-for-service payment systems (that in some countries existed prior to the introduction of DRGs), individual costing studies or even expert opinions have occasionally been used as a proxy for costs when calculating weights of DRGs (for example, in Estonia and Poland).

However, in many European countries, the introduction of DRGs has also encouraged changes in hospitals' cost-accounting systems. Following the introduction of DRGs for classification purposes – and even more so following the introduction of DRG-based hospital payment systems – standardized (sometimes mandatory) cost-accounting systems have been introduced in at least a sample of hospitals in most countries. Countries have often introduced national cost-accounting handbooks, which provide detailed rules and definitions concerning the types of cost centres and cost categories to be used, and which specify the allocation methods and allocation bases for distribution of costs to final cost centres and patients.

Yet, significant differences exist between countries in terms of (1) the number of hospitals that participate (voluntarily or not) in collecting standardized cost-accounting information; and (2) the level of detail required according to the national cost-accounting standards. In fact, there may be a trade-off between collecting detailed patient-level data using a bottom-up micro-costing approach (see Chapter 5) and the goal of having a large representative sample of hospitals contributing to a national cost database (Schreyögg et al., 2006). This is because

## 28 Diagnosis-Related Groups in Europe

a more complex cost-accounting system increases the costliness of the data-collection exercise, which may become prohibitively costly if data collection is extended to a large number of hospitals. In addition, as the importance of hospital cost information has increased, most countries have introduced regular data checks, with the aim of assuring the validity of reported hospital cost information.

While changes to cost-accounting systems resulting from regulations have been important, the introduction of DRG-based hospital payment systems has also increased the intrinsic motivation for hospital managers to introduce or optimize existing cost-accounting systems (see Berki, 1985). Without high-quality cost-accounting systems, hospital managers do not know whether hospitals are able to 'produce' DRGs at costs that are below the payment rate. Consequently, they do not know whether hospitals are making a profit or are incurring a loss by providing these DRGs. In addition, in order to be able to identify the cost drivers of hospital products (that is, of DRGs) and to manage the production of DRGs, hospital managers require detailed information about the costs of different inputs in the production process – an element that can be provided by high-quality cost-accounting systems. In summary, as illustrated by the arrows in Figure 3.1, hospital cost information is a necessary input for effective DRG-based hospital payment systems, and (ideally) improved hospital cost information is also an outcome of the changed incentive structure following the introduction of DRG-based hospital payment.

### *DRG-based hospital payment (Chapter 6)*

While the use of DRGs for reporting purposes and for managing hospitals is important, most countries included in this book use DRGs primarily as the basis for hospital payment. In general, two main models of DRG-based hospital payment system can be distinguished. On the one hand, in DRG-based case payment systems, each discharged patient is grouped into the applicable DRG, and hospitals receive a payment per case that is determined by the weight of that DRG (after monetary conversion and relevant adjustments). On the other hand, in DRG-based budget allocation systems, the available regional or national hospital budget is distributed to individual hospitals on the basis of the number and type of DRGs that these hospitals produced during one of the previous years or that they are expected to produce in the next year. The casemix (that is, the sum of the weights of all DRGs produced by a hospital) and the casemix index (CMI) (that is, the casemix divided by the number of discharges) are usually the determining factors for distributing the budget. However, adjustments for structural indicators and for certain high-cost cases are also considered, and an implicit monetary conversion rate exists that can be used to estimate the implicit revenue contribution to the hospital budget of one patient in a specific DRG. In addition, some countries with DRG-based case payment systems, such as Germany or Finland, use DRGs to negotiate global hospital budgets, which limit (to a certain extent) the total amount of money that hospitals can earn from DRG-based case payments.

There are three main incentives for hospitals resulting from DRG-based hospital payment systems: (1) to reduce costs per treated patient, (2) to increase

revenues per patient, and (3) to increase the number of patients. These incentives can have both intended and unintended consequences on efficiency, quality and technological innovation. However, the strength of these incentives is determined by the type of DRG-based hospital payment systems (case-based payment versus budget allocation), by the proportion of total hospital revenues related to DRG-based hospital payment, and by the degree to which DRG weights and monetary conversion rates are adjusted to reflect hospital-specific cost structures.

In all DRG-based hospital payment systems (except for that operating in the Netherlands), the actual payment rate is not the same as the DRG weight. As illustrated in Figure 3.1, three main approaches for expressing DRG weights exist in the countries included in this book: (1) relative weights, (2) raw tariffs, and (3) scores. Each of these approaches corresponds to a specific monetary conversion method. In countries using a relative weight approach, the relative weight provides a measure that relates the average costs of treating patients within one DRG to the average costs of treating all patients included in the DRG system in the country (see Chapter 6). Table 3.1 provides an example of how DRG weights for a hypothetical DRG determine hospital payment within the framework of the different approaches for expressing DRG weights. The idea of all three approaches is the same: the DRG weight (almost always) provides a measure of the average or expected costs of treating patients falling into that DRG. The actual hospital payment rate is calculated by multiplying the DRG weight with a country-specific monetary conversion/adjustment rate, which often takes into account structural, regional or hospital-specific differences in the costs of service provision.

Monetary conversion/adjustment rates may differ between types of hospitals, for example, by degree of specialization or geographic location, according to the country-specific choices for adjusting the DRG-based payment rate. Sometimes, monetary conversion rates are hospital specific, and are calculated in a way that shelters hospitals from budget cuts, which means that the incentives of DRG-based hospital payment are much reduced (see, for example, the Finnish system described in Chapter 18). In addition, DRG weights are generally adjusted in order to account for certain high-cost patients that stay in hospital much longer than the average case, or that receive additional services, which are not adequately reimbursed on the basis of the DRG-based payment system. Furthermore, most countries operating DRG-based case payment systems prevent an excessive increase in costs by applying macro-level price/volume

**Table 3.1** DRG weights and monetary conversion example

<i>Hypothetical example</i>			
<i>DRG weight approach</i>	<i>DRG weight (unit)</i>	<i>Monetary conversion/adjustment (unit)</i>	<i>Hospital payment rate (€)</i>
Relative weight	1.95	×	2 000 € = 3 900 €
Raw tariff	3 000 €	×	1.3 = 3 900 €
Score	130 points	×	30 € = 3 900 €

control measures (such as global hospital budgets, sectoral budgets, or price reductions).

### **3.2.2 Understanding the effects of DRG-based hospital payment**

#### *Effects on hospital efficiency (Chapter 7)*

In many countries, one of the most important purposes of introducing DRG-based hospital payment systems was to increase efficiency of hospital care. Because DRG-based hospital payment provides incentives to increase activity and to minimize costs, there is reason to believe that these systems contribute to improved efficiency. However, 'efficiency' is a widely used term that can have various meanings. Economists generally differentiate between technical efficiency – that is, maximizing outputs for a given level of inputs, or minimizing inputs for a given level of outputs; allocative efficiency – namely, ensuring the appropriate mix of inputs and outputs to maximize utility; and cost-efficiency – that is, minimizing costs for a given level of output.

DRG-based hospital payment systems are often discussed as representing a form of 'yard stick competition' (Shleifer, 1985). The idea of yard stick competition is that prices for a given product (for example, a specific DRG) are set at the level of average costs of other firms producing the same product (that is, the same DRG). With DRG-based hospital payment, if hospitals produce DRGs at costs that are below the average costs of other hospitals, they benefit directly by retaining the generated financial surplus; if they underperform, they generate deficits and, ultimately, risk bankruptcy. All hospitals, including the most efficient ones, are incentivized to continually reduce costs. In practice, numerous options exist for hospitals to increase (technical and cost-) efficiency: care pathways can be optimized to reduce the length of stay; duplicate and unnecessary tests can be avoided; and costly treatments can be replaced by similarly effective but less costly alternatives.

However, unfortunately, if the incentives for cost reduction are too strong, and if regulatory authorities do not have sufficient capacity to monitor adequately the quality of care, DRG-based hospital payment can lead to unintended consequences (see Chapter 6). For example, hospitals could discharge patients inappropriately early, and service intensity could be reduced to a level at which necessary services are withheld from patients – thus leading to cost reductions but not to improvements in efficiency. Consequently, the effects of DRG-based hospital payment systems on efficiency have been highly controversial.

Although improving hospital efficiency is generally a key motivation for introducing DRG-based hospital payment, relatively few studies have explicitly identified and quantified its impact using established methods, such as data envelopment analyses (DEAs) or stochastic frontier analyses (Jacobs et al., 2006). Rather, most research has concentrated on indicators of efficiency – such as activity, length of stay and costs – which are more easily measured, but by definition provide only a partial picture. Given the challenges inherent in undertaking cross-country efficiency comparisons, most available studies have

adopted a longitudinal perspective, comparing hospital efficiency before and after the introduction of DRG-based hospital payment. Chapter 7 reviews both types of studies, efficiency analyses and studies of indicators of efficiency.

When interpreting the results of these (longitudinal) studies, it is important to consider the difficulties that often arise in clearly separating the effect of the introduction of DRG-based hospital payment from other concurrent influences, such as changes in medical technology or new legislation. Furthermore, in longitudinal studies, the measured effect of introducing DRG-based hospital payment depends on the hospital payment system that existed prior to the introduction of the system. In the United States, where DRG-based hospital payment replaced a fee-for-service system, the DRG-based hospital payment system provided strong incentives to reduce costs (Berki, 1985). In contrast, in Europe, where DRG-based hospital payment systems often replaced global hospital budgets, the incentives of DRG-based hospital payment would be expected to lead to an increase in hospital activity, which could also result in increased costs.

#### *Effects on hospital quality (Chapter 8)*

The effect of DRGs on hospital quality is not straightforward (Davis & Rhodes, 1988; Farrar et al., 2009). On the one hand, because DRGs provide a concise and meaningful measure of hospital activity and thus facilitate monitoring and comparisons of hospital quality, they could contribute to better quality of care. In addition, cost-reduction incentives of DRG-based hospital payment systems could lead to increased efforts to improve quality, if quality contributes to reduced costs. For example, improved coordination between hospitals, outpatient providers and long-term care facilities would reduce costs but could also contribute to better quality of care. However, on the other hand, and this has been a reason for continuous concern (Rogers et al., 1990), hospitals may be tempted to reduce costs by reducing quality, if DRG-based payments do not depend on quality. For example, because DRGs do not specify which services must be provided when treating a specific patient, hospitals can 'skimp' on quality by avoiding certain diagnostic tests, disregarding hygiene standards, or by lowering staffing ratios per bed.

Assessments of the effect of DRGs on hospital quality are often complicated by the fact that the notion of quality is rather diffuse (Legido-Quigley et al., 2008). This book defines quality as any aspect of hospital services that benefits patients during the process of treatment or improves health outcome after treatment (Chalkley & Malcomson, 1998). To measure 'quality', a common framework developed by Donabedian (1966) differentiates between structural, process and outcome indicators of quality. Structural indicators, such as qualification(s) of medical staff or available equipment are easy to measure and are relevant to quality if they represent conditions for the delivery of a given quality of health care. Process indicators can also be measured relatively easily, but should be based on the available evidence of what constitutes 'good' quality of care in the treatment of a specific patient and in a specific situation (Smith et al., 2010). Thus, they usually provide clear pathways for action. Outcome

## 32 Diagnosis-Related Groups in Europe

indicators assess what is most meaningful for policy-makers and patients (for example, mortality), but it is not always possible to determine the contribution of health care to health outcomes because outcomes are also influenced by (unobserved) patient-level factors. Therefore, careful risk adjustment is necessary if outcome indicators are to be used.

The effect of DRGs and of DRG-based hospital payment systems on the quality of hospital care has been assessed in numerous studies from the United States and several studies from Europe, using a range of indicators. Again, when interpreting the results, which are presented in Chapter 8, it is important to consider that the effects of the introduction of DRGs and of DRG-based hospital payment on quality may be different depending on the hospital payment system previously in existence.

In theory, DRG-based hospital payment systems could be modified to explicitly consider quality of care. However, basic information on the quality of services provided is still lacking in most countries in which DRGs are used for hospital payment. Yet, the availability of information regarding the quality of services (in terms of structure, process or outcomes) is a prerequisite for any attempts to explicitly integrate financial incentives for quality into DRG-based hospital payment systems (see Chapter 8).

### *Effects on technological innovation (Chapter 9)*

Since the introduction of DRG-based hospital payment systems, there have been concerns that these systems may not provide sufficient incentives to encourage the desired adoption and use of technological innovations in health care (OTA, 1983; MedPAC, 2003; Shih & Berliner, 2008). However, the effect of DRG-based hospital payment systems on any specific technological innovation depends on how the technological innovation influences total hospital costs (both capital and operating costs) per admission.

Technological innovations may increase or decrease capital costs, operating costs or both. DRG-based hospital payment systems encourage hospitals to invest in technological innovations that reduce total costs per patient and discourage hospitals from introducing technological innovations that lead to higher costs per patient. Yet, whether this effect of DRG-based hospital payment on technological innovation is socially desirable or not depends on whether the innovations in question really improve the quality of care. In cases in which technological innovation is more costly but does not improve quality of care, the effect of DRG-based hospital payment (namely, preventing hospitals from adopting these innovations) is in line with societal objectives. However, when technological innovations increase quality of care and are associated with higher costs, DRG-based hospital payment becomes problematic.

The problem is that hospitals are paid on the basis of cost information that was collected in hospitals in the past. Consequently, when technological innovations first enter the market, the higher costs of those innovations are not yet accounted for in current DRG weights. Only once hospitals have started using these technological innovations, and when data relating to the costs of using these innovations in routine practice have been collected, can DRG

systems and DRG weights be updated to account for the change in practice patterns and costs. Therefore, the ability of DRG-based hospital payment systems to respond to technological innovation is determined by (1) the frequency of updates of DRG systems and of DRG weights, and (2) the time-lag to data used for these updates (see Chapter 9).

Furthermore, most countries included in this book have developed additional payment incentives to encourage the use of quality-increasing technological innovations that also increase costs, within the time period during which the DRG-based hospital payment system does not yet account for the innovation. Because the available evidence relating to the effects of DRGs on technological innovation is virtually non-existent, Chapter 9 is less focused on reviewing the limited available literature than on providing an overview regarding how European countries deal with technological innovation.

### 3.3 In summary: What do we want to understand?

This chapter provides a framework for understanding and comparing DRG systems and DRG-based hospital payment systems in Europe. It introduces the building blocks of DRG-based hospital payment systems and highlights their likely effects on efficiency, quality and technological innovation. The chapter also outlines some alternative options that exist when designing DRG-based hospital payment systems, indicating that the specific design features will influence the effects of those systems.

Table 3.2 summarizes key questions that are raised in this chapter and that are addressed within the chapters that follow (Part One of this book). The concluding chapter of Part One (Chapter 10) draws on the findings of chapters 4–9: (1) in order to make specific recommendations for policy-makers regarding how best to design DRG-based hospital payment systems given country-specific aims and objectives; and (2) to explore the potential for harmonization of DRG systems and DRG-based hospital payment systems across Europe.

**Table 3.2** Key questions to be answered by this book

<i>Chapter</i>	<i>Key questions</i>
Chapter 4: DRG systems and similar patient classification systems in Europe	<ol style="list-style-type: none"> <li>1. What are the advantages and disadvantages of importing DRG systems?</li> <li>2. How are diagnoses and procedures coded?</li> <li>3. Which classification variables can be used?</li> <li>4. What should be the scope of included services?</li> <li>5. How many groups are justified?</li> </ol>
Chapter 5: DRGs and cost accounting: Which is driving which?	<ol style="list-style-type: none"> <li>1. Why is cost accounting important?</li> <li>2. How many hospitals should be included in the data sample?</li> <li>3. What incentives exist for hospitals to calculate their costs?</li> <li>4. What cost-accounting methods should be used?</li> <li>5. Which cost categories should be included?</li> </ol>

*Continued overleaf*

## 34 Diagnosis-Related Groups in Europe

**Table 3.2** *Continued*

<i>Chapter</i>	<i>Key questions</i>
Chapter 6: DRG-based hospital payment: Intended and unintended consequences	<ol style="list-style-type: none"><li>1. How can hospitals be paid using DRGs?</li><li>2. What are the incentives of DRG-based hospital payment?</li><li>3. What determines the strength of these incentives?</li><li>4. How can unintended consequences be avoided?</li><li>5. How can DRG-based hospital payment be adjusted?</li></ol>
Chapter 7: DRG-based hospital payment and efficiency: Theory, evidence and challenges	<ol style="list-style-type: none"><li>1. Why should DRG-based hospital payment improve efficiency of hospitals?</li><li>2. How has the effect of DRG-based hospital payment on efficiency been measured?</li><li>3. Does DRG-based hospital payment improve efficiency?</li><li>4. What challenges need to be overcome?</li></ol>
Chapter 8: DRGs and quality: For better or worse?	<ol style="list-style-type: none"><li>1. Why should DRGs and DRG-based hospital payment influence the quality of hospital care?</li><li>2. How has the effect of DRG-based hospital payment on quality been measured?</li><li>3. Does DRG-based hospital payment lead to better or worse quality of care?</li><li>4. How can DRG-based hospital payment be modified to improve quality of care?</li></ol>
Chapter 9: Technological innovation in DRG-based hospital payment systems across Europe	<ol style="list-style-type: none"><li>1. Why should DRG-based hospital payment influence the adoption of technological innovation?</li><li>2. How do countries in Europe encourage technological innovation?</li><li>3. How does technological innovation become incorporated into DRG-based hospital payment?</li><li>4. How could innovation management be improved in DRG-based hospital payment systems?</li></ol>

## 3.4 References

- Berki, S.E. (1985). DRGs, incentives, hospitals, and physicians. *Health Affairs (Millwood)*, 4(4):70–6.
- Brügger, U. (2010). *Impact of DRGs: Introducing a DRG Reimbursement System. A Literature Review*. Zurich: SGGP (Schriftenreihe der SGGP, Vol. 98).
- Busse, R., Schreyögg, J., Smith, P.C. (2008). Variability in healthcare treatment costs amongst nine EU countries – results from the HealthBASKET project. *Health Economics*, 17(Suppl. 1):1–8.
- Chalkley, M., Malcomson, J.M. (1998). Contracting for health services when patient demand does not reflect quality. *Journal of Health Economics*, 17(1):1–19.
- Chapko, M.K., Liu, C., Perkins, M. et al. (2009). Equivalence of two healthcare costing methods: bottom-up and top-down. *Health Economics*, 18(10):1188–201.
- Davis, C., Rhodes, D.J. (1988). The impact of DRGs on the cost and quality of health care in the United States. *Health Policy*, 9(2):117–31.
- Donabedian, A. (1966). Evaluating the quality of medical care. *The Milbank Memorial Fund Quarterly*, 44(3):166–203.

- European Parliament and Council (2011). *Directive 2011/24/EU on the Application of Patients' Rights in Cross-Border Healthcare*. Brussels: Official Journal of the European Union (L88/45–L88/65).
- Farrar, S., Yi, D., Sutton, M. et al. (2009). Has payment by results affected the way that English hospitals provide care? Difference-in-differences analysis. *British Medical Journal*, 339:b3047.
- France, F.H.R. (2003). Casemix use in 25 countries: a migration success but international comparisons failure. *International Journal of Medical Informatics*, 70(2–3):215–19.
- Jacobs, R., Smith, P., Street, A. (2006). *Measuring Efficiency in Health Care*. Cambridge: Cambridge University Press.
- Kimberly, J.R., de Pourvoirville, G., D'Aunno, T., eds (2008). *The Globalization of Managerial Innovation in Health Care*. Cambridge: Cambridge University Press.
- Lave, J.R. (2003). Developing a Medicare prospective payment system for inpatient psychiatric care. *Health Affairs (Millwood)*, 22(5):97–109.
- Legido-Quigley, H., McKee, M., Nolte, E., Glinos, I.A. (2008). *Assuring the Quality of Health Care in the European Union: A Case for Action*. Copenhagen: WHO Regional Office for Europe on behalf of the European Observatory on Health Systems and Policies.
- McCrone, P., Phelan, M. (1994). Diagnosis and length of psychiatric inpatient stay. *Psychological Medicine*, 24(4):1025–30.
- MedPAC (2003). Payment for new technologies in Medicare's prospective payment system, in MedPAC. *Report to the Congress: Medicare Payment Policy*. Washington, DC: Medicare Payment Advisory Commission.
- OTA (1983). *Diagnosis-Related Groups (DRGs) and the Medicare Program: Implications for Medical Technology – A Technical Memorandum*. Washington, DC: Office of Technology Assessment.
- Quentin, W., Scheller-Kreinsen, D., Geissler, A., Busse, R. (in press). Appendectomy and diagnosis-related groups (DRGs): patient classification and hospital reimbursement in 11 European countries. *Langenbeck's Archives of Surgery* (in press).
- Rogers, W.H., Draper, D., Kahn, K.L. et al. (1990). Quality of care before and after implementation of the DRG-based prospective payment system. A summary of effects. *Journal of the American Medical Association*, 264(15):1989–94.
- Schreyögg, J., Stargardt, T., Tiemann, O., Busse, R. (2006). Methods to determine reimbursement rates for diagnosis related groups (DRG): a comparison of nine European countries. *Health Care Management Science*, 9(3):215–23.
- Shih, C., Berliner, E. (2008). Diffusion of new technology and payment policies: coronary stents. *Health Affairs (Millwood)*, 27(6):1566–76.
- Shleifer, A (1985). A theory of yard stick competition. *The RAND Journal of Economics*, 16(3):319–27.
- Smith, P.C., Mossialos, E., Papanicolas, I., Leatherman, S. (2010). Conclusions, in P.C. Smith, ed. *Performance Measurement for Health System Improvement*. Cambridge: Cambridge University Press.